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Source of Hospital Payment as a Determinant of Cesarean Section Use, California, 1986

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THESIS

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ABSTRACT

This thesis examines cesarean section use to learn more about the determinants of medical practice. It is often believed that medical care decisions are influenced only by the clinical conditions of patients. However, a large volume of evidence suggests that non-clinical factors, including health care financing, have a substantial influence on medical decision-making.

To assess the effect of payment source on cesarean section use, this study employs data from the 217,368 deliveries occurring in California hospitals in the first half of 1986. Cesarean sections were performed in 24.3% of these deliveries, with health care payors differing substantially in their cesarean section rates. It was observed that women covered by private insurance had cesarean section rates (28.7%) nearly double those of indigent women (15.3%). Women covered by non-Kaiser HMOs (27.0%), Medi-Cal (23.1%), Kaiser (19.8%), and self-pay and others payors (19.2%) had successively lower rates.

This same ordering was generally observed when deliveries were stratified by clinical indications, maternal age and race/ethnicity. Payor differences were particularly dramatic for women with previous cesarean sections. Vaginal birth after cesarean occurred more than twice as frequently in women covered by Kaiser (19.1%) and Indigent Services (27.9%), compared to those covered by private insurance (7.9%). In addition, after controlling for patient characteristics through the methods of indirect standardization and multiple logistic regression, payment source continued to have a sizable effect on cesarean section use.

This study demonstrates that payment source is an important determinant of cesarean section use, confirming the role of non-clinical factors in medical decision-making. Because cesarean delivery is associated with increased physician and hospital costs, variations in cesarean section use have economic implications for health care payors. Were they to achieve Kaiser's cesarean section rate, private insurers, non-Kaiser HMOs, and Medi-Cal collectively would save an estimated $40 million in health care costs.

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INTRODUCTION

While it is often believed that medical decisions are influenced only by the clinical conditions of patients, a large volume of evidence suggests otherwise. The existence of variations in medical practice under differing modes of health care organization and financing are particularly provocative. The influence of these organizational factors, however, has been relatively unexplored in past research. The purpose of this thesis is to investigate one such factor, the source of payment for hospitalization, and to determine its influence on cesarean section use. By focusing on this controversial obstetrical procedure, much can be learned about the relationship between medical practice and health care organization.

Cesarean section is the most common hospital surgical procedure in the United States. In 1987, 934,000 cesarean sections were performed, accounting for 24.4% of all deliveries.[1] The tripling of U.S. cesarean section rates in the past 15 years has led to concerns regarding a negative impact on maternal and perinatal outcome, health care costs, and the subjective experience of childbirth. In particular, public and professional criticism has been fueled by observed variations in cesarean section use that are independent of clinical characteristics. Consistent with research on other medical practices, these variations suggest that non-clinical factors play a sizable role in obstetrical decision-making.

Most controversial are those variations associated with health care organization: the institutional and financial conditions under which

medical services are provided. The impact of health care organization on cesarean section use undermines the widely held normative belief that decision-making is unaffected by these extraneous influences. At the same time, these findings suggest a potential role for health care organization in planned interventions to control rising cesarean section rates.

This investigation focuses on the method of financing health care services. Health care financing in the United States is heterogenous: health care providers are reimbursed for their services through several distinct mechanisms. Each method of payment provides a unique context for obstetrical decision-making.

This thesis employs hospital discharge data from the State of California for the first half of 1986 to evaluate the effect of health care financing on cesarean section use. Cesarean childbirth provides an excellent model for the study of medical practice patterns. Investigation of this procedure has policy implications, both for obstetrics and for medical services more generally.

SUMMARY OF THESIS

Chapter One of this thesis reviews relevant past research on medical practice variations to provide a theoretical basis for investigating the relationship between cesarean section use and payment source. This review identifies those factors found to influence medical decision-making and presents three alternative models of physician behavior proposed to explain variations in medical practices. This literature, despite several drawbacks, has important implications for the analysis of cesarean section use.

Chapter Two introduces the clinical and policy controversies surrounding cesarean section use. This background on cesarean section use includes relevant obstetrical and statistical issues and is provided to define the clinical territory of the present study.

Chapter Three reviews past research linking health care organization with cesarean section use. While past research demonstrates that a variety of health care organizational factors influence cesarean section use, few studies have adequately analyzed this relationship.

Based on past work on medical practice patterns, as well as research specific to cesarean section use, Chapter Four presents the eight research hypotheses of this investigation. Many of these hypotheses address issues left unanswered by previous studies. The major hypotheses address the expectation that financial incentives will have a predictable influence on cesarean section use.

Chapter Five presents the methodology used to investigate the effect of payment source on cesarean section use. Data from the 217,000 California hospital deliveries in the first half of 1986 form the basis of this analysis. The variables available in the Office of Statewide Health Planning and Development (OSHPD) database are described in detail, as are the statistical methods employed to analyze the data.

The results presented in Chapter Six indicate a strong association between payment source and cesarean section rates. Cesarean section rates are highest for women with private insurance (29%) or non-Kaiser health maintenance organization (HMO) coverage (27%). Women covered by Medi-Cal (23%), Kaiser Permanente (20%), and Indigent Services (15%), as well as those without a third party payor (self-pay, 19%), have lower

rates of cesarean section. This pattern persists after controlling for numerous patient characteristics.

The implications of these findings are discussed in Chapter Seven. Despite several limitations, this study demonstrates that health care financing has a predictable influence on medical decision-making. While several mechanisms may operate simultaneously, the results are consistent with an important role of economic incentives in medical practice. The results suggest a need for fee-for-service payors to closely monitor cesarean section use, particularly in women with previous cesarean sections. Such an effort could result in substantial reductions in health care costs and inappropriate medical services. Finally, there is a need to elucidate the causal mechanisms by which health care organization affects medical practice, in order to increase the usefulness of this finding to public policy.

CHAPTER ONE

MEDICAL PRACTICE VARIATIONS

The type and amount of medical care that people receive depends on where they live. Ten-fold differences in the use rates of surgical procedures are common between similar geographic areas.[2] Beyond geographical variations, a variety of other non-clinical factors have been associated with variations in medical practice patterns. While it would be reassuring to find that these variations result from different distributions of illness, a sizable literature indicates that this is not the case. This research, therefore, has important policy implications for assessing the appropriateness of medical care and for developing strategies to modify medical practice.

Previous studies have investigated a variety of medical practices. While the focus has been on common surgical procedures, cesarean section use has not been well-studied. In summarizing past research, this review will establish a framework for investigating medical practice variations. This will not only provide a theoretical perspective for the analysis of cesarean section use that follows, but also will suggest deficiencies of past research that must be addressed.

This review will focus on five aspects of past research:

- The range of medical practices investigated.
- The factors shown to influence medical decision-making.
- Models of physician behavior that explain variations in medical practices.
- The policy implications of medical practice variations.

- Deficiencies in previous studies.

THE RANGE OF PRACTICES INVESTIGATED

Studies of medical practice variations typically have focused on the use rates of specific surgical procedures in geographic areas.[2-21] While this "small area" approach is inefficient in identifying causal patterns, it has documented the existence of striking variations and has provided a foundation for other approaches. A variety of other study designs have been employed less frequently, including the study of variations between patient populations, practice settings, and other organizational factors.

The wide range of medical practices that have been investigated include drug prescription,[22] radiological studies,[23] laboratory testing,[19,24,25] hospitalization for medical conditions,[19] and surgical procedures.[6-8,11-14,16,20,26-32]. Each of these practices is subject to substantial variation. Surgical procedures have been the focus of research, largely because surgery is more specifically and reliably documented than other medical practices. Frequent surgical procedures, such as tonsillectomy, hemorrhoidectomy, and appendectomy have been the most commonly studied. While research on non-surgical practices is limited, these practices appear to be no less variable in their use than surgical procedures.

Cesarean section, despite its frequency, has not been well-studied from this traditional perspective.[30] The standard approach to investigating variations employs population-based use rates (procedures per 100,000 population). This approach, however, is not well-suited to obstetrical procedures, which are highly dependent on population fertil-

ity rates. The use of delivery-based cesarean section rates (procedures per 100 deliveries) circumvents this difficulty and renders cesarean section use ideal for the study of medical practice variations.

FACTORS INFLUENCING MEDICAL PRACTICE

Explaining variations in medical practice requires understanding medical decision-making. In the absence of differences in the incidence or severity of a given condition, practice variations are nothing more than regular or institutionalized differences in the pattern of medical decisions made by physicians. Medical decision-making is a necessary starting place for the investigation of practice variations. A key feature of previous research has been to describe the factors that influence decision-making.

Clinical features of the individual patient are often assumed to have an overwhelming role in medical decision-making. Despite this widely held assumption, an abundance of evidence indicates the importance of non-clinical factors. This review documents the range of factors that influence clinical decision-making, leaving for the following section a discussion of the theoretical models of physician behavior.

Clinical decision-making occurs in a specific relationship between a physician and patient. Three groups of factors influence decisions:[33]

- Characteristics of the patient.
- Characteristics of the physician.
- Features of the doctor-patient relationship, including its economic and organizational context.

Patient Characteristics

Medical decision-making is affected by both clinical and non-clinical patient characteristics. The clinical conditions that patients present to the health care system have an obvious role in medical decision-making, because it is these features that receive direct medical attention. Decision-making may be influenced not only by clinical diagnoses, but also by the degree of uncertainty associated with the diagnostic process.

The patient, however, is not a purely medical entity, but has economic, social, cultural and demographic attributes that may modify medical decisions.[33-36] These factors may have a legitimate influence in so far as they are correlated with clinical characteristics that affect decision-making. For example, the elderly have a higher incidence of chronic conditions requiring medical treatment.

In contrast, other patient characteristics may affect decision-making independent of clinical factors. A patient's values, family situation, available resources, and access to medical care may affect the provision of medical care. For example, higher socioeconomic status is associated with higher surgery rates.[13,37]

Physician Characteristics

Physician characteristics, such as training and psychological attributes, also influence medical decision-making. The nature of formal and informal training, as indicated by specialty, years since medical school graduation, and extent of training, affect not only the database and skills available for decision-making, but may be linked to different modes of decision-making.[23,35] For example, physicians with

specialty training are more likely to order x-ray studies than non-specialists.[23]

The psychological make-up of physicians has been linked to the concept of "style of practice," implying that physicians differ in their inherent preference for different modes of making decisions.[2,38] A variety of factors have been discussed, including age, sex, innovativeness, and preference for specific work environments.[35,39] Physicians whose practice style favors intervention will be more likely to perform or recommend surgery, as in Roos' example of hysterectomy-prone physicians.[11]

There is a strong potential interaction between psychological make-up and training. Training decisions may be made on the basis of psychological characteristics, and training in turn may influence preferences for specific styles of practice.[40]

Doctor-Patient Relationship

The most complex influence on medical decision-making comes from features of the doctor-patient relationship itself, including the health care system that structures and defines this interaction. Because these factors are often less concrete and more abstract in nature, their influence is often down-played by the medical profession. Six categories of influences have been identified:

- The interpersonal relationship between physician and patient (including the patient's family).
- The organization of an individual physician's medical practice.
- The physician's relationship to hospital resources.
- The nature of formal or informal monitoring of physician decision-making.

- The organization of payment for medical services.
- The economic market in which a physician practices.

The interpersonal doctor-patient relationship influences decision-making. Szasz and Hollender, for example, describe three patterns of doctor-patient relationships: activity-passivity, guidance-cooperation, and mutual participation.[41] These patterns influence the exchange of information and determine the degree of patient participation in decision-making. It is unclear, however, if these dimension have a predictable effect on the use of medical services.

The organization of a physician's medical practice exerts a variety of influences on medical decision-making. Important dimensions of practice organization are: solo vs. group practice, health maintenance organization (HMO) vs. fee-for-service, referral-dependent vs. non-referral-dependent, and high vs. low degree of peer interaction.[22,40,42-47] The use of paraprofessionals in a medical practice also influences medical practice.[33] The role of these factors is illustrated by Freidson's finding that client-dependent physicians are less likely to adhere to established medical standards.[42] As with training decisions, psychological attributes may affect the setting in which physicians choose to practice. Physician selection of specific work environments may confound the relationship between organizational factors and clinical decision-making.[42,48]

Medical practice relies on the substantial capital resources of the modern hospital. The physician's relationship to these resources influences medical decision-making. Such factors as the availability of hospital beds, the relationship of the physician to the hospital (res-

ident vs. employee vs. admitting privileges), the availability of ancillary services, and the profit-mode of the hospital (public vs. private; non-profit vs. proprietary) all may affect physician practices.[3,6,9,16,49] These factors are typified by Roemer's Law, which states that hospital utilization expands to fill empty hospital beds.[35]

The nature of formal or informal physician review influences how physicians make decisions. Such monitoring involves local influences such as peer review, clinical leadership, supervision of residents, and internal review by hospitals. More global influences are diffusely present in societal, economic, ethical and legal norms regarding medical practice. Enforcement of these norms takes concrete form as malpractice suits, de-licensure proceedings, and the claims review and second opinion requirements of health care payors.[35]

The organization of payment for medical services has a variety of influences on clinical decision-making.[20,24,45,50-54] The extent to which out-of-pocket payments are made by the patient affects practice patterns, with physicians being less likely to provide services if patients must pay a substantial portion of the cost.[35,53] The relative payment for different medical services may influence decision-making. For example, surgery may be performed more frequently when surgical skills are over-compensated relative to cognitive skills.[55] Differing methods of paying physicians (salary vs. fee-for-service) also introduce incentives for different styles of practice.[45,49] Finally, the method by which hospitals are reimbursed for their services also influences physician decision-making.[56,57] In all of these instances, the presence of financial incentives is associated with increased use of services.

Avoidance of the costs of malpractice litigation may also be conceptualized as an economic incentive that influences medical practice.

The economic market in which a physician practices has an impact on his or her practice patterns. Although this factor has not been well-studied, such dimensions as rural vs. urban markets, the supply and specialty mix of other physicians, and the extent of competition for patients appear to affect medical decision-making.[58,59] An increased supply of physicians, for example, is generally associated with increased utilization.[6,20,60,61]

Summary

Previous studies have identified three sets of factors that influence medical decision-making. Patient characteristics (including non-clinical attributes), physician characteristics, and elements of the doctor-patient relationship all motivate the use of medical services. The range of factors cited illustrates that variations in medical practice involve far more than the clinical characteristics of patients.

MODELS OF PHYSICIAN BEHAVIOR

Three general models of physician behavior have evolved to explain why the three groups of factors described above influences medical decision-making:

- The physician acts as an agent of the patient.
- The physician acts as a self-fulfilling practitioner seeking to maximize economic and/or social goods.
- The physician acts according to organizational and social norms.

These models are not mutually exclusive, but explain different facets of medical decision-making left unexplained by the other models.

These three models have their origin in cognitive, economic and sociological theories of human behavior. Each theoretical model makes particular assumptions regarding the nature of human behavior and action. As applied to medicine, none of these three models has been fully developed, especially the economic and sociological models. Although the agency model underlies most research on medical decision-making and practice variations, the other models have important applications.

Physician as the Patient's Agent - Normative Model

Although not an adequate explanatory model in its pure form, a normative model of medical decision-making underlies most past research on medical practice variations. As a description of how medical decision-making should function, the normative model assumes that the physician is both capable and willing to act as the patient's rational agent.[34] Under this model, clinical characteristics of the patient are assumed to dominate medical decision-making. The physician employs his or her specialized skills to interpret this complicated information and selects an appropriate course of action by weighing the risks and benefits of various alternatives. This model of decision-making is formalized in the mathematical and statistical literature on decision-analysis.[62-67]

The dominant descriptive model of practice variations is Wennberg's professional uncertainty model, which is a modified version of the normative model.[21,68,69] Wennberg's model acknowledges that medical diagnosis and the selection of treatment are characterized by uncertainty introduced because:

- Patients' with specific conditions show a range of signs and symptoms, making observations and tests less than 100% predictive.

- The outcome of actions is also uncertain, because sound information is often lacking on the likelihood of various outcomes.

This model also endows the physician with psychological attributes that influence his or her approach to treatment in the face of uncertainty. Despite these alterations, the physician still functions as the patient's agent. Instead of being a neutral processor of complex information, the physician's actions are clouded by his or her personal "style of practice."[21,69]

A cognitive approach to decision-making can accommodate the additional feature of non-clinical patient characteristics as a determinant of medical practice. Family situation and the cultural, social and economic characteristics of patients influence decision-making by modifying the value placed on various risks and benefits of specific treatments.[33] Medical decisions are presumed to represent the decisions that patients themselves would make if they had the technical expertise of physicians.[70]

A model that views the physician acting as the patient's agent is able to incorporate clinical and non-clinical features of the patient, as well as physician characteristics, into a description of how physicians behave. This approach to explaining variations, however, does not incorporate the demonstrated role of organizational and economic influences.

Economic Model of Physician Behavior

In contrast to viewing behavior as the outcome of the disinterested processing of information, economic theory views behavior as motivated by self-interest. An economic model views physician behavior as ration-

al action which is oriented towards maximizing social or economic utility. In addition to functioning on behalf of the patient, the physician functions on behalf of himself or herself. Several alternative goals may be pursued by the physician: maximum income, a target income level, a balance between income and leisure time, a particular mode of practice, or an avoidance of malpractice litigation.[35]

This model does not bypass entirely the clinical basis of decision-making, but it no longer views the physician as solely, or even primarily, an agent of the patient. Like the normative model, the economic model views the physician as a rational actor, but this time acting rationally to promote his or her own interests.

The most clearly specified economic model of physician behavior is that of "physician-induced demand."[21,36,39,61,71-73] This model recognizes that the normal relationship between consumer (patient) and supplier (physician) is disrupted in medical practice. As a result, providers are able to create demand for their services. In this model, financial incentives, the availability of hospital beds, and the supply of other physicians, affect the willingness and ability of physicians to create demand for their services.

The economic model is often criticized for viewing the physician as a self-serving actor. Such manifestly pecuniary activity is often denied by physicians and is difficult to demonstrate. As Luft points out, however, economic motivations may be embedded in the norms of medical practice, so that they function indirectly.[49] In this sociological variation of the economic model, physicians need not be seen as rationally self-interested because established norms of practice have incorporated rules that lead to utility maximization.

An economic model of physician behavior is able to explain the role of many non-clinical factors known to influence decision-making. While this model is not popular among the medical profession, it parsimoniously explains how medical decision-making is influenced by the health care system.

Sociological Model of Physician Behavior

A sociological model of physician behavior views the social system surrounding medical practice as a key determinant in medical decision-making. The health care system, whether defined locally (the physician's office) or globally (federal policy), generates social norms that function to maintain the system. These norms help to shape how individual physicians relate to their work environment. As Freidson quotes Mannheim: "both motive and actions very often originate not from within but from the situation in which individuals find themselves."[42] The agency and economic models, in contrast, have fixed definitions of physician motives. The agency model assumes that problem solving is the task of medical decision-making, while the economic model views utility maximization as the motive.

In describing variations in practice patterns, the most important element of the sociological model is its focus on the diverse situations in which physicians practice.[40,42] These situations define the norms of medical practice, which in turn influence medical decision-making.

Eddy's model of clinical standards provides a link between the agency and sociological models.[74,75] According to this model, the degree of uncertainty in diagnosis and medical treatment necessitates clinical standards as a method of simplifying the otherwise unmanageable com-

plexity of medical decision-making. Clinical standards function as institutionalized norms that govern physician action in specific clinical situations. While clinical standards may incorporate the rational information central to the agency model, they are also affected by other factors, such as convenience, economic incentives, and institution-specific conditions.

Social norms may be either explicit or implicit. Some norms, like those in textbooks, may be acted on consciously by physicians. Other norms, such as a preference for providing too much care rather than too little care, may be latent.[75]

Many of the social norms affecting physician behavior are common to all physicians and have been imparted through the socialization process of medical training. Other norms vary between physicians because of differences in practice settings and local conditions. Each setting develops explicit or implicit norms that guide the actions of physicians within the specific practice environment.

A sociologic model views physician behavior as having a non-rational component. Therefore, a broader range of situational influences may be incorporated into decision-making, in contrast to the agency and economic models. In the sociological model, the individual patient or physician is no longer the focus of attempts to explain variations in physician behavior. The salient dimension of medical practice is the broader system that provides a context for the work of individual physicians.

Summary

Three models of physician behavior provide mechanisms to explain variations in medical practice patterns. A normative model describes physician behavior as oriented towards clinical problem solving with the physician acting as an agent of the patient. An economic model views behavior as motivated by practitioners' self-interest. Finally, a sociological model views physician behavior as oriented towards fulfilling the social norms associated with their work environment.

POLICY IMPLICATIONS OF MEDICAL PRACTICE VARIATIONS

Research on medical practice variations has important implications for policy formulation involving physicians and the health care system. Given the current emphasis on controlling health care expenditures, research has been applied in two major areas:

- Gauging the extent of inappropriate utilization of services.
- Selecting potential strategies for modifying medical practice patterns.

Variations and Inappropriate Utilization

The existence of variation in medical practice indicates that utilization patterns are neither cost-effective nor technically appropriate. Variations also suggest that clinical standards are either poorly defined or not adhered to by physicians. The issue, however, is complicated by several factors:

- Over-use and under-use of services frequently occurs within the same population.
- Average utilization patterns may not be suitable norms for judging the appropriateness of medical practice.
- Variations may have legitimate origins in patients' clinical and selected non-clinical characteristics.

In populations with high utilization of services, the marginal effect on health outcome of additional health care services is usually regarded as small.[26,76,77] Some have maintained that marginal utility in this situation is often negative, due to iatrogenic illness produced by unneeded services.[26,38,76] In the presence of practice variations, high utilization suggests the provision of inappropriate services, with medical and economic costs that outweigh the benefits.[26]

Such a straight-forward view of variations has been increasingly questioned. Chassin, for example, has shown that inappropriate services are not limited to populations with high utilization rates.[5,78] Inappropriate utilization, as judged by an expert panel, was found to be prevalent even at low levels of utilization.

Due to cost considerations, research has focused on the link between high levels of utilization and unnecessary services. However, low utilization may suggest that needed medical actions are not being taken. The fee-for-service market includes incentives that make this less likely, because over-utilization is rewarded, while under-utilization is not. However, under other modes of financing health care, particularly pre-paid services, the opposite incentives may operate.[79]

Eisenberg has cautioned against using average utilization rates as norms for determining whether utilization is appropriate, because the average rates may themselves represent inappropriate medical practice.[80] Attempts to measure the appropriateness of utilization according to strict clinical standards suggest that clinical standards are followed less than half the time. This is particularly germane to variations in cesarean section use, where several critics have concluded that optimal cesarean section rates lie well below current average rates.[81,82]

Some have argued that variations may not reflect inappropriate utilization at all, because variations are potentially explained by patients' medical characteristics and the values that different patients place on medical intervention.[70,83] Pauly implies that even if variations are due to inappropriate utilization, this utilization is not important from a policy perspective, because its choice by patients indicates that the services provided are valued on some level.[70]

In conclusion, there is no clear cut set of criteria for gauging the appropriateness of medical services. However, high utilization in the presence of practice variations is often equated with inappropriate and unnecessary services. The validation of this generalization requires further research. What is clear is that, in the absence of differences in disease severity or patient preferences, medical practice variations indicate uneven adherence to the clinical literature.

Strategies for Changing Practice Patterns

Research on variations in practice patterns has several important implications for changing physician behavior. While medicine has historically been free of external regulation, policies aimed at modifying practice patterns are becoming increasingly important.[35,84,85] A crucial question faced by policy makers is how to reduce health care expenditures without reducing the quality of care.[80,85]

The strategies selected for changing practice patterns will largely depend on how physician behavior is conceptualized. If the physician is viewed as functioning as an agent of the patient, then clarifying the scientific database available for decision-making is the most effective strategy. Wennberg, for example, proposes to modify physician behavior

by disseminating detailed utilization information as a feed-back mechanism for decision-making.[68] An economic theory of physician behavior, in contrast, would emphasize strengthened incentives for appropriate utilization patterns. The Medicare Prospective Payment System's (PPS) use of diagnosis related groups for reimbursement focuses on providing incentives for efficient patient management.[57,86] A sociological model would emphasize structural changes in the health care system, as illustrated by efforts to promote HMOs as an alternative to a fee-for-service mode of practice.[79,87]

Past research on medical practice variations is perhaps most relevant in showing that health care organization affects physician behavior. This is critical because few patient or physician characteristic are amenable to modification. Most of these characteristics, such as age, sex, past medical training, and psychological orientation, are immutable. Changes in medical practice patterns, however, may be approached through modification of health care organization. Despite the salience of the connection between health care organization and medical practice, previous studies have not fully explored the policy implications of this relationship.

The relationship between health care financing and medical practice deserves special consideration. The finding that health care financing affects decision-making suggests that the method and amount of reimbursement might be modified to affect physician behavior. Past research, for example, suggests that fee-for-service reimbursement leads to over-utilization, while HMOs appear to maintain quality of care with lower utilization.[79]

DEFICIENCIES OF PAST RESEARCH

Research on medical practice variations has soundly refuted the widely accepted assumption that medical decisions are guided solely by the clinical characteristics of patients. Despite success in this task, this research suffers from five major deficiencies:

- There has been an over-emphasis on describing, rather than explaining, practice variations.

- Most research is subtly biased towards the traditional normative model of medical practice, without sufficient development of economic or sociological models of behavior.

- Small area analysis is over-emphasized to the exclusion of analytically more powerful research designs.

- The distribution of disease between populations (case-mix), is only rarely taken into account.

- Multivariate analysis is not generally employed.

Research on variations in medical practice patterns has described the existence of variations without adequately searching for their cause. This deficiency results from several causes, including: under-development of economic and sociologic explanations, the use of ecological (ie. geographically defined) units of analysis, and a lack of sophistication in statistical analysis. In the absence of explanatory models of variations, medical practice variations are frequently accepted as a natural (and almost necessary) element of the health care system.

It has been very difficult for researchers to extricate themselves from a normative model of medical decision-making. The professional ethos of medicine carries strong norms regarding the relationship between doctor and patient. Conceptualizing medical decision-making in

any other manner contradicts these fundamental norms. As a result, the normative model underlies most research on medical practice variations, while economic and sociological models of physician behavior have remained relatively undeveloped.

Research on variations has been stifled by an over-reliance on small area studies. This research design is not statistically powerful in identifying the causes of variations. As an ecological approach, small area analysis is constrained in its ability to make generalizations about the behavior of individual physicians. In addition, this approach is not readily employed in urban areas because of difficulties in defining small areas.[35] The results from rural areas may not be generalizable.

A major deficiency of previous studies is the failure to confront the hypothesis that differences in the distribution of disease (case-mix) explain most variations in medical practice. Only a minority of studies have attempted to control for clinical case-mix, usually with crude methods. It is often presumed that the magnitude of variations is so great that case-mix differences can explain only a small fraction of the observed variations. For example, the finding of ten-fold variations in the use of tonsillectomy is not likely to be explained by differences in upper respiratory infections among populations of children. Without explicit proof of these assertions, however, the lack of case-mix adjustment leaves a convenient target for those skeptical of the influence of non-clinical factors.

Past studies have been over-reliant on univariate techniques of data analysis. The wider use of multivariate analysis would not only allow for adequate case-mix adjustment, but would also permit the

independent role of many complex influences to be assessed. Roos, for example, concluded from a univariate analysis that clinical standards are similar in high use and low use areas.[14] Examination of the study's summary data, however, suggests a confounding effect of physician supply and illness incidence. Multivariate approaches would not only be more statistically powerful, but may also yield more valid conclusions. This is particularly important as research on variations moves beyond description and begins to seek the causes of variations.

Summary

The limitations of previous studies of medical practice variations impose restrictions on the usefulness of this research. As will be described below, many of these deficiencies are recapitulated in research focusing specifically on cesarean section use. The present investigation will attempt to address the short-comings of previous studies, particularly in the area of case-mix adjustment.

CHAPTER TWO

CESAREAN SECTION

Cesarean section, the delivery of a fetus by surgical incision through the abdominal wall into the uterus, has been performed since antiquity.[88-90] While the origin of the term is disputed, it may derive from a Roman legal mandate that abdominal delivery be performed after maternal death. Alternatively, cesarean may be an altered form of the Latin *cadere*, meaning to cut. Accounts of Julius Caesar being delivered in this manner have been discounted, since his mother was known to have survived his birth. Despite this long history, only in the last 40 years has cesarean section become safe enough to be widely applied in less desperate situations.

For an assortment of reasons, cesarean section is now frequently performed for a number of relatively common obstetrical indications. The increase in cesarean section rates, however, has been criticized from medical, social and economic perspectives. The controversy surrounding cesarean childbirth and several unique features of obstetrical practice make cesarean section ideal for an examination of the factors affecting medical decision-making.

In 1987, 934,000 cesarean sections were performed in the U.S., accounting for 24.4% of all deliveries.[1] As the most frequent surgical procedure in U.S. hospitals, cesarean sections accounted for 4.5% of all hospital surgeries in 1985.[91,92] As shown in Table 1 and Figure 1, the widespread use of cesarean section is a recent phenomenon. In less than

two decades, the cesarean section rate has quadrupled from its 1970 rate of 5.5%.[93,94] Although the largest relative increases occurred in the mid-1970's, cesarean section rates have continued to increase throughout the 1980's. Likely future trends are not clear. The 1.4% increase from 22.7% in 1985 to 24.1% in 1986 is one of the largest absolute annual increases in the U.S.[95] Based on data through 1985, Placek projected that the cesarean rate in 2000 will exceed 40%.[96] However, the 0.3% increase from 1986 to 1987 is the second smallest relative, as well as absolute, increase experienced since 1970.[1,97]

Trends in the State of California coincide with those for the nation as a whole (Table 1 and Figure 1). Throughout the 1970's, California experienced higher cesarean rates than the rest of the country, although since 1979 this difference has disappeared.[98-101] In 1986, California experienced a cesarean section rate of 23.1% (based on live births).[100]

Although the United States has high cesarean rates compared to other nations, cesarean section use internationally has shown a similar pattern of increasing rates.[102] During the 1970's, the cesarean section rates of most industrialized nations doubled.

REASONS FOR INCREASING CESAREAN SECTION USE

Many factors have contributed to the increase in cesarean section rates. Although their relative contribution is controversial, a number of factors have been implicated.

Cesarean section has become an increasingly safe procedure, due in part to the availability of antibiotics to treat post-surgical complica-

tions.[103-105] This development has shifted risk-benefit considerations in the direction of cesarean section use.

Increasing cesarean section use may also be linked to a shift in obstetrics towards a greater emphasis on fetal outcome, with a relatively diminished emphasis on maternal outcome.[89,106,107] The increasing safety of the birth process for the mother and changing fertility patterns have placed a premium on optimal fetal outcome.

Obstetrical residency programs have reduced their training in difficult vaginal deliveries. As a result, fewer obstetricians are trained in complex non-surgical maneuvers.[89,90,106]

The use of obstetrical forceps has fallen out of favor as a means of expediting delivery, with cesarean section as the remaining alternative.[105,108] This change has been prompted by a recognition of the dangers of traumatic vaginal delivery, as well as diminished training in forceps delivery.

Sophisticated technology, particularly fetal heart monitoring and ultrasound, have increased the diagnosis of fetal compromise, leading to increased cesarean section use. Improved ascertainment, however, has been accompanied by reduced diagnostic specificity and more false positive test results.[105,109,110]

Increasing intervention in childbirth has also been blamed on the prominence of obstetrical malpractice concerns since the late 1970's. The fear of becoming involved in malpractice litigation may have produced a lower threshold for the use of cesarean section.[90,108,111,112]

In the 1960's and 1970's, childbirth became increasingly the province of obstetricians, with non-specialists only rarely supervising

deliveries. The medicalization and specialization of childbirth may have led to a more interventionist mode of practice.[113-115]

Declining work-loads for obstetricians in the 1980's provide an additional incentive for the more liberal use of cesarean section.[91] From 1979 to 1984, the number of obstetrician/gynecologists increased by 22%,[91] while the number of births increased by 0.5%.[93,116]

Increasing cesarean section use also results from past cesarean sections. Past primary cesarean sections, particularly among young women, will have a continued impact on future repeat cesareans, because nearly all women with previous cesarean sections are delivered abdominally.[93,108]

Increasing maternal age and decreasing parity, both of which increase the risk of cesarean section, also have made a small contribution to rising cesarean section rates.[117] In addition, these demographic changes are associated with changing cultural attitudes towards child-bearing that emphasize a desire for perfect perinatal outcome.[90]

CLINICAL INDICATIONS FOR CESAREAN SECTION

As a surgical procedure, cesarean section is associated with several distinct clinical situations. As discussed below, these diverse indications have been classified into five categories: previous cesarean section, dystocia, breech presentation, fetal distress and all other indications (Table 2 and Figure 2). The use of cesarean section for these indications seeks to improve perinatal outcome in situations where vaginal delivery is perceived to carry an increased risk to the fetus.[105]

Previous Cesarean Section

Previous cesarean section is the most frequent reason for cesarean section and accounts for 35% of all U.S. cesareans.[1] Current patterns in the 9.5% of deliveries with this indication continue to follow the long-standing dictum that "once a cesarean, always a cesarean."[118] In 1987, 90.2% of women with a previous cesarean were delivered by repeat cesarean section.[1,97] While questioned in the current obstetrical literature,[119-126] this pattern persists because of an unwarranted fear that the uterine scar from the previous cesarean section makes the uterus more likely to rupture if labor is permitted.[121] In addition, it is perceived that the anatomical and physiological conditions leading to the initial cesarean will recur in subsequent deliveries. An abundance of evidence, however, suggests that vaginal birth after cesarean (VBAC) is both safe and feasible in the absence of clearly recurrent conditions. Uterine rupture of serious consequence is exceedingly rare.[127-129] The recurrence of indications from the initial primary cesarean section is much less frequent than once thought.[130-132] Vaginal birth after cesarean (VBAC) is increasingly advocated[89,133,134] and is common in Western Europe.[102]

Dystocia

Indications other than previous cesarean section account for 65% of all cesarean sections. In 1987, one out of every six women who had not had a previous cesarean delivered abdominally.[1] Dystocia, which includes anatomical and functional difficulties of labor, accounts for 28% of all cesareans. Of women whose primary diagnosis is dystocia, 59.5% deliver by cesarean section. Dystocia comprises four diagnostic sub-

categories: disproportion, obstructed labor, long labor, and abnormal labor.[108] Disproportion occurs when the maternal pelvis is too small to accommodate the fetus. Obstructed labor is an arrested descent of the fetus in the birth canal. Long labor refers to any situation where the progress of labor is protracted, though not necessarily arrested. Abnormal labor refers to functional problems with uterine contraction that delay descent. These conditions are interrelated and more than one is often present simultaneously.[135] Dystocia serves as an indication for cesarean section either by preventing vaginal delivery altogether or by compromising fetal or maternal health to the extent that abdominal delivery becomes necessary.[89,136]

The frequent use of cesarean section for the indication of dystocia has been criticized.[81,89,137-143] In comparison with the diagnosis of previous cesarean section and breech presentation, dystocia is a more subjective diagnosis. Some critics have charged that dystocia is a convenient post-hoc diagnosis for cesarean sections performed without legitimate indication.[87]

Breech Presentation

Cesarean section for breech presentation, where the fetal feet or buttocks enter the birth canal first, make up 10% of cesareans. Cesarean section is becoming the norm for the 3% of deliveries in breech presentation: in 1987 84.4% of women in breech presentation delivered by cesarean section.[1] Cesarean section is often advocated in breech presentation because this position makes vaginal delivery more difficult.[144-145] One such difficulty arises because the lower extremities and torso of the fetus are delivered more easily than the fetal head.

This produces arrest of the aftercoming head, which may compromise blood flow to fetal tissues.[144] Abdominal delivery is also advocated for very low birthweight infants in breech presentation because these infants are less tolerant of the additional physical forces employed in vaginal breech delivery.[146]

While breech presentation is considered a strong indication for cesarean section, vaginal delivery in breech presentation continues to have advocates.[147,148] Several studies have failed to show that abdominal delivery improves perinatal outcome in otherwise normal term infants presenting in breech.[147] Manual repositioning the fetus with its head in the preferred downward orientation (external cephalic version) is increasingly advocated to avoid breech presentation altogether.[148-154] This procedure, now aided by medications that relax the uterus, is enjoying a renaissance after falling out of favor in the past two decades.[155]

Fetal Distress

Fetal distress, the response of the fetus to an inadequate supply of oxygen, accounts for an additional 10% of cesareans.[1] Of deliveries where fetal distress is the primary diagnosis, 38.2% occur by cesarean. Fetal distress is usually diagnosed by specific abnormalities detected with monitoring of the fetal heart rate.[105,110,156] Changes in the fetal heart rate serve as a proxy for lack of adequate oxygen to other vital organs, particularly the brain.[89] Lack of adequate oxygenation may be produced by circulatory conditions in the mother, insufficient placental circulation, and umbilical cord compression.[89] Cesarean section is indicated if heart rate patterns indicate prolonged compromise and

vaginal delivery is not imminent.[105,135]

Substantial disagreement exists regarding the role of fetal monitoring and the use of cesarean section for marginally abnormal fetal heart patterns.[89,156] It has been demonstrated that in low-risk populations, an abnormal fetal heart tracing has a low predictive value, indicating a high rate of false positive tracings for which cesarean section was not required.[110]

Other Indications for Cesarean Section

There are a variety of other medical diagnoses that serve as indications for the remaining 18% of cesarean sections.[1] The most common other indications for cesarean section are umbilical cord complications, premature rupture of the fetal membranes, early or threatened labor, malpresentation other than breech, multiple pregnancy, maternal hypertension, maternal infection, antepartum hemorrhage, and other maternal medical conditions.[89,105,157-159] In contrast to the more common indications, relative consensus exists for the use of cesarean section for many of these indications.[89,105]

TRENDS IN THE INDICATIONS FOR CESAREAN SECTION

As cesarean section use has increased there have been several important trends in the patterns of cesarean use by indication. Table 3 apportions the change in cesarean section rates from 1970 (5.7%) to 1987 (24.4%) into three elements:

- The amount due to changing incidence of indications for cesarean section.
- The amount due to changing indication-specific cesarean section rates.

- The amount of change due to both of these factors for a particular indication.

In Figure 3, these changes are presented by showing the incidence of indications and the incidence of cesarean section for given indications, both as percentages of total deliveries.

More than a third of the increase in cesarean section use over the past 17 years can be attributed to an increasing number of deliveries in women with previous cesarean sections.[1,160] Cesarean sections due to dystocia have contributed to 26% of the 1970 to 1987 increase in total cesarean section rates, mostly due to increased reporting of dystocia. Fetal distress, a diagnosis made possible by the introduction of fetal heart monitoring during this period, accounted for 13% of the total increase. Cesarean section use in the presence of breech presentation increased from 12% in 1970 to 84% in 1987. As a result, cesareans for breech presentation constitute 11% of the total rise in cesarean section rates. Other indications collectively accounted for 15% of the 1970 to 1987 increase.

Past studies that describe the changing indications for cesarean section confirm the increasing prominence of previous cesarean section.[108,159,161-169] Over a wide range of time periods and geographical locations, these studies also indicate the contribution made by the more frequent diagnosis of dystocia and fetal distress.

CRITICISMS OF INCREASING CESAREAN SECTION RATES

Much controversy has accompanied these dramatic changes in the use of cesarean section. The increasing frequency of cesarean childbirth has been criticized from several perspectives. Calls for lower cesarean section use focus on:

- The increased maternal mortality associated with cesarean childbirth.
- The increased maternal morbidity from cesarean section.
- The uncertain relationship between cesarean section use and perinatal mortality.
- The increased infant morbidity associated with cesarean section in specific situations.
- The social and psychological impact of cesarean section.
- The increasing health care costs associated with cesarean section.

Maternal Mortality

While an increasingly safe procedure, cesarean section carries a small, though definite, increased risk of maternal mortality. The most quoted estimate is that the risk of death from cesarean section is two to four times that of vaginal delivery.[170,171] However, several studies have estimated the risk to be as high as 12 times that of vaginal delivery.[172,173] One recent report attributed the rising maternal mortality rate in a public hospital to an increase in cesarean section use.[174]

Much of the increased risk from cesarean section is due to the surgical process. Common causes of death following cesarean section include pulmonary embolism, anesthesia mishaps, infection, and hemorrhage.[170,175-178] The mortality risk from cesarean section, however, is occasionally confounded by the presence of maternal conditions that contribute to the need for cesarean section and are themselves independently associated with increased maternal mortality.[171]

Maternal Morbidity

Maternal morbidity, particularly post-partum infection, is common following cesarean section.[157,170,179-181] Even when prophylactic antibiotics are employed, as many 20% of women develop fever and 15% develop endometritis, an infection of the uterus.[182] Full recovery from childbirth is prolonged following cesarean section.[183] Women delivering by cesarean stay in the hospital an average of 2.3 days longer than women delivering vaginally.[1] In addition, longer periods of limited activity following hospital discharge are required after cesarean section.[89]

Relationship to Perinatal Outcome

While the historical association of rising cesarean rates and falling perinatal mortality is given as a rationale for increasing cesarean use,[104,184] a causal relationship between the two trends is not clear. A closer examination of this relationship suggests a more complex situation. First, since the early 1980's improvements in perinatal outcome have slowed substantially despite dramatic increases in cesarean section use.[185] Second, low perinatal mortality and low cesarean rates have been achieved in some U.S. hospitals and in many Western European countries.[186-189] Third, trends in neonatal intensive care, electronic fetal monitoring, and improved prenatal care may be more directly responsible for declines in perinatal mortality rather than increasing rates of cesarean childbirth.[187] Because many studies have demonstrated similar perinatal outcome at dissimilar cesarean section rates,[156,186,190-192] high cesarean section rates cannot be interpreted as an indicator of better quality of care. The bulk of evidence suggests that if a causal relationship exists between cesarean section

use and perinatal outcome, this relationship operates only in populations where cesarean section use is relatively infrequent by current U.S. standards.

Infant Morbidity with Cesarean Section

In certain situations, cesarean section use is associated with increased infant morbidity. Elective cesarean section occurring before the onset on labor carries the risk of iatrogenic prematurity and respiratory distress syndrome in the infant.[89,117] While errors in obstetrical dating have been reduced by the increasing use of diagnostic ultrasound, this problem still continues at an unknown level.[193] Independent of premature delivery, pulmonary complications are more likely to occur because optimal infant lung function appears to depend on the physical pressures exerted on the fetal thorax during vaginal delivery.[194] Finally, recent studies have observed that infants delivered by cesarean section were at higher risk of low Apgar scores[195] and respiratory distress syndrome[265] when relevant demographic and obstetrical factors were taken into account.

Social and Psychological Impact of Cesarean Section

Increasing cesarean section use is part of a broader trend towards greater intervention in the birth process. Increasing medicalization of delivery has resulted in fundamental changes in the experience of childbirth. These changes have been criticized in the popular press for their negative impact on how women experience childbirth and how they relate to their infants.[196-198] While these criticisms often have an ideological component, several studies have documented a negative impact of cesarean section on mother-infant bonding.[89,199-202] Decreased bonding

has been explained by the greater post-surgical pain and the lack of post-partum infant contact in women receiving cesareans.[200]

Economic Impact of Cesarean Section

Additional health care costs are associated with cesarean section.[203-206]. The average total cost (physician and hospital) of a cesarean section in 1986 ($4,270) was 68% greater than for a vaginal delivery ($2,560).[203,207] While most of this difference reflects the two to three additional hospital days required following cesarean section,[1,95,208,209] physician fees for cesarean section ($1,100) are also greater than for vaginal delivery ($890).[203] Every percent increase in the U.S. cesarean section rate carries a cost of $66 million. If 50% of cesareans are not necessary,[81,82] then excess expenditures amount to $740 million.

Summary

Concerns regarding maternal outcome, perinatal outcome, psychological impact, and health care costs explain why increasing cesarean section use has been termed an "epidemic" by both the public and the medical profession.[107,210] Careful assessment of the relationship between health care organization and cesarean section use will add insight into current obstetrical practice patterns. Such an investigation will aid in the development of policy aimed at controlling the rise of cesarean section rates, a widely advocated objective.[89,95,140] Identifying the non-clinical determinants of cesarean section use may suggest specific strategies.

CESAREAN SECTION USE AS MEDICAL PRACTICE VARIATION

An analysis of the effect of health care organization on cesarean section use will help elucidate the nature of medical practice variations. Several factors make cesarean section use an ideal situation in which to investigate variations in medical decision-making.

The clinical controversy surrounding cesarean section indicates uncertainty regarding its use. Variations in clinical practice patterns are more likely to occur in the presence of such uncertainty.[21,38,48] Additional factors also make cesarean section well-suited for an investigation of medical practice variations:[30]

- Cesarean sections are sufficiently frequent to insure adequate statistical power in an analysis of their use.
- An accurate use rate for cesarean section is more easily calculated than for health services where population-based rates must be employed.
- Obstetrical care is provided during a well-defined episode of care.
- Despite continuing controversy, the indications for cesarean section use are well-characterized.
- Because birth represents a vital statistical event, details are readily available regarding delivery that are not routinely available for other types of health care.

The frequency of cesarean section provides large sample sizes for statistical analysis, increasing the statistical power to detect variations in the use of cesarean section. A large sample size also allows the use of data from the most current single year, rather than combining data over several years. In addition, greater flexibility in analytical methods is possible. For instance, subpopulations may be analyzed in a way not possible with rarer surgical procedures.

Patterns of cesarean section use are easily assessed in a statistically valid manner because an accurate use rate can be calculated. Investigating surgical procedures using population-based rates is frequently handicapped by difficulties in defining an appropriate population denominator.[14,63] In contrast, calculation of cesarean section rates as the number of cesarean sections per 100 deliveries makes use of a readily available denominator. In addition, population-based use rates are profoundly affected by whether patients seek health care services, as well as by physician behavior. Analysis of cesarean section use more successfully isolates the physician behavior component, because the entire denominator (hospital deliveries) is directly subject to medical decision-making.

Obstetrical decision-making occurs in a well-defined episode of care during a single hospitalization. This discrete nature of the delivery episode facilitates assessment of cesarean section patterns. In contrast, for many health care services decision-making extends over several health care encounters that collectively define an episode of care. For example, gall bladder removal (cholecystectomy) is usually performed only after a series of outpatient and/or inpatient encounters.

Due to controversy regarding its proper use, the indications for cesarean section have been well-defined in the obstetrical literature. This establishes a set of clinical diagnoses that may be used to statistically control for relevant characteristics of patients. Unlike other surgical procedures, the indications for cesarean section are routinely ascertained in patients not subjected to surgery.

Because birth is a vital statistical event, information about the birth process is recorded in greater detail than for many other hos-

pitalizations. For example, information on both maternal and fetal conditions that affect delivery are routinely recorded. This amount of detail enhances the ability to analytically control for patient characteristics.

These factors make cesarean section use a valuable medical practice in which to evaluate variations in decision-making. The results of such an analysis may be applicable to a wide variety of other health care services not so easily analyzed.

CHAPTER THREE

HEALTH CARE ORGANIZATION AND CESAREAN SECTION USE

Few previous studies have directly assessed the effect of payment source on cesarean section use. Past research has, however, demonstrated a relationship between cesarean section use and health care organization more generally. It serves to illustrate the range of non-clinical factors that influence the use of cesarean section. Even when not directly focused on payment for health care services, past research provides insight into the possible mechanisms of obstetrical decision-making that affect the relationship of payment source and cesarean childbirth.

Previous studies have assessed the organizational determinants of cesarean section use by employing three types of information:

- Vital statistics data collected on birth certificates and hospital discharge abstracts.
- Medical records data from individual hospitals.
- Cross-national comparisons with a variety of data sources.

Despite the shortcomings of past research, compelling evidence indicates that health care organization strongly influences cesarean section utilization. In particular, direct or indirect financial incentives appear to lead to increased cesarean section rates. Additionally, hospital characteristics, such as size, ownership, teaching hospital status and the presence of an neonatal intensive care unit (NICU) affect cesarean section utilization.

Past studies, however, suffer from two major deficiencies that are shared with investigations of medical practice variations generally. First, inadequate attention has been paid to controlling for the potentially confounding effect of demographic and clinical characteristics that define obstetrical case-mix. Because case-mix should, ideally, be the sole determinant of cesarean use, examination of the relationship of other variables to cesarean section must account for the effect of case-mix. The second deficiency of past research is that the particular parameters of health care organization that causally affect cesarean section use have not been elucidated. Determining the independent effects of health care organization variables is particularly important because many of these variables are closely interrelated.

STUDIES EMPLOYING VITAL STATISTICS DATA

Studies using data from birth records or hospital discharge abstracts suggest the following relationships between health care organization and cesarean section rates:

- Cesarean section rates generally increase as the size of a delivery service increases.
- Hospitals affiliated with medical schools have higher cesarean section rates.
- Public or HMO ownership is associated with lower cesarean section rates.
- The relationship of cesarean section to the adequacy of hospital resources differs depending on the type of resource involved.
- Women whose expected source of payment for hospital care is Medicaid, HMO's or self-pay have lower cesarean section rates.

Two caveats regarding the studies presented in this review must be noted. First, increasing cesarean section rates over time represent a

potential problem in presenting the results of studies completed at different points in time. The cesarean section rates cited in this review are intended to indicate the magnitude of the effect of health care organization on cesarean section use within individual studies. Differences in the absolute cesarean section rates reported between different studies should not be surprising, given the secular trend of increasing cesarean section use, as well as substantial geographic and hospital-specific variations.

Many studies of cesarean section rates and health care organization have not calculated the statistical significance of observed differences in cesarean rates. While this review attempts to indicate where differences are not statistically significant, this was not always possible on the basis of published information.

Hospital Size

The National Hospital Discharge Survey (NHDS) has been used to investigate the relationship between cesarean section and several health organization variables.[1,93-95,116,211,212] The 1981 and 1985 data show hospitals with 500 or more beds to have cesarean section rates that are 150% higher than hospitals with under 100 beds.[94,116] Data for 1987, while still showing large hospitals with the highest rates (25.6%) and small hospitals with the lowest rates (21.3%), indicate a lessening of differences in cesarean section rates.[1] Early rates from the 1965 Survey also show a gradient with hospital size.[89]

Using 1977 data from the Hospital Cost and Utilization Project (HCUP), Goldfarb found that hospitals with 500 or more beds had a 14% cesarean section rate, while small hospitals (under 100 beds) had a rate

of 11%.[114] Stratifying the data by whether or not hospitals had a medical school affiliation and/or a neonatal intensive care unit (NICU), however, showed an inconsistent relationship between hospital size and cesarean section rates.

Using 1978-1980 birth and fetal death certificate data from California, Williams and Chen found that small delivery services had the lowest unadjusted primary cesarean rate (9%), while middle size services had a rate of 13%, exceeding that of the largest hospitals (11%).[213] Controlling for a number of demographic and other variables (age, birthweight, ethnicity, parity, etc.) did not alter this pattern.

Shiono employed a survey sample of 450 U.S. hospitals to collect data on obstetrical practices in 1979 and 1984.[214] In 1984, hospitals with large delivery services (>5,000 annual deliveries) had a cesarean section rate of 20.6%, compared to 18.5% for the smallest delivery services. A stronger gradient by delivery service size was noted for 1979 (17.1% vs. 12.3%).

Data from the 1974 Professional Activities Survey (PAS) show that large hospitals (500 or more beds) had cesarean section rates (10%) exceeding those of small hospitals with less than 100 beds (7%).[89] A similar pattern was noted for 1967 data.

Using 1982 hospital discharge data from Maine, Carpenter found no statistically significant effect of either hospital size or the annual number deliveries by a particular physician.[215] Unfortunately, only 59 physicians were included in the study.

In summary, past studies indicate that a low volume of deliveries is correlated with lower cesarean section rates. However, past studies have been inconsistent with respect to the magnitude of this effect and

the relative rates of medium and large-sized hospitals. The causal explanation for these past findings is not clear. The effect of hospital size may be due to the indirect effects of other variables, such as patient characteristics. Williams, however, found that larger hospitals had case-mixes that are no more prone to high cesarean section rates than smaller hospitals.[213] Goldfarb's analysis suggests that the presence of an NICU or medical school affiliation may override the effect of hospital size.[114]

Hospital Ownership

Data from the 1981 NHDS found the highest cesarean section rates for proprietary hospitals (22%), followed by voluntary non-profit hospitals (19%) and government hospitals (15%).[116] The 1987 data show narrowing differences with proprietary hospitals having rates 23% greater than government hospitals.[1] Earlier data from 1965 show the different ownership categories to have similar rates.[89]

The HCUP data showed nearly identical rates for proprietary (13%), voluntary (13%) and government hospitals (12%).[114] This similarity persisted when hospitals were stratified by medical school affiliation and the presence of an NICU.

After adjusting for demographic case-mix variables, Williams and Chen found proprietary, non-profit and district hospitals to have primary cesarean rates (13%) above those for hospitals owned by the Kaiser Foundation (10%), counties (10%), the University of California (10%) or the Federal government (9%).[213] Unadjusted rates showed a similar pattern.

The Consensus Conference on Cesarean Childbirth, in an analysis of New York City birth registration data for 1968-1977, observed that municipal hospitals had lower primary and repeat cesarean section rates (14%) than either voluntary (16%) or proprietary hospitals (16%).[89] A similar pattern was noted for 1968-1969 data. When the data were stratified by birthweight, the differential between municipal and the other hospitals increased in magnitude.

Deliveries taking place in military and other federal hospitals in 1980 have lower rates (simple average of 13%) than for the U.S. as a whole (15%).[89]

Italian birth registration data from 1985 show that private clinics had cesarean section rates (32%) higher than either obstetric clinics run under government contract (26%) or those owned by the government (21%).[216] Adjustment for maternal characteristics resulted in a similar pattern, but with a diminished gradient between public and private hospitals. Data from Brazil indicate that public hospitals had rates that were 20% less than private for-profit or private non-profit hospitals.[217] Similar findings have been reported for Australia.[218]

In summary, past studies have shown public hospitals to have lower cesarean section rates. The cesarean rates of proprietary hospitals generally are higher than those of non-profit hospitals. Several direct causal explanations are possible. Differences by hospital ownership status may be related to financial incentives, physician organization (salaried vs. fee-for-service), physician characteristics, and patient case-mix.

Teaching Status

Unlike hospital ownership, whether or not a hospital is a teaching center does not show a consistent effect on cesarean section use. California birth records data for 1978-80 show that medical center teaching hospitals had lower rates of primary cesarean section (9%) than other hospitals (12%), a pattern not modified by adjusting for patient demographic characteristics.[89] Petitti, also using California birth records data, showed that while in 1978 teaching hospitals had the same rate as other hospitals, by 1982 the cesarean section rate for teaching hospitals was lower than that of other hospitals.[219] Data from the 1980 National Natality Survey, on the other hand, found higher cesarean section rates in hospitals with a medical school affiliation (18%), compared to unaffiliated hospitals (16%).[109] Shiono found that hospitals with obstetrics residency programs (56% of all hospitals in her sample) had cesarean section rates identical to those of other hospitals.[214]

Data from the Professional Activity Survey for 1967-74 showed that among large to medium sized hospitals, higher cesarean section rates are found in teaching hospitals.[89] Most recently, hospital discharge data from 1986 in Illinois were used in a multiple logistic regression model to demonstrate that teaching hospitals had lower cesarean section rates even when demographic and medical variables were controlled.[220] For women with previous cesarean sections, vaginal birth after cesarean rates were dramatically different for teaching (16.6%) and non-teaching hospitals (7.9%). On a univariate basis, Goldfarb observed that hospitals with medical school affiliation had higher rates (14%) than unaffiliated hospitals (12%).[114] The effect of medical school affiliation, however, depended on whether a hospital had an NICU. In the

presence of an NICU, affiliation was associated with decreased cesarean section rates (14% vs 16%), while in the absence of an NICU there were increased rates (13% vs. 11%). Stratification by specific demographic and medical risk factors did not alter this pattern.

In total, these studies do not show a consistent relationship between teaching hospital status and cesarean section use. Part of the confusion surrounding the role of teaching programs may result from changes over time in this relationship. It may be that early diffusion of obstetrical technology led to higher rates in teaching centers. Over time, however, the unrestricted diffusion of technology to community hospitals may have placed this technology in a setting where it is less likely to be used appropriately. This explains why NICUs are associated with increased cesarean section use in non-teaching hospitals. The greater expertise in the use of this technology in teaching centers may constrain further growth of cesarean section rates.

Presence of a Neonatal Intensive Care Unit

Williams and Chen showed similar standardized cesarean section rates in hospitals with full capability neonatal intensive care units (NICUs), intermediate NICUs and no NICUs.[213] Surprisingly, hospitals with full capability NICUs (Level III) delivered women at lower inherent risk for cesarean section. Shiono's 1984 survey data indicated that the presence of an NICU increased cesarean section rates (21% vs. 19%), although this finding was not statistically significant.[214] Goldfarb found that on a univariate basis, the presence of an NICU increased cesarean section rates (15% vs. 12%).[114] This relationship was maintained whether or not a hospital was affiliated with a medical school,

but was particularly strong for unaffiliated hospitals (16% vs 11%). Stratification by maternal age, race and birthweight did not alter this pattern. When the data were stratified by medical complications, however, the presence of an NICU resulted in lower cesarean section rates, particularly in medical school-affiliated hospitals.

In sum, the relationship between NICU and cesarean section rates is a complex one that has not been examined adequately. Most studies show higher unadjusted cesarean rates in hospitals with NICUs. Goldfarb, however, found that cesarean section rates are lower in the presence of an NICU after stratifying for the presence or absence of medical complications.[114] It is not known whether hospitals with an NICU serve a more cesarean prone population (based on medical complications), leading to higher cesarean rates. Changes in the relationship between obstetrical technology and its appropriate use may also have occurred over the past ten years.

Other Hospital Resources

Carpenter's data from Maine show that the presence of a 24-hour blood bank reduced the rate of cesarean section in the presence of dystocia.[215] As the number of anesthesiologists present in the hospital increased there was a corresponding decrease in cesarean section rates. Because the presence of on-site anesthesiologists facilitates emergency cesarean section, their presence may allow obstetricians to attempt vaginal delivery with emergency back-up rather than opting for an elective cesarean section. Carpenter found that a longer expected interval required to perform an emergency cesarean section was correlated with higher cesarean section rates.

Little work has been done to investigate whether the availability of hospital resources has an effect on cesarean section rates. Teaching status and NICU status are imprecise proxies for hospital resources that more directly affect cesarean section use. This area is in need of further examination because the availability of such resources may confound the relationships between other hospital characteristics and cesarean section rates.

Source of Payment

Data from the 1981 NHDS showed that women whose hospital care is paid for by Blue Cross (20%) and other private insurance (19%) have higher cesarean rates than those covered by Medicaid (16%), other government programs (15%), self-pay (14%) and no charge or other sources (12%).[116] NHDS data for 1986, when stratified by race and age, continued to show this gradient.[93] Aggregate U.S. data for 1987 again showed Blue Cross with the highest rate (26.5%) and self-pay with the lowest (19.3%).[1]

California hospital discharge data for 1984 show that cesarean section rates were substantially lower for Medi-Cal (21%), HMO or prepaid health plans (20%) and self-pay (17%) than for private insurance (27%).[208,221] Stratification by age or race categories diminishes, but does not eliminate, these differences. Similar results were found with 1985 California discharge abstract data.[209]

Goldfarb observed the highest cesarean section rates for Blue Cross (14%) and commercial insurance (13%), while Medicaid (12%) and self-pay (11%) had lower rates.[114] This gradient was not altered when the data were stratified by medical school affiliation and the presence of an

NICU. New York City data for 1976-1977 showed that women covered by Medicaid had lower cesarean rates (14%) than those with other insurance (18%) or those who were self-pay (15%).[89] Stratification by birthweight revealed a similar pattern. Norris and Williams examined 1978 data from California birth records and found that women with Medi-Cal had the same cesarean section rates as women without Medi-Cal.[222] Stratification by race did not alter this finding, although other case-mix differences may have confounded this finding.

In summary, past studies have shown substantial differences by payor source, with private insurance associated with higher rates and HMO or self-pay categories associated with lower rates. These findings are consistent with an influence of direct or indirect financial incentives on physicians and hospitals. However, other factors that may, in part, account for these findings include: patient case-mix, physician characteristics, and the characteristics of hospitals used by different payors. The question of how payment affects cesarean section use is what the present study seeks to examine in detail. A particularly important goal is to investigate whether case-mix differences explain variations between health care payors.

Summary

Studies using hospital discharge abstracts or birth records have demonstrated that hospital characteristics strongly influence cesarean section rates. Small hospitals, publicly owned hospitals, and HMO hospitals are more likely to have lower cesarean rates than other institutions. The effect of other variables, such as teaching status, presence of an NICU, and other hospital resources is more complex.

Source of payment for hospitalization has been identified as an important determinant of cesarean section use. Higher cesarean rates occur in women covered by private insurance, compared to those covered by Medi-Cal, HMOs or who are self-pay.

Few of these relationships have been examined controlling for the demographic and medical characteristics of patients known to affect cesarean section use. No studies have made use of multivariate analysis to estimate simultaneously the independent effect of each factor. Additional organizational factors, including hospital occupancy rates, relative hospital charges for vaginal and cesarean childbirth, referral status, and physician characteristics have not been examined.

STUDIES OF INDIVIDUAL HOSPITALS

Studies based on medical records from individual hospitals, while more limited in scope, make use more specific information than is available from vital statistics sources. Studies using this source of data also demonstrate the influence of health care organization on cesarean section use, observing that:

- Women delivered by private physicians have higher cesarean section rates than those delivered by salaried physicians.
- The cesarean section rates of HMO patients are lower than those of fee-for-service patients.

Private vs. Clinic Patients

Using data based on deliveries in four Brooklyn hospitals in 1977-1982, de Regt found that the cesarean section rate of private physicians was 25% higher than that of salaried clinic physicians. This pattern was observed for both primary and repeat cesareans.[192] Similar results were obtained when the data were stratified by specific medical com-

plications or statistically adjusted for birthweight. Porreco's analysis of 1982-1983 deliveries in a Denver hospital showed cesarean rates of 6% for clinic patients and 18% for private patients.[191] Primary cesarean section rates showed a similar differential (4% vs. 11%). No adjustments were performed to account for patient characteristics. Data from birth records in New York City for 1976-1977 also show higher cesarean section rates among private patients (17%) compared to general service (clinic) patients (14%).[89] Both primary and repeat cesareans followed a similar pattern. When the data were stratified by birthweight, the differential tended to increase in magnitude. Similar results were observed for 1968-1969.

Biggs reported that in Brisbane, Australia private patients underwent 20% to 170% more cesareans than clinic patients on a year by year basis between 1960 and 1982.[223] Reporting 1982 data from New Zealand, Timmings found cesarean section rates of 16% for private patients and 11% for clinic patients.[224] This gradient was confined to primary cesarean sections (13% vs 6%); repeat cesareans were more common among clinic patients. Based on an analysis of a number of hospitals in Brazil, Janowitz found that private physicians had over five times the primary cesarean section rate of salaried hospital physicians.[225,226] This pattern persisted when the data were stratified by a variety of medical complications.

In summary, these studies show lower cesarean section rates among salaried physicians than among their fee-for-service counterparts. This finding is observed both in the United States and in other countries. The causal explanation for this finding is not clear, but may be related to financial incentives, different patient characteristics, and peer

review among salaried physicians (who are often affiliated with medical training programs).

HMO vs Fee-For-Service Patients

Using 1975-1976 data from Brigham and Women's Hospital in Boston, Wilner observed higher primary cesarean sections rates for fee-for-service (FFS) physicians (14%), compared to HMO physicians (11%).[227] This gradient was increased among multiparous women (7% vs 3%).

Using 1979-1981 data from a Detroit obstetrical group practice, Wright found that although patients were being delivered by the same physicians, FFS patients had a cesarean rate of 22%, compared to 13% for HMO patients.[228] The difference was more pronounced for primary cesareans (15% vs. 8%). While not explicitly controlled for in the analysis, HMO and FFS patients had similar characteristics.

The results of these two studies, showing that HMO patients have lower cesarean section rates, are consistent with studies based on vital statistics. That differences were found between HMO and FFS patients at the same hospital or with the same physician suggests that causal factors are operating independent of hospital or physician characteristics. This finding again suggests that indirect financial incentives influence cesarean section use.

Summary

Previous studies employing data from individual hospitals demonstrate that women receiving care as clinic patients have lower cesarean section rates, as do women covered by HMOs. With the exception of the de Regt study,[192] these studies have not taken advantage of the greater detail and quality of data available from medical records. As with

studies based on vital statistics, inadequate attention has been paid to adjusting for the demographic and medical characteristics of patients.

CROSS-NATIONAL COMPARISONS

Large cross-national differences in cesarean section rates exist in the absence of differences in perinatal outcome. While cross-national comparisons are problematic, studies using national data to compare obstetrical practices suggest that:

- Cesarean section rates tend to be lower in nations where more physicians are on salary.
- Parameters of health care organization are likely to play a role in cross-national differences.
- Despite wide variations in cesarean section rates, medical practice patterns are not converging.

A series of studies also have compared obstetrical practices in Ireland and the U.S., employing data from individual hospitals. These studies validate studies based on national statistical data and provide a more detailed description of variations in cesarean section rates.

Organizational Differences in Cross-national Differences

Notzon reports vital statistical data from 19 countries in Europe, North America and the Pacific.[102] For 1981, cesarean section rates varied from 18% in the U.S. to 5% in the Netherlands and Czechoslovakia. Despite many potentially confounding factors, countries where physicians are paid on a fee-for-service basis had higher cesarean section rates. Time series data presented for 1970-1983 showed that cesarean section rates are increasing at similar rates in all countries, suggesting that current differences are likely to be maintained.

Bergsjo analyzed cesarean section use in nine European nations, finding the highest rate in West Germany (13%) and the lowest reported rate in Turkey (1%).[186] Wide variations were observed among European nations. These data suggest that cesarean section rates are lowest in relatively poor nations. Among the most developed nations, however, the sizable variations in cesarean section use may be explained by other factors, including differences in national health care programs.

In contrasting obstetrical practices in Europe and the United States, Thiery and Derom concluded that cesarean section rates are lower in Europe because of differing cultural attitudes towards childbearing, a de-emphasis on high technology, and differences in how health services are organized.[229,230] In the Netherlands, the extensive use of both home-birthing and government salaried mid-wives is an important factor in that country's low cesarean section rate.

While the interpretation of cross-national differences is open to uncertainty and requires much speculation, it is likely that health care organization plays a considerable role in the observed differences. While the method of paying physicians is a salient variable, this factor alone explains only part of the observed differences. Other differences in health organization, as well as cultural, social and economic differences, may also be important.

Comparison of Irish and American Practices

The National Maternity Hospital in Dublin, Ireland, which has maintained a cesarean section rate of less than 7% since the late 1960's, has been the center of debate regarding American and Irish obstetrical practices.[137,138,187,188,231-233] Although O'Driscoll[138,188,189]

distinguishes Irish practices primarily on the basis of a consciously different approach to managing labor, differences in health care organization are also present. American and Irish cesarean section rates vary most widely for the indications of dystocia (4.7% vs. 0.7% of all deliveries) and previous cesarean (4.7% vs. 1.1% of all deliveries), exactly those indications subject to the greatest scientific dispute.

Levano[233] and O'Driscoll[188] have engaged in an ongoing debate regarding comparisons of the National Maternity Hospital in Dublin to Parkland Hospital in Dallas. This debate focuses on whether differences in patient characteristics invalidate the finding that the Irish hospital has achieved comparable perinatal outcome statistics with a cesarean section rate that is a third of the American rate.

Sheehan compared cesarean section use for 1980-1982 in unspecified American and Irish hospitals that serve demographically similar populations.[137] The primary cesarean section rate in nulliparous women at low risk for complications was twice as high at the American hospital (12% vs. 6%). Sheehan attributes this finding to differences in how patients pay for health services, how physicians are paid, and the influence of American malpractice litigation.

Although this debate on Irish and American hospitals is of limited generalizability, the more detailed information available in these studies validates the findings from national vital statistics data. Irish/American comparisons suggest that cross-national differences arise in exactly those situations where clinical uncertainty would tend to increase the influence of health care organization.

Summary

Cross-national differences in cesarean section use are of such a magnitude that differences in health care organization should be considered as a contributing cause. While there has been little detailed discussion of such a relationship, cross-national comparisons provide results consistent with the influence of health care organization within the U.S. Comparisons between Western Europe and the U.S. have much in common with comparisons between HMOs and the fee-for-service sector. Financial incentives provide an explanation for both findings, although other factors are also likely to be important. As with the other studies reviewed, cross-national comparisons fail to adequately account for the role of patient characteristics.

CONCLUSIONS

Past research has demonstrated that parameters of health care organization, such as specific clinical settings, the arrangement of services and health care financing, have a strong influence on cesarean section use. This conclusion is supported by studies using vital statistics data, those using information from individual hospitals, and those comparing national patterns of cesarean section use.

Studies making use of vital statistics data suggest a complex relationship between hospital characteristics and cesarean section rates. Smaller hospitals and those owned publicly or by HMOs have lower rates. The role of teaching status, the presence of an NICU, and the availability of other hospital resources is not consistent. The source of payment for hospital services also affects cesarean section use.

Studies employing medical records data from individual hospitals also suggest a role for financial incentives. These studies emphasize the role of physician payment mechanism (fee-for-service vs. salary), rather than hospital payment mechanism. By evaluating such differences within hospitals, these studies hold constant the potentially confounding effect of hospital characteristics. The most striking finding of cross-national comparisons is the lower cesarean section rates observed in countries where physicians are salaried.

Past studies inadequately adjust for case-mix adjustment and fail to measure the independent effects of health organization variables. Inadequate attention has been paid to controlling for the potentially confounding effect of demographic and medical case-mix characteristics. Because referral patterns may be based on medical complications, it is particularly important that this potentially confounding effect be taken into account. Most of the studies reviewed, however, did not adjust for any differences in case-mix between different health care organization categories. The reliance on unadjusted rates carries the risk that spurious conclusions will be drawn.

The parameters of health care organization that have a causal relationship to cesarean childbirth have not been elucidated effectively. Past studies have generally considered only one health care organization parameter at a time. Detailed explanations of how health care organization affects cesarean section use will need to simultaneously examine the effects of several interrelated elements of health care organization.

Given the salience of financial incentives as a possible causal linkage between health care organization and cesarean section use, it is

critical to clarify the relationship between cesarean section use and source of payment. The present study seeks to accomplish this task. While a focus on payment will not resolve the question of how payment interacts with other health care organization variables, it represents an important step towards understanding the medical decision-making process leading to cesarean section.

CHAPTER FOUR

RESEARCH HYPOTHESES

The past three chapters have reviewed three areas of research relevant to this study. Chapter One has examined past research on general variations in medical practice. Chapter Two has provided a review of the clinical and statistical issues pertinent to cesarean childbirth. Chapter Three has focused on specific investigations relating cesarean section to health care organization. Given this review, this study's research hypotheses have the following objectives:

- Validating the results of past studies by employing an improved methodology and more recent data.
- Examining the consistency of the effect of payment source on cesarean section use under differing clinical situations.
- Evaluating cesarean section use in Health Maintenance Organizations (HMOs).
- Describing the populations served by different health care payors in terms of their risk for cesarean section.

VALIDATION OF PAST FINDINGS

One focus of this study is to confirm and validate the results of past research. This task is necessitated by the methodological deficiencies of previous studies and the dramatic changes that have occurred recently in the health care system.

In order to reassess past findings, the present study employs a large sample size and careful adjustments for obstetrical case-mix. In addition, the use of California data allows simultaneous investigation of many modes of hospital payment. These elements of research design

will correct for the deficiencies of past studies and produce more reliable results.

Three changes in the financing of health care require reassessment of past patterns of cesarean section use. First, in the early 1980's Medicaid eligibility criteria became more restrictive and greater constraints were placed on beneficiaries.[204,234] Second, among private health insurers, preferred provider organizations (PPOs) have grown in membership. Because the co-payments of PPO members are reduced or eliminated if care is sought at selected hospitals, fee-for-service financing resembles pre-payment from the patient's perspective.[57] Finally, the number of individuals without health insurance or government entitlement has increased substantially.[204,235] California is at the forefront of these changes, and national trends are likely to follow California's lead. These changes point to the need to reevaluate the following hypothesis:

> *HYPOTHESIS I: The cesarean section rates of health care payors will vary in a regular fashion, with private insurance being associated with the highest rates followed by Medi-Cal, Health Maintenance Organizations (HMOs), Self-pay, and Indigent patients. This ordering will persist with adjustment for the case-mix of the different payors.*

While cesarean section rates of these five payment sources have never been evaluated simultaneously, a number of studies point to the hypothesized relationship. Ellis' studies of 1984 and 1985 California data confirm the ordering of Private Insurance, Medicaid, and Self-pay groups found in many past studies.[208,209,219] Ellis also found that HMO patients had lower cesarean section rates than Private and Medicaid patients, a finding consistent with past research.[227,228] The low rate of abdominal delivery predicted for Indigent patients rests on evidence

of low cesarean rates in clinic (as opposed to private) patients[89,191,192] and public hospitals.[1,89,93,114,213] Unfortunately, case-mix adjustment has not been performed in most past studies.

The predicted ordering is consistent with the general literature on medical practice variations. Hospitals and physicians will experience the most profound economic incentives when they are reimbursed on a fee-for-service basis. Economic incentives will lead to the highest cesarean section rates in women covered by private insurance. Identical fee-for-service incentives operate for Medicaid, but will be less potent because of the lower Medicaid reimbursement levels to both hospitals and physicians.[203,204,206] Deliveries paid for by HMOs, Self-pay and Indigent services all face economic incentives for vaginal delivery, leading to less frequent use of cesarean section.

CONSISTENCY OF THE EFFECT OF PAYMENT SOURCE

An innovation of this study is to analyze the effect of payment source on cesarean childbirth among and between different patient subpopulations defined by demographic and clinical characteristics. Past research has not been sufficiently detailed to allow for such comparisons. The present study will test the following hypotheses:

> *HYPOTHESIS II: The relationship between cesarean section use and payment source will be consistent within subpopulations defined by age, race/ethnicity and medical indications for cesarean. Specifically, the order of Private Insurance, Medi-Cal, HMOs, Self-pay and Indigent will be retained within each subpopulation.*

Several lines of evidence suggest that payor differences will be present across patient subpopulations. Past research on cesarean section use has demonstrated that the effect of health organization is consistent between primary and repeat cesarean sections. The finding of

health care organizational differences in dissimilar populations suggests that differences will persist when a single population is subdivided. The literature on medical practice variations implies that specific "clinical policies" evolve in reference to how patients pay for their care. While patient characteristics may modify the power of these policies, they do not nullify their underlying effect on medical decisions.

> *HYPOTHESIS III: Those medical indications where cesarean section use is considered more discretionary will show wider variations in cesarean section rates by payment source. The widest variations are expected for previous cesarean section, followed by dystocia, fetal distress and breech presentation.*

Several researchers have suggested that variations in medical practices will be widest when clinical uncertainty is greatest.[21,38,48] It follows that those indications for cesarean section with the greatest clinical controversy will show the widest variations between payors. In the presence of clinical uncertainty, the effect of payment source will play a larger role relative to other factors. Review of the obstetrical literature suggests that breech presentation is the most widely accepted indication for cesarean section. In contrast, previous cesarean section is the most controversial, with current repeat cesarean section rates arguably inconsistent with accepted standards of practice. While dystocia and fetal distress are also controversial indications, controversy centers on their over-diagnosis. Thus, a portion of deliveries with these indications are nondiscretionary, while the remainder involve considerable latitude.

> *HYPOTHESIS IV: By race/ethnicity, whites will show wider variations by payment source than will other racial or ethnic groups.*

Several studies suggest that medical practice variations increase

with socioeconomic status.[13,37] The finding of lower cesarean section rates in clinic and public hospital populations is consistent with a lower number of marginally indicated cesareans in lower socioeconomic populations. Because of their greater average income, whites in California will show greater variations in cesarean section use than other groups.

HYPOTHESIS V: By maternal age, the magnitude of payment source differentials will be greatest for the youngest age group, but similar for all other age groups.

While the magnitude of variations is not expected to vary widely for different age groups, the youngest group represents a more uncertain situation.[135] In delivering younger women, particularly nulliparas without an obstetrical history, obstetricians may be affected by non-clinical factors to a greater extent than in delivering older women.

CESAREAN SECTION USE IN HEALTH MAINTENANCE ORGANIZATIONS

The analysis of California obstetrical data offers a unique opportunity to assess differences between HMOs. Although HMOs have been shown to have lower cesarean section rates,[208,209,219,227,228] it is not known whether cesarean section use varies between HMOs. The present study will examine the following two hypotheses:

HYPOTHESIS VI: Large, centrally-managed group HMOs will have lower cesarean section rates than other HMOs.

Comparisons of practice patterns between group and non-group HMOs show that the performance of non-group HMOs more closely resembles that of fee-for-service providers.[40,44] These findings confirm the theoretical expectation that centrally-managed care will be better able to encourage cost-savings. Furthermore, group HMOs have consistent hospital, physician and administrative incentives to avoid cesarean sec-

tion. Patients covered by Individual Practice Arrangement (IPA) and Network HMOs face administrative and physician incentives to avoid overuse, but lack clear hospital incentives. Past studies of cesarean section use have not assessed the effect of these differences. The present study allows the cesarean section use in Kaiser Permanente to be compared to that in non-Kaiser HMOs (Other HMOs).

HYPOTHESIS VII: The two Kaiser Permanente Regions in California, both representing large group model HMOs, will have comparable cesarean section rates.

While the two Kaiser Permanente Regions are independently managed in different regions of the state, they have in common the same organizational structure.[44,236,237] It is predicted that this structural similarity will result in comparable patterns of cesarean section use.

DESCRIPTION OF PAYOR POPULATIONS

A subsidiary purpose of this study is to describe the populations served by different health care payors. Different types of patients differ in their likelihood of delivering abdominally, independent of who pays for their delivery. For example, women with previous cesarean section are at much greater risk of delivering by cesarean section. Payors, in turn, differ in the types of patients they serve. It is important to assess the degree to which particular payors serve more or less cesarean-prone populations. A more cesarean-prone population implies that a payor serves women whose demographic or medical characteristics are, on average, more likely to lead to cesarean section. Evaluating the presence of such payor differences in case-mix suggests the biases likely to be encountered in comparing unadjusted cesarean section rates. The present study evaluates the following hypothesis:

HYPOTHESIS VIII: Based on the distribution of age, race/ethnicity and indications for cesarean section among each payor's deliveries, Private Insurance will have the most cesarean-prone case-mix, followed by Other HMOs, Kaiser, Medi-Cal and Self-Pay.

Past studies comparing case-mix between payors have found that working populations, like those served by Kaiser, Other HMOs and Private Insurance, are healthier and comprised of less complicated cases.[44] For most medical conditions this implies lower hospital admission rates and shorter stays in the hospital. A different pattern may apply to obstetrical care. Working populations may have a higher risk of cesarean section because women with health insurance are likely to be older and have more risk factors for cesarean section. In contrast, women covered by Medi-Cal and Self-Pay may be at lower risk for cesarean section.

SUMMARY

The analysis of California hospital discharge abstract data for 1986 will focus on these eight hypotheses. Past studies of cesarean section use provide the practical basis for these hypotheses, while research on variations in medical practice provide the theoretical foundation. These hypotheses have direct policy implications, as well as relevance to understanding the factors affecting medical practice.

CHAPTER FIVE

MATERIALS AND METHODS

To evaluate the research hypotheses stated in the previous chapter, an analysis was performed using 1986 hospital discharge abstract data for the State of California. The characteristics of this database and the rationale for its selection are described below. Documentation of the variables used in this analysis is provided, with a particular focus on the principal independent variable, expected source of hospital payment. Women in California have their obstetrical care paid for by a diverse range of payors, whose characteristics are described.

This study seeks to describe the influence of payment source on cesarean section use. A critical aspect of the analysis is to account for potential confounders. Several strategies are employed to evaluate the alternative hypothesis that payor differences in cesarean section rates are explained by population differences between payors. Defining the demographic and clinical features of payor populations that constitute case-mix is central to this process. The data analysis relies on three methods: simple tabular analysis, indirect standardization for potential confounding variables, and multiple logistic regression analysis.

CALIFORNIA HOSPITAL DISCHARGE ABSTARCT DATA

California hospital discharge abstract data for the first half of 1986 form the basis of this investigation. The data are collected through the California Office of Statewide Health Planning and Develop-

ment (OSHPD) on each non-military hospital discharge in the State.[238,239] Analysis was limited to hospital discharges associated with a delivery.

Rationale for Selection of the OSHPD Data

Several considerations motivate the use of the OSHPD data for this investigation. The use of available discharge abstract data has distinct advantages over the collection of new data. Among available discharge data sets, the OSHPD data is best suited for this study.

Although the collection of data from hospital medical records could generate a broader range of information on each delivery, this process is cumbersome both in terms of time and expense. The use of readily available data is more cost-effective and allows a sample size sufficient for the detailed analyses performed in this investigation. The use of California hospital discharge information takes advantage of the substantial efforts expended by the State to develop the OSHPD database.

Aside from the State of California, there are a number of other sources of computerized hospital discharge abstract data. Several other states, most notably New York, Maryland, and Illinois, have publicly available hospital discharge databases.[9,27,220] In addition, the National Center for Health Statistics (NCHS)[108] and the Professional Activities Survey (PAS)[160] have national samples of hospital discharges available.

The overriding criterion for the selection of the OSHPD data was the heterogeneity of payment sources for California hospital deliveries. The large number of deliveries to patients covered by HMOs makes California ideal for evaluating payment source as a determinant of medical practices. Aside from this consideration, the OSHPD data have several other advantages:

- The author is most familiar with the practice environment of California, an important consideration in interpreting the results of this investigation.
- While no state can be considered typical, practice patterns in California often shape medical practices in other states.
- With the exception of the New York State data, the OSHPD data have by far the largest number of deliveries available in any given time period for a specific geographic area.
- The OSHPD data have been collected since 1981, allowing for gradual improvements in data quality.

Mechanisms of Data Collection

The process of data collection by the State involves several steps. It begins in each non-military hospital where information contained in the medical record of discharged patients is abstracted to a summary of the hospitalization, known as the discharge "face sheet." The State has uniform minimum requirements for data reporting. The required data elements (Table 4) are transferred to computer tape and sent to the State twice a year.

The State submits each discharge record to a series of editing checks.[240] These checks are designed to improve data quality by detecting missing, invalid or contradictory data. The results of the initial edit checks are returned to individual hospitals for correction. Following submission of corrections to OSHPD, the editing checks are repeated. Thresholds for errors are set so that data quality is balanced against data correction costs. Individual data elements are assigned different error rate thresholds depending on their relative importance or inherent difficulties in their collection. For example,

no errors are tolerated for the designation of discharging hospital, an error rate of 0.1% is tolerated for the coding of the admission date, and a 5% error rate is tolerated for race/ethnicity. These error rates relate to the internal consistency and completeness of the data and do not assess other aspects of data accuracy.

Several of the OSHPD data checks concern obstetrical patients. For example, if the discharge is reported to be a delivery, the patient's sex must be female and appropriate ICD-9-CM diagnosis codes must be assigned. If a cesarean section is assigned as a procedure, then an ICD-9-CM diagnosis code must indicate a complicated delivery. As a result, nearly all cesarean sections in the data used for this analysis (99.7%) have an accompanying indication coded on the discharge record.

OSHPD performs further data processing before public release of the data to insure confidentiality and increase data usefulness. Patient age and hospital length of stay are calculated, dates are converted into month and day of the week, and invalid or missing data are converted into an Other/Unknown code. Table 5 presents the available data elements and their coding.

The processed OSHPD data are released publicly twice a year, approximately 18 months after the close of a particular half-year reporting period.

Time Period Covered by the OSHPD Data

This study employs data from the first half of 1986. Released in December 1987, these data were the most current available when data analysis was initiated. The data include information on hospital discharges occurring between January 1, 1986 and June 30, 1986. This

time frame is based on the date of discharge, rather than the date of delivery.

The use of a half-year's data, while not optimal, is unlikely to materially affect the results of this study. It was not feasible to delay data analysis until a full-year of 1986 data was available. Nor was it deemed appropriate to employ July 1985 to June 1986 data, given the rapidly evolving developments in cesarean section use and the need for up-to-date information. It is unlikely that seasonal variations in fertility rates, the incidence of indications for cesarean section, or the practice patterns of obstetricians are large enough to alter the validity of this study's findings. The accuracy of this assumption is supported by a comparison of monthly patterns of cesarean section use for the first half of 1986. There were no substantial variations in the observed relationship between payment source and cesarean section use, except for decreasing cesarean section rates for indigent services (16.4% in January compared to 13.4% in June).

The OSHPD data were made available through the Kaiser Foundation Health Plan, Department of Medical Economics and Statistics, Oakland, California.

Limitations of the OSHPD Database

Despite its relative advantages, the OSHPD database has several limitations. Three drawbacks are associated with employing these data:

- Available data elements are not optimal.
- There are potential problems with data quality.
- Out-of-hospital and military hospital deliveries are not included.

As with any set of data collected for multiple purposes, the

available OSHPD data elements are not completely satisfactory for every use. While the OSHPD data contain the major elements necessary for an analysis of cesarean childbirth, more information ideally would have been collected. The most important deficiency of the OSHPD data is the lack of detail on specific payment sources. While major classes of payors are distinguished, more detail regarding specific private insurers or health maintenance organizations would add depth to this investigation. The analysis of potentially confounding characteristics would be enhanced by further information on patients' past obstetrical histories, such as gravidity, parity, type of previous cesarean section, prior fetal losses, and indication for previous cesarean section.

Another disadvantage of vital statistics data is that it is difficult to insure accurate and complete data reporting. While the edit checks described above function to improve data quality, the diversity and size of the health care system in California may diminish the uniformity of data reporting.

These issues are evaluated in an analysis carried out by OSHPD on 1983 data.[241] For a sample of discharges, data submitted to OSHPD were compared to data re-abstracted from medical records. While many of the data elements were found to be highly accurate (date of birth, zipcode, and hospitalization dates), others showed variations in coding accuracy. For race, 13% of Hispanics were found to have been miscoded as white. For only 87% of the re-abstracted principal diagnoses was an equivalent code found on the abstract (whether coded as a principal or secondary diagnosis). However, the analysis also suggests that except for the diagnosis of obstructed labor, obstetrical diagnostic coding is more reliable than for other types of patients.

The 1986 data are likely to be more accurate than the 1983 data. Although continued improvements in data quality have been expected by the State, it is difficult to gauge the relative accuracy of the 1986 data.

Deliveries occurring outside of hospital or in military hospitals are not included in the OSHPD database. In 1983, approximately 6,400 California births occurred outside of hospitals, accounting for 1.5% of all births.[242] An additional 3% of births occurred in military hospitals.[242]

Delivery Database

The 1986 OSHPD data base initially included 1,646,034 hospital discharges (including newborns). A delivery is defined as the extraction or removal of the fetus after a period of gestation estimated to be at least 20 weeks. This definition includes stillbirths (fetal deaths) after 20 weeks gestation and live births. Of all California discharges in the first half of 1986, 217,368 or 13.2% were deliveries. These deliveries occurred in 332 hospitals. Of these, 81 hospitals performed less than 30 deliveries, while 71 hospitals performed 1,000 or more deliveries. The median number of deliveries per hospital was 450. The largest number of deliveries (8,210) occurred in University of Southern California - Los Angeles County Hospital.

Summary

This investigation employs hospital discharge abstract data collected by the State of California on hospital deliveries in the first half of 1986. These data have substantial advantages, including a large number of deliveries that are paid for by a range of health care payors.

The limitations inherent in utilizing publicly available, multi-use data are recognized, but do not seriously diminish the usefulness of these data nor are these short-comings expected to affect materially the conclusions of this study.

VARIABLE DEFINITION

The data elements available through the OSHPD database allow effective evaluation of the influence of payment source on cesarean section use. In addition to the principal variables of cesarean section use and payment source, several case-mix variables are included in the analysis. As potential confounders, maternal age, race/ethnicity, and indication for cesarean section must be controlled for in assessing the relationship between cesarean childbirth and payment source. Analysis without the inclusion of these variables is more likely to lead to spurious results.

Cesarean Section Use

The dependent variable in this analysis is the use of cesarean section. For the tabular data analysis, cesarean section use is defined in terms of cesarean section rates. For the logistic regression analysis, cesarean section use is defined as a dichotomous variable, denoting whether or not a cesarean section was performed for a particular delivery.

The performance of a cesarean section was assessed via ICD-9-CM procedure codes.[243] The coding of a classical cesarean section (74.0), a low cervical cesarean section (74.1), or other types of cesarean section (74.2-74.4, 74.91 or 74.99) indicated that a cesarean section had been performed. In 1986, 97.8% of cesareans were low cervical

(either transverse or vertical), 1.0% were classical vertical incisions, and 1.2% were other or unspecified types. If both vaginal and abdominal routes were employed in the delivery of twins, the delivery was coded as a cesarean section.

Cesarean section rates are defined as the number of cesarean sections per 100 total deliveries in a particular subpopulation and are referred to in percentage terms. Primary cesarean section rates are calculated in a subpopulation consisting of women without previous cesarean sections. Repeat cesarean section rates are calculated for women who have delivered by cesarean section prior to the current delivery.

The definition of cesarean section rates in terms of deliveries differs from a definition of rates in terms of births, as is occasionally employed in the literature.[100,244] As defined in this study, cesarean section rates count only one delivery, even if a multiple delivery (twins, etc.) occurred. Delivery-based cesarean section rates also include fetal deaths. The net effect of these differences is for birth-based rates to exceed delivery-based rates in a given population of hospital discharges. Limiting the analysis to hospital deliveries excludes home and birthing-clinic deliveries. This results in a higher cesarean section rate than if these deliveries were included, because non-hospital deliveries are overwhelmingly vaginal.

Expected Source of Hospital Payment

The principal independent variable for this analysis is the expected source of payment for the hospitalization. As defined by OSHPD, this variable represents the hospital's assessment, at the time of a

patient's discharge, of the payor expected to reimburse the hospital. The expected source of payment usually, though not always, represents the ultimate payor. When two or more payors are expected to contribute to payment, only the principal payor is listed.[239]

Table 6 indicates the diversity of health care financing in California by listing the major categories of payors of obstetrical care in California. To examine several research hypotheses concerning HMOs, the initial HMO category was subdivided into three subcategories. Women covered by an HMO and delivering in a Kaiser Permanente Hospital were assigned to Kaiser as their likely payor source. There are relatively few members of HMOs other than Kaiser who deliver in Kaiser hospitals.[245] For the data analysis, Kaiser was further subdivided into Southern or Northern Regions based on the hospital where delivery occurred. Women covered by an HMO, but not delivering in Kaiser Hospitals were assigned to the non-Kaiser HMO category. The number of Kaiser members delivering in non-Kaiser facilities is also small.[245] Although this method of distinguishing HMOs is not perfect, classification errors will have a conservative effect, making Kaiser and non-Kaiser HMOs appear spuriously similar.

Description of Health Care Payors in California

California has a diverse system of health care financing. Hospital costs for women delivering in California are covered by nine principal categories of health care payors:

- Blue Cross/Blue Shield.
- Other Private Insurance.
- Medi-Cal.
- Kaiser Permanente Northern California Region.

- Kaiser Permanente Southern California Region.
- Other Health Maintenance Organizations.
- Self-Payment by the Patient.
- Indigent Services.
- Other Health Care Payors.

Blue Cross/Blue Shield (referred to hereafter as Blue Cross) is the largest single private insurer for obstetrical hospitalizations, covering 6% of all California deliveries. Most women with Blue Cross are covered through group policies obtained from employers. The employer may be her own or that of a family member. A small proportion of these women have obtained their insurance through an individual policy. As an indemnity type of health insurance, payment for hospitalization requires the patient to share part of the hospital charges, through deductibles and/or co-payments. Physicians and hospitals providing service to Blue Cross members are reimbursed on a fee-for-service basis. Blue Cross operates on a non-profit basis.

Other Private Insurance is the dominant payor category for deliveries in California, with 29% of all deliveries. This category includes a large number of for-profit insurance companies. The largest private health insurers in California are Prudential and Aetna. The coverage for hospital charges under most of these insurance companies is similar to Blue Cross.

As the California program for Medicaid, Medi-Cal covering 26% of all deliveries in the State. Medi-Cal is a joint State and Federal program to cover the health care costs of several entitlement categories. A major part of the Medi-Cal program operates to cover the health

care costs of low-income women and their children. In 1986, the Medi-Cal threshold level for family income was set at twice the federally defined poverty level.[234] Although Medi-Cal beneficiaries generally do not share in the payment of hospital charges, the level of Medi-Cal payment to hospitals is below that of private insurance. Medi-Cal pays hospitals at a set per diem rate, at a level below average hospital costs. In 1986, Medi-Cal paid only 47.7% percent of hospital charges, which amounted to 67.0% of hospital costs.[246] Medi-Cal fee-for-service payment to physicians is also below the level of reimbursement from private insurance.[203,234] Medi-Cal places restrictions on where beneficiaries can receive inpatient services. Except for emergency services, only hospitals contracting with Medi-Cal can receive payment. Of the 251 hospitals with 200 or more total deliveries in the first half of 1986, 178 (71%) performed more than 50 Medi-Cal deliveries.

HMO coverage differs from private insurance in that hospital and out-patient costs are covered on a pre-paid basis.[40,44] While beneficiaries often pay small registration fees when services are utilized, the patient does not bear significant out-of-pocket expenses. HMOs generally restrict patients to using particular hospitals and/or physicians. As with private insurance, most HMO members receive health care coverage through employers. There are several models of HMO operation that differ in the degree to which physicians are under administrative control by the HMO. From most to least integrated, Staff, Group, Network, and Individual Practice Association (IPA) models represent the four major modes of HMO operation.[40,247] Group and Staff models pay physicians on a salaried basis or through service contracts. Network and IPA models pay physicians on a capitated basis, by fee-for-service,

or through service contracts. The increased integration of medical practice with administrative concerns in Staff and Group HMOs leads to shared incentives for cost-containment.

Kaiser Permanente is a Group model HMO whose inpatient services are provided in Kaiser-owned hospitals.[236,237] The Kaiser Health Plan operates on a non-profit basis, although it contracts with the for-profit Permanente Medical Group. As a federally-qualified HMO, Kaiser must offer a minimum comprehensive coverage level for each beneficiary. Kaiser Permanente is a national organization, but its two largest regions, Northern and Southern California, are managed with a great deal of autonomy. In 1986, the Northern California Region operated in the San Francisco Bay Area and greater Sacramento area. The Southern California Region of Kaiser operated in the entire Los Angeles Basin, as well as the greater San Diego area. Together, the two Kaiser Regions covered 12% of all California deliveries.

There are a large number of other HMOs in the California health care market (Table 7). Other than their smaller individual size, these HMOs are distinguished from Kaiser in several respects.[44,247] Unlike Kaiser, hospital services to HMO members are provided in private community hospitals, rather than HMO-owned facilities. With the exception of Health Net, the larger non-Kaiser HMOs are operated on a for-profit basis. Together, non-Kaiser HMOs covered 9% of all deliveries in California.

Indigent services are those provided at County hospitals to individuals without health insurance or other government coverage.[235] In some smaller California counties, indigent services are provided under county contract in community hospitals. In 1986, 2.5% of all California

deliveries were covered through Indigent services. A total of 17 hospitals performed more than 20 deliveries reimbursed by indigent services. Funds for Indigent Services come from both the State and Counties, with each County determining its own eligibility criteria. For obstetrical services, the main group making use of indigent coverage at public hospitals are undocumented aliens with no source of insurance. Some counties, however, exclude this group from indigent services eligibility. Up until 1988, undocumented aliens were ineligible for coverage under Medi-Cal.[248] Women with family incomes above the Medi-Cal threshold, but no source of insurance also make use of indigent services in County hospitals.

Self-pay women have no source of health insurance, but are not eligible for (or make use of) Medi-Cal or county Indigent Services programs.[235,248] These deliveries accounted for 11% of 1986 deliveries. Three situations lead to women being self-pay: 1) being technically eligible for Medi-Cal, but not willing to formally seek eligibility, 2) the working poor and others with a family income above the Medi-Cal threshold, but no health insurance coverage, and 3) undocumented aliens not eligible for Medi-Cal, but ineligible for a particular County's Indigent Services program.

Several other payors play a minor role in the financing of obstetrical hospitalizations. Medicare, Title V, Worker's Compensation, Other Government Payors, Other Non-government payors and No Charge together account for 3.8% of all deliveries in the State. Of the deliveries in these payment categories, most are covered by either Other Government Payors (70%) or Other Non-Government Payors (21%). In the data analysis that follows these payors are combined into a single group, but are

described here for completeness.[239]

While Medicare primarily provides health care coverage to the population over 65 years of age, some 1986 deliveries were covered through the permanently disabled program of Medicare. Worker's Compensation is a State program for coverage of work-related injuries or illnesses, but covers rare situations where work-related conditions accompany pregnancy. Title V is a joint Federal and State program aimed at providing maternal and child health services on an out-patient basis, although it paid for some inpatient stays in 1986.

Other Governmental Sources of Payment include any source of payment from a local, state or federal agency, except Medicare, Medi-Cal, and Title V. For obstetrical services, a major category is the Civilian Health and Medical Program of the Uniformed Services (CHAMPUS), which provides coverage for military personnel and their dependents.[239] Other Non-Governmental Sources of Payment includes any third party payor of services not included in the other payment source categories. For obstetrical services, a major category is self-insured health plans sponsored by employers.[239] The No Charge category includes those situations where no payment is expected from the hospital. This includes free care, special research, or charity care.

Combination of Payor Categories

Payment categories were combined for the data analysis in order to focus attention on the major payors. To simplify the presentation of data, the smaller payors were combined into a single Other Payor category. The two major payors in this category, Other Government Payors and Other Non-Government payors, had similar cesarean section rates.

For many of the analyses, the data are also presented with the number of payor categories reduced further. Payors were combined only if they had similar attributes and similar cesarean section rates. For example, Blue Cross and Other Private Insurance are combined into a single Private Insurance category, because they represent the same mechanism of health insurance and were found to have comparable cesarean section rates. The two Kaiser Regions are combined into a single category because they share a common model of HMO operation, as well as a common organizational identity. The Self-pay and Other Payor categories, despite different payment mechanisms, are combined because they have similar cesarean section rates and are less central to the analysis.

Potential Confounders

In addition to the dependent variable (cesarean section use) and the principal independent variable (payment source), several other variables are included in the analysis. These case-mix variables are included to account for their potentially confounding effect on the relationship between payment source and cesarean section use. By controlling for these characteristics, the analysis confronts the alternative hypothesis that the relationship between payment source and cesarean section use is explained by each payor's obstetrical population. This frequently neglected issue is critical because the populations served by different payors are clearly not randomly assigned.

As described below, controlling for potential confounders is accomplished via three analytic methods. Much of the data analysis concentrates on examining the effect of payment source on cesarean

section use in subpopulations defined by age, race or medical indications. Potential confounders are also controlled for statistically through indirect standardization and multiple logistic regression.

The variables of age, race and medical indications are employed because they have been identified in the literature as important determinants of cesarean section use.[37,89,108,114,160,249] In testing the hypotheses regarding payment source, this investigation will also seek to confirm past observations regarding the effect of these variables on cesarean section use. Other potential confounders, particularly characteristics of hospitals and their market areas, are not included, but rather left for future analysis. It is not expected that controlling for these variables would modify the conclusions of this study with respect to payment source.

Maternal Age

Maternal age is controlled for in the analysis because it has been shown to be positively related to cesarean section rates.[249] Age is defined in two ways. For most of the analyses, age is defined as five-year age categories: < 20, 20-24, 25-29, 30-34, and 35 and over. There were too few births under 15 or over 40 to make additional categories useful. For the logistic regression analyses, however, age is defined as a continuous variable to make full use of its statistical information. Depending on whether other variables are simultaneously controlled, age may function as a proxy for parity, the risk of obstetrical indications for cesarean section, and/or differences in practice patterns experienced by older or younger women.

Race/Ethnicity

Past research suggests that cesarean section rates vary by race and ethnicity.[37,114] In particular, Hispanics generally have lower cesarean rates than either White-non-Hispanics or Blacks. The potential for race/ethnicity to play a direct or indirect role in the process of medical decision-making makes it an important potential confounder. As recorded in the OSHPD database, racial/ethnic identity is either self-reported by the patient or assessed by hospital personnel. As shown in Table 5, seven categories for racial/ethnic identity are initially coded. For data analysis, these are reduced to five categories: White-non-Hispanic, Black, Hispanic, Asian and Others/Unknown. While "Latino" may be preferable to "Hispanic," the later is used to maintain consistency with the original OSHPD coding scheme. In subsequent discussions, White is used as an abbreviation for White-non-Hispanic. The Other/Unknown category includes women initially coded as Native American/Eskimo, Others and Unknown. Race may serve as a proxy for a variety of other factors, including socio-economic status, the risk of medical indications, and potential practice differences that vary by race/ethnicity.

Medical Indications for Cesarean Section

The analysis of race and age as potential confounders indirectly evaluates the alternative hypothesis that payor differences in cesarean section rates are attributable to the characteristics of their populations. These demographic variables are important because they vary in distribution by pay source and are themselves predictive of cesarean section use. However, analysis of the medical indications leading to

abdominal delivery offers a more direct assessment of payor population differences.

The OSHPD database includes detailed information regarding antepartum, intrapartum and postpartum complications, via the reporting of ICD-9-CM diagnostic codes. The reporting of indications for cesarean section is enhanced by the OSHPD edit checking performed to insure that every cesarean section is accompanied by a medical indication.

Analysis of payor population differences in medical indications is enhanced by the existence of well-defined categories of indications in the obstetrical literature. While past research employs the term "complications" to refer to medical diagnoses leading to cesarean section,[108] the present investigation favors the term "indication," so as to avoid confusion with those complications that result from childbirth. These medical conditions are relative indications, because in many instances, the necessity for cesarean section in the presence of these indications has been questioned.

The most frequently discussed indications for cesarean section include: previous cesarean section, breech presentations, dystocia, and fetal distress.[89,108,135,161,250,251] Given the historical use of these categories in describing cesarean section use, they have been adopted for this investigation. Table 8 presents the major categories of indications for cesarean section. These categories have been described above.

Previous Cesarean Section

The past performance of a cesarean section is a frequent indication for repeat cesarean section. While the dictum of "once a cesarean,

always a cesarean" is no longer accepted as the standard of practice, it nonetheless continues to be the norm.[1,212] The presence of this indication is specified in the OSHPD data by ICD-9-CM code 654.2 (uterine scar from previous surgery).

Breech Presentation

Breech presentation occurs when the fetus is positioned so that its feet, rather than head, are the first fetal parts to enter the birth canal. Cesarean section is often advocated in breech presentation because safe vaginal delivery is more difficult to accomplish.[144] The presence of breech presentation is indicated by ICD-9-CM codes 652.2 and 669.6.

Dystocia

Dystocia refers to difficulties with labor that decreases the chance of safe vaginal delivery. In comparison with the indications of previous cesarean section and breech presentation, dystocia is a more subjective diagnosis, which presents potential difficulties for data analysis.[136] Dystocia comprises four diagnostic categories: disproportion (ICD-9-CM 653), obstructed labor (660), long labor (662), and abnormal labor (661, except for 661.3). More than one of these closely related diagnoses are often coded on a delivery.

Fetal Distress

Fetal Distress (ICD-9-CM 656.3) occurs when the fetus is compromised by a lack of oxygen and is usually diagnosed by fetal heart rate abnormalities. Interpretation of fetal heart rate tracings, however, is not standardized. The diagnosis of fetal distress is relatively subjective, though perhaps less so than dystocia.[89]

Other Indications

There are a variety of other medical diagnoses that can serve as indications for cesarean section. Some of these indications contribute to the need for cesarean section when they accompany the above indications, while others serve as indications in their own right.[135] In the absence of other major indications, the most common indications are umbilical cord complications (21% of all complicated deliveries without the four major indications), premature rupture of the fetal membranes (7%), early or threatened labor (7%), maternal hypertension complicating obstetrical management (4%), and prolonged pregnancy (5%). A variety of less frequent indications account for the remainder.

For the tabular analysis and indirect standardization, all of these other indications for cesarean section are grouped into a single category, because displaying these categories would unnecessarily complicate the analysis. The methodology employed in the present investigation defines this category of Other Indications differently than in past studies. Past research has defined this category to include any delivery not coded as normal in every respect (ICD-9-CM 650).[108] However, several complications included in this manner occur subsequent to a decision regarding mode of delivery. To improve the validity of this category, these complications are excluded from the Other Indication category. The most important exclusion is obstetrical trauma (ICD-9-CM 664), principally perineal lacerations resulting from vaginal delivery.

For the multiple logistic regression analysis, a greater degree of detail is retained within the Other Indication category. Because logistic regression allows estimation of the independent effects of

indications, several individual other indications are included, as their presence could modify the effects of the four major indications. For the logistic regression analysis the following categories are included: cord complications, complications of the amniotic membranes, early or threatened labor, maternal hypertension complicating obstetrical management, prolonged pregnancy, and a residual category of all other indications.

Umbilical cord complications (ICD-9-CM 663) most frequently involve situations where the umbilical cord is compressed and fails to provide adequate blood supply to the fetus.[135] Cord compression often contributes to the need for cesarean section. Complications of the amniotic membranes (658), includes premature rupture of the membranes, which occurs when the membranes that surround the fetus and amniotic fluid break prior to 38 weeks of gestation. Prolonged or post-date pregnancy (645) occurs when pregnancy continues past an estimated 42 weeks of gestation.[135] This situation can require cesarean section if labor cannot be induced successfully. Hypertension in pregnancy (642) refers to either pre-existing chronic hypertension or pregnancy induced hypertension, usually associated with pre-eclampsia.[135] Severe hypertension can require immediate delivery of the infant via cesarean section. Early labor or threatened labor (644) is the initiation of labor prior to 38 weeks of gestation.[135]

Multiple Indications for Cesarean Section

A major difficulty in analyzing medical indications is that more than one indication for cesarean section is often reported for a single delivery. This problem is partially solved by grouping together indica-

tions that theoretically share a common underlying process (dystocia) or that are individually rare (other indications). Even with only five categories of indications there are an average on 1.3 indications reported for deliveries in the California database with any indications for cesarean section. The data analysis which follows employs two solutions to this problem:

- The use of a hierarchy of mutually exclusive indications.
- Employing multivariate analysis to estimate each indication's independent effect.

Hierarchy of Indications

For much of the analysis, multiple indications are simplified by establishing a hierarchy of indications. A mutually exclusive primary indication for cesarean section is assigned from the highest priority indication among all coded diagnoses. A single primary indication is assigned regardless of accompanying indications. The hierarchy employed is essentially that developed by Anderson and Lomas[165] and used by many subsequent researchers.[108,160] From most to least important indications, this hierarchy includes: previous cesarean section, breech presentation, dystocia, fetal distress, and all other indications.

Anderson and Lomas developed this scheme after extensive consultation with clinicians. This hierarchy assumes that a previous cesarean section usually leads to a repeat cesarean section, regardless of whether other indications are present. Breech presentation is also a strong indication, because it predisposes to dystocia and/or fetal distress. Dystocia is given a higher priority than fetal distress, because fetal distress is compatible with immediate vaginal delivery. Other indications either are rare or do not have an over-riding role in

decision-making when other higher priority indications are present.

It is important to consider temporal changes in the indications for cesarean section, and to assess whether the proposed hierarchy remains valid. In the 1982 Canadian data from which this hierarchy originated, there was a clear ordering of indication-specific cesarean section rates: previous cesarean section, 95%; breech delivery, 65%; dystocia, 33%; fetal distress, 33%; and all other indications, 6%.[165] Since this time there has been an increase in breech-specific cesarean section rates, along with a small decrease in the repeat cesarean section rate. For 1986 California deliveries, the cesarean rates for previous cesarean section (89%) and breech presentation (87%) are similar in magnitude. For some payors, breech presentation is now a stronger indication for cesarean section than is previous cesarean section.

Placing previous cesarean section at the top of this hierarchy is valid only when elective repeat cesarean sections are the norm. If repeat cesarean section is performed prior to or early in labor, other indications are either of secondary importance or are never allowed to occur. In contrast, if a trial of labor for previous cesarean sections is allowed, then the decision to delivery abdominally depends on the appearance of other indications for cesarean section. Although there is a growing trend towards trial of labor, elective repeat cesarean section remains the clinical norm. At the present time, this hierarchy remains an efficient means of simplifying the analysis of multiple indications.

The primary indication for cesarean section is not necessarily the principal diagnosis coded on the hospital discharge abstract. While the principal diagnosis is often identified as the reason for admission, its usefulness is limited in obstetrics, where conditions often evolve in

the course of labor. In addition, the State's analysis of data quality suggested that misordering of principal and secondary diagnoses was common.[241] In the analyses that follow, the position of a particular diagnosis in the recorded list of diagnoses is not distinguished.

Independent Effects of Indications

Another solution to the problem of multiply-coded indications is to estimate the independent effect of each indication using multivariate analysis. This allows an estimate of each indication's effect on cesarean section use, independent of the effects of other indications. Evaluating the effect of each indication also makes it feasible to include a broader range of individual indications. A multivariate regression model allows for the inclusion of interaction terms that account for the ability of one indication to modify the effect of another when they occur simultaneously.

Potential Biases in Diagnostic Coding

One potential problem with diagnostic information is that coding of specific indications for cesarean section may be biased by whether a cesarean section was performed. This bias leads to over-adjustment of cesarean rates, which, in turn, may make the practice patterns of different payment sources appear spuriously similar.

There are several reasons to suspect bias in the recording of some indications for cesarean section. First, it has been charged that dystocia is a diagnostic label often applied post hoc to cesarean sections performed without well-defined indications.[89,138] The requirement that a diagnostic indication for cesarean section be included on the OSHPD discharge data may exacerbate this pattern. Second, deliv-

eries where fetal heart monitoring is employed are more likely to be delivered abdominally for an indication of fetal distress.[156] Thus, the diagnosis of fetal distress may in part reflect labor management policy (ie. use of fetal monitoring), rather than objective clinical characteristics of parturients. Third, deliveries where a cesarean section has been performed may be more closely scrutinized for medical indications, compared to the same objective situation where a cesarean was not performed.

The danger associated with these biases is that reported medical indications for cesarean section may not reflect objective differences between populations of deliveries. Statistically adjusting cesarean section rates for the distribution of these medical indications may diminish or minimize the differences in cesarean section use between payment sources. An extreme analogy would be adjustment of hospital death rates for the occurrence of nosocomial infections. Consider two hospitals with similar patient populations. Hospital A experiences a higher rate of nosocomial infections that eventually lead to a higher death rate. If death rates are adjusted for the presence of an infection, then both hospitals will erroneously appear to have the same adjusted death rates. An identical process may occur when dystocia or fetal distress are controlled for in evaluating differences in cesarean section rates. The effect of these biases is likely to be conservative in that they minimize actual effects rather than over-stating them. Type II errors (false negative findings) are more likely than Type I errors (false positive findings).

Summary

Using 1986 OSHPD data on deliveries in California, this study analyzes the effect of hospital payment source on cesarean section use. As the dependent variable, cesarean section use is defined either as a cesarean section rate per 100 deliveries or as a dichotomous variable indicating whether a cesarean section was performed. Payment source, the principal independent variable, is defined by nine payor categories that span the range of California's diverse system of health care financing. In order to account for the potentially confounding effect of the populations covered by each payor, several features of payor case-mix are defined. The inclusion of maternal age, race/ethnicity and indication for cesarean section allows the effect of payment to be assessed in a variety of clinical and demographic subpopulations. These characteristics also are used to statistically control for differences in payor populations.

STATISTICAL METHODS

To evaluate this study's research hypotheses using the 1986 OSHPD data, three statistical methods are utilized:

- Tabular analysis of stratified data.
- Indirect standardization.
- Multiple logistic regression.

These methods vary in analytical complexity, with tabular analysis being the most simple and logistic regression the most complex. Given an uncomplicated relationship between payment source and cesarean section use, these three methods should produce comparable findings. However, logistic regression will be better able to describe a complex

relationship between payment source and cesarean section use.

Tabular Analysis of Specific Subpopulations

This study's major analytical method is the calculation of cesarean section rates by payment source for a variety of subpopulations. As described above, these subpopulations are defined by age group, race-ethnicity, and primary medical indication for cesarean section. The analysis of stratified data has two purposes. First, it accounts for the potentially confounding effect of these three variables by holding them constant as the relationship between payment source and cesarean section use is examined. If a particular relationship between payment and cesarean section use is retained across subpopulations this indicates that the relationship exists independent of that case-mix variable. Second, stratified data analysis allows the magnitude of the relationship between payment source and cesarean section rates to be compared under a variety of circumstances.

Confidence Intervals and Odds Ratios

To compare cesarean rates across payment sources within a specific subpopulation, confidence intervals are calculated around the cesarean section rates of each payor. The comparison of confidence intervals is useful in establishing the relative ordering of payors with respect to their cesarean section rates. Confidence intervals were constructed so that the probability of two payment categories with non-overlapping confidence limits having the same population mean is less than 5%. In other words, payors whose confidence intervals do not overlap are different at a statistical significance level of $P < 0.05$. These confidence intervals are inherently conservative, because the standard

error of differences implied by this method is an over-estimate of the true standard error of differences.[252] This method is employed because it allows a parsimonious presentation of cesarean section rates that are subject to multiple comparisons.

The existence of multiple comparisons necessitates that the confidence intervals of the cesarean rates be calculated with a z-score of 2.58, the value usually used for a significance level of $P < 0.01$ on a pair-wise basis. Taken collectively, however, the confidence intervals of the cesarean section rates imply a statistical significance level of $P(alpha) < 0.05$, because multiple comparisons will be made (see below).

In order to assess the magnitude of variations in cesarean section rates between payors, odds ratios for each payor were calculated in comparison to Private Insurance, the defined payor reference category. The odds ratio measures the odds of a cesarean section in one payor relative to the reference payor. Thus, if for one payor the odds of cesarean are 3 cesareans to 7 vaginal deliveries and 2 to 8 in the reference payor, the odds ratio is 24/14 or 1.71. Odds ratios are an appropriate tool for assessing the magnitude of variations because they are relatively insensitive to changes in the overall rate of cesarean section. This characteristic is useful in comparing the magnitude of variation in cesarean section rates across subpopulations that vary in their average cesarean section rates. While more sophisticated methods of evaluating the magnitude of variation are available,[8] the use of odds ratios adequately measures variations in cesarean section rates among comparison groups of constant size.

Statistical Significance Level

Because of the large sample sizes available in this study, relatively small differences in cesarean section rates between payors will be statistically significant. Given a single comparison between two payors with cesarean section rates of approximately 24% and 30,000 deliveries each, the cesarean rates will be statistically different at a two-tailed p-value of 0.05 if they vary by more than 0.7% (ie. 0.7 cesareans/100 deliveries), at a two-tailed p-value of 0.01 if they vary by more than 0.9%, and at a two-tailed p-value of 0.001 if they vary by more than 1.2%. Given this degree of statistical power, it is important to distinguish between statistical and substantive significance. It would be improper to place excessive weight on differences in cesarean section use that do not reflect differences that are meaningful from clinical or policy perspectives. However, large sample sizes are available for analysis by the very fact that deliveries occur frequently and utilize considerable health care resources. Even the difference of 0.7% cited in the above example, represents 210 additional cesarean sections for one payor, with an additional cost as high as $360,000.[203] This suggests that the conventional $P < 0.05$ statistical significance level is appropriate.

The construction of confidence limits and statistical significance testing must account for the multiple comparisons among payment categories suggested by this study's research hypotheses. Straight-forward use of a $P < 0.05$ level is not appropriate because this would understate the true risk of falsely rejecting the null hypothesis of no association between payment source and cesarean section use. With multiple comparisons, there are multiple opportunities for chance variations to

produce differences in cesarean section rates. Bonnferroni's method offers a solution to this problem[252]. Under this method, the alpha level employed for pair-wise comparisons is based on the desired alpha level divided by the number of planned comparisons. In the current study, there are six major payor categories to be compared. While there are 15 separate comparisons possible among these payor categories, some comparisons are redundant or of minimal importance. In establishing the simple order of these six categories there are five comparisons that must be made. This appears to be a reasonable figure for the number of comparisons, because Bonnferroni's method is known to over-correct for multiple comparisons.[252] Thus, to achieve a statistical significance level of $P < 0.05$, individual pair-wise comparisons will utilize a z-score of 2.58, usually associated with a $P < 0.01$ level. Although one-tailed distributions would be appropriate for many comparisons where the findings are independently predicted, two-tailed distributions are uniformly employed.

Indirect Standardization

The second, more formal, technique used to adjust for potential confounders is indirect standardization.[27,252,253] This affords a simple way of evaluating differences in the populations served by each payment source. In indirectly standardizing for case-mix variables, cesarean section rates for all payors are calculated for case-mix categories defined by all combinations of the case-mix variables. There are 150 case-mix categories based on combinations of maternal age group (5 levels), race/ethnicity (5 levels), and indication for cesarean section (6 levels). Each of these 150 categories has an associated cesarean

section rate based on the aggregate of all payors.

Expected cesarean section rates are calculated for each payor as the rate that would be experienced by that payor if the State-wide case-mix-specific rates were applied to the payor's distribution of case-mix categories. The expected cesarean section rate indicates the inherent risk of cesarean section among the payor's population, based on its case-mix.

The indirectly standardized cesarean section rate is then calculated as the ratio of actual to expected cesarean section rates multiplied by the average cesarean section rate for all payors. The standardized rate can be conceptualized as the rate that would be experienced if case-mix differences between payors were equalized.

Indirect standardization also allows the differences between a payor's cesarean section rate and the State-wide average to be apportioned into two components:

- The portion of the difference due to the case-mix of a particular payor.
- The portion of the difference due to practice differences.

An alternative set of case-mix categories is employed to examine the potential effect of excluding dystocia as a case-mix category. As discussed above, dystocia is a relatively subjective diagnosis whose reporting may carry the potential to bias the adjustment of cesarean section rates. In order to evaluate the effect of excluding this diagnosis from the indirect standardization, primary indication for cesarean is redefined with dystocia combined with other indications to yield five categories of indications. Under this alternative there are a total of 125 case-mix categories.

As discussed below, one deficiency of indirect standardization is the manner in which it apportions any covariation between case-mix variables and payment source. Unlike multiple regression, indirect standardization attributes all explanatory power to case-mix rather than to both case-mix and payment source. In instances where the cesarean section rate of a particular case-mix category (eg. Black, 25-29 years, previous cesarean section) could be partially explained by the distribution of payors within this category, indirect standardization fails to account for this effect. This is a potentially important characteristic of indirect standardization that spuriously minimizes the attributable effect of payment source, because case-mix categories with low cesarean section rates are disproportionately served by payors with low cesarean section rates.

Logistic Regression

To analyze the independent effects of payment source and case-mix (race, age, and medical indications) on cesarean section use, a statistical model based on logistic regression is developed. This approach is well-suited to the analysis of a dichotomous dependent variable (cesarean section use) to be predicted by both dichotomous and continuous independent variables.[252,254] This approach is a useful adjunct to the tabular analysis, in that it concisely summarizes the independent effects of age, race-ethnicity, medical indications and payment source. While logistic regression is expected to yield results consistent with those obtained from the other methods, it is better able to describe a complex relationship between cesarean section use, payment source and case-mix. In particular, logistic regression handles the co-variation

between case-mix and payment source differently than indirect standardization. In this case of colinearity between case-mix and payment source, logistic regression apportions explanatory power between these two variables.

Several logistic regression models are evaluated. These models employ both case-mix variables and payment source simultaneously as independent variables. This model predicts the log of the odds of a cesarean section being performed in a particular patient, defined as

$$L_i = \log_e [q_i / (1 - q_i)] ,$$

where q_i is the probability of a cesarean being performed for a given patient (i). A generalized model to be estimated is specified as follows:

$$L_i = b_0 + b_1 x_{1i} + b_2 x_{2i} + b_3 x_{3i} + \ldots + b_n x_{ni} + B_1 z_{1i} + B_2 z_{2i} + B_3 z_{3i} + \ldots + B_n z_{ni} + E ,$$

where L_i is the log odds of a cesarean section being performed;

$x_{1i}, x_{2i}, x_{3i} \ldots x_{ni}$ are the case-mix variables;

$z_{1i}, z_{2i}, z_{3i} \ldots z_{ni}$ are payment source variables;

b_0 is the intercept; $b_1, b_2, b_3 \ldots b_n$ and $B_1, B_2, B_3 \ldots B_n$ represent the log of the odds ratios associated with these variables; and E is the error term.

The specific construction of the regression equation depends on how delivery characteristics are operationalized. For dichotomous characteristics, all variation in the characteristic is described by a simple dichotomy (eg. presence or absence of dystocia). Categorical characteristics are described by a series of mutually exclusive traits (eg. payment is Blue Cross, Medi-Cal, etc.). For continuous characteristics,

variations are described by gradations on some meaningful scale (eg. maternal age in years). Each of these characteristics is incorporated into a logistic regression equation in a distinct manner.

Several characteristics are evaluated in more than one form. For example, age may be alternatively defined as a categorical (mutually exclusive age categories) or as a continuous characteristic (age in years). Medical indications may be defined either as mutually exclusive primary indication categories or as a series of simple dichotomous characteristics representing the presence or absence of individual indications.

For simple dichotomous characteristics, a single variable is included in the logistic regression equation. The coefficient estimated for this variable represents the log odds ratio of this characteristic being present versus its being absent, independent of the effect of other characteristics specified in the equation. For categorical characteristics, such as race or payment source, the regression equation includes one variable for each defined category minus one. In specifying race/ethnicity, for example, dichotomous variables for Black/non-Black, White/non-White, Asian/non-Asian, and Other/non-Other are included in the logistic regression equation. The category of Hispanic, which is not represented by a variable in the equation, is the reference category. The coefficient for each variable represents the log odds ratio of that particular characteristic being present relative to the reference category, independent of all other characteristics included in the model. In the example of race, the coefficient estimated for the Black/non-Black variable represents the log odds ratio of being Black relative to being Hispanic.

For each of the estimated regression coefficients, the converted odds ratios ($OR = e^{Bn}$) will indicate the strength of the independent effect of a particular characteristic on cesarean section use. The standard errors corresponding to these log odds ratios will be employed to evaluate the statistical significance of log odds ratios using the Wald test where $Q = (B_n)^2/(se\ B_n)^2$. Q is compared against a Chi-square distribution. The 95% confidence intervals around the odds ratios are calculated as $e^{(Bn \pm 2.58\ se\ Bn)}$, accounting for multiple comparisons.

The specific form of the regression model will be determined by evaluating a series of regression equations using a 5% sample of the database. These equations will differ by the inclusion or exclusion of particular variables and the form of defining particular variables (eg. age as categorical vs. continuous), and the inclusion of interaction terms. From these test models, a final regression equation will be chosen that accurately depicts the relationship between cesarean section use, payment source, and case-mix with the fewest number of parameters. This final model will be applied to the full database.

Computer Processing

Data processing and analysis were carried out using the Statistical Analysis System (SAS) software, Version 5 [255] on IBM mainframe computer system employing an MVS/TSO operating system.

Data processing was carried out using the background processing (DATA step) capabilities of SAS. The principal processing steps were:

- Reading the OSHPD data from magnetic tape and converting them into data directly usable by SAS.
- Excluding non-deliveries from the data base.

- Defining a variable denoting cesarean section use.
- Defining payment source, age, race and medical indication categories as described above.

Tabular data analysis was accomplished with PROC TABULATE, which creates multi-dimensional cross-tabulation of cesarean section rates, their standard errors, and distributions of deliveries (see Appendix A). Indirect standardization was accomplished by further processing the information extracted from the cross-tabulations using DATA steps and PROC SUMMARY. Multiple logistic regression analysis was accomplished using PROC LOGIST.[254]

Summary

Three statistical methods of tabular analysis, indirect standardization and multiple logistic regression are employed to examine the influence of payment source on cesarean section use. In distinct ways, each of these methods allows the potentially confounding effects of maternal age, race/ethnicity, and indications for cesarean section to be taken into account. Each method has particular advantages and disadvantages, but in sum they allow the effect of payment source to be evaluated effectively.

CHAPTER SIX

RESULTS

Out of 217,368 hospital deliveries in the first half of 1986, 52,804 cesarean sections were performed in California, a rate of 24.3%. As expected, this rate is higher than the 23.1% reported for California births in 1986,[101] because military hospital and out-of-hospital deliveries are excluded from the current study. The 24.3% rate, however, is comparable to the 1986 U.S. rate of 24.1%, also based on hospital deliveries.[95]

AGGREGATE RESULTS BY PAYMENT SOURCE

By payment source, cesarean section rates varied from 28.8% (Other Private Insurance) to 15.3% (Indigent Services). Intermediate to these extremes, the other payment sources were associated with a range of cesarean section rates (Table 9A).

The highest rates were experienced by women covered by Private Insurance, with comparable cesarean section rates for Blue Cross (28.3%) and Other Private Insurance (28.8%). Women covered by non-Kaiser health maintenance organizations (Other HMOs) had cesarean section rates (27.0%) lower than women with Private Insurance.

Women covered by Medi-Cal experienced a cesarean section rate of 23.1%. While below the state average, this rate was significantly above the remaining payors. The cesarean section rates of women covered by Kaiser Southern (20.5%), Self-Pay (19.2%), Other Payors, and Kaiser Northern (19.0%) were similar. Indigent women experienced the lowest

cesarean section rate (15.3%).

With the exception of Kaiser vs. Self-Pay/Others, all differences between the six major categories of payors were statistically significant. These differences are summarized in Figure 4. The odds ratio (OR) for Kaiser vs. Private Insurance was 0.61 (95% Confidence Limits [CL95%] 0.59, 0.64), while the odds ratio for Indigent Services vs. Private Insurance was 0.45 (95%CL 0.41, 0.50) (Table 9B). Note that the Private Insurance category includes both Blue Cross and Other Private Insurance.

Table 9A and Figure 5 indicate the diversity of health care financing for obstetrical services in California. Blue Cross and Other Private Insurers paid for 36% of California deliveries. Together, Kaiser Northern (6%), Kaiser Southern (6%) and other HMOs (9%) covered more than a fifth of California deliveries. Medi-Cal accounted for 26% of deliveries, while 11% of deliveries were Self-Pay (ie. without a third-party payor). Indigent Services covered 2.5% of deliveries and Other Payors accounted for 4%.

TABULAR ANALYSIS OF STRATIFIED DATA

The large differences in cesarean section rates by payor suggest an influence of financial and organizational factors on health care decisions. An important competing hypothesis is that the observed gradient of cesarean section rates results from differences in payor populations. That is, the payors with higher cesarean section rates might serve more cesarean-prone populations. Consideration of confounding variables is important, because the women covered by particular payors are not randomly selected. To evaluate this competing hypothe-

sis, cesarean section rates were analyzed by these three variables: medical indications for cesarean section, maternal age and race/ethnicity. These three variables have independent effects on cesarean section use and vary in their distribution among payment sources. As described below, however, differences between payor groups were found to persist within subpopulations defined by these variables.

CLINICAL INDICATIONS FOR CESAREAN SECTION

The performance of a cesarean section generally follows the occurrence of several medical indications before or during delivery. Examination of payor cesarean section rates by indication allows an evaluation of the homogeneity of the effect of payment source across a range of distinct clinical situations. In addition, the persistence of payor differences across different indications suggests that the distribution of indications by payor cannot explain payor differences.

Primary Cesarean Section Rates

Primary cesarean section rates represent the frequency of cesarean section use among women without a previous cesarean section. Relative to total cesarean section rates, primary rates are a better indicator of differences in practice patterns, because they employ a more similar population of deliveries.

Payment source had a strong effect on primary cesarean section rates (Table 10). Despite excluding women with previous cesarean sections, the findings are comparable to those for all deliveries. All comparisons between the major categories of payors are significantly different, again with the exception of Kaiser vs. Self-Pay/Other Payors (Table 10B). Odds ratios of 0.65 (CL95% 0.61, 0.68) for Kaiser vs.

Private Insurance and 0.50 (CL95% 0.45, 0.57) for Indigent Services vs. Private Insurance were similar to those found with all deliveries.

Indication-Specific Cesarean Section Rates

Payor differences in cesarean section use are also examined for the individual indications associated with cesarean section. Employing the hierarchy of primary indications described in Chapter Five, clinical diagnoses associated with cesarean section were classified into five mutually exclusive categories (Table 11 and Figure 6). Analyzing payor differences defined by these indications, controls for major clinical differences between payors.

More than half of California deliveries had indications that could potentially lead to cesarean section. Among the categories of primary indications, previous cesarean section carried the greatest risk of cesarean section (89.2%), while Other Indications were associated with a cesarean section rate of only 11.5% (Figure 7). Data screening carried out by the State successfully eliminated most instances where a diagnostic indication fails to accompany a cesarean section. Only 167 cesarean sections occurred in women without a coded indication (0.02%).

Previous Cesarean Section

In California, 9.7% of deliveries were to women with a previous cesarean section. As expected, payors with higher primary cesarean section rates served populations with more previous cesarean sections (Table 12A). More than 11% of women covered by Private Insurance had a previous cesarean, while only 6.3% of indigent women had prior cesareans. Overall, 89.2% of women with a previous cesarean section deliv-

ered by repeat cesarean section. Repeat cesarean section made up 36% of all cesareans in the State.

There are dramatic differences between payors, with Other Private Insurance having the highest repeat cesarean rate (92.2%) and Indigent Services having the lowest rate (72.1%) (Table 12B). Vaginal birth following cesarean section was more than three times more likely in indigent women (27.9%) than in those women with Private Insurance (7.9%) (Figure 8). While the ordering of payors is similar to that for all indications, Medi-Cal had a repeat cesarean rate (90.9%) that was not significantly different from that of Private Insurance. The odds ratio for Kaiser vs. Private Insurance was 0.36 (CL95% 0.31, 0.43), while the OR for Indigent Services vs. Private Insurance was 0.22 (CL95% 0.16, 0.31). These odds ratios indicate a stronger effect of payment source on cesarean section use for women with previous cesarean sections compared to the effect in all deliveries (Table 9).

Breech Presentation

Breech presentation is an infrequent indication for cesarean section, occurring in 3.1% of deliveries. As with previous cesarean section, breech presentation generally resulted in a cesarean section (86.6%). These cesareans accounted for 11% of all cesareans. Breech presentation occurred more frequently (3.5%) in women covered by Private Insurance than those covered by other payors (2.8%) (Table 13A).

While Indigent women again had the lowest cesarean section rates (74.0%), a different relationship of payment source to cesarean section use was observed (Table 13B). Kaiser's high rate of breech cesarean delivery (88.8%) was not significantly different from that of Blue Cross

(88.2%), Other Private Insurance (88.8%), or Other HMOs (91.6%). However, Kaiser's cesarean section rate was significantly greater than the rate for Self-Pay/Others (81.5%). Medi-Cal had a relatively low rate of breech cesarean delivery (84.1%). Odds ratios are: Kaiser vs. Private 1.00 (CL95% 0.71, 1.40) and Indigent vs. Private 0.36 (CL95% 0.21, 0.62) (Table 13B).

Dystocia

For the state as a whole, 12.0% of deliveries had a primary indication of dystocia. In these cases, abdominal delivery was performed 64.4% of the time, accounting for 32% of all cesareans (Table 14A). Payors with high total cesarean rates (Table 9) consistently had a higher incidence of dystocia. Of women covered by Blue Cross, 14.7% were diagnosed with dystocia, while Indigent women had an incidence of only 8.1%. An incidence gradient of this magnitude is not present for either breech delivery or fetal distress. The gradient observed for previous cesarean section is explained by the self-perpetuating nature of higher primary and repeat cesarean section rates. The pattern for dystocia, however, is consistent with biased diagnostic reporting, which may occur because the diagnostic components of dystocia (obstructed labor, prolonged labor, abnormal labor, and disproportion) are relatively subjective. Thus, examining cesarean section rates for dystocia may not be valid, as comparisons may underestimate the payor differences that would occur if a uniform definition of dystocia was employed by all payors.

Despite this caveat, a moderately strong relationship was noted between payment source and cesarean section rates in the presence of

dystocia (Table 14B). The highest cesarean section rate was found for Other HMOs (66.8%), but it was not significantly different from Private Insurance (65.9%), Medi-Cal (65.2%) or Self-Pay (62.8). Kaiser (58.0%) and Indigent Services (55.7%) had significantly lower dystocia-specific cesarean rates. Neither the Indigent vs. Private odds ratio of 0.65 (CL95% 0.50, 0.84) nor the Kaiser vs. Private odds ratio of 0.71 (CL95% 0.64, 0.80) were as large as that observed for all indications.

Fetal Distress

Just over eight percent of deliveries in the State had a primary indication of fetal distress. Of these, 28.8% delivered abdominally, accounting for 10% of all California cesareans. There was no clear pattern of payor differences in the incidence of fetal distress (Table 15A). By payment source, Other HMOs (34.1%) and Private Insurance (31.7%) had the highest cesarean section rates. Medi-Cal (27.1%), Kaiser (26.7%), Self-Pay/Other (25.9%), and Indigent Services (23.4%) experienced similar rates of cesarean section. The odds ratios of 0.78 (CL95% 0.68, 0.91) for Kaiser vs. Private and 0.66 (CL95% 0.51, 0.86) for Indigent vs. Private (Table 15B) were similar to that noted for dystocia.

Other Indications for Cesarean Section

Almost a quarter of California deliveries had Other Indications, a variety of diagnoses potentially leading to cesarean section. While cesarean section was less likely among these women (11.5%), such cesareans still accounted for 12% of all cesareans. Women in this category had a variety of indications related to pregnancy, labor and delivery that were not included in the other four primary indications.

Among this subpopulation the most common diagnoses were pre-term labor, premature rupture of the membranes, umbilical cord complications, maternal hypertension, and prolonged pregnancy.

For women with Other Indications, the relationship of payment source and cesarean section rates is pronounced (Table 16). Private Insurance (14.0%) and Other HMOs (13.0%) had the highest cesarean section rates. Medi-Cal (10.9%) and Kaiser (10.0%) had moderate rates, while Self-Pay/Others (8.1%) and Indigent Services (7.4%) had the lowest rates. Odds ratios for Kaiser vs. Private of 0.68 (CL95% 0.60, 0.78) and Indigent vs. Kaiser of 0.49 (CL95% 0.38, 0.64) were comparable to those noted for all indications (Table 16B).

Summary

For each of the five categories of primary indications, statistically significant differences in cesarean section rates were found between health care payors. Private Insurance or Other HMOs consistently had the highest rates, while Indigent Services consistently experienced the lowest rates. The ordering of the other three payors depended on the indication, but tended towards Medi-Cal, Kaiser and Self-Pay/Others having successively lower rates. Breech presentation, however, showed a distinct pattern, with Kaiser having relatively high rates.

MATERNAL AGE AND CESAREAN SECTION USE

While the mean maternal age of California deliveries was 26.4 years, there was a wide distribution between the ages of 20 and 34 (Figure 9). The risk of cesarean section increased with increasing maternal age (Table 17 and Figure 10). The cesarean section rate of

women over 35 years of age (31.6%) was nearly double that of women under 20 (17.9%).

Maternal Age less than 20 Years

The obstetrical care of women less than 20 years of age was covered largely by government programs or not covered at all. More than half of California deliveries in this age group were covered by Medi-Cal. Only 25% were covered by Private Insurance or HMOs (Table 18A). While women under 20 had relatively low cesarean section rates (17.9%), sizable differences were observed between payors. Private Insurance (20.0%), Other HMOs (18.4%) and Medi-Cal (19.3%) had similar rates. Kaiser (14.3%), Self-Pay/Others (14.9%) and Indigent Services (12.6%) had significantly lower rates. Odds ratios for Kaiser vs. Private (0.67 CL95% 0.55, 0.82) and Indigent vs. Private (0.58 CL95% 0.43, 0.77) indicate a more modest relationship than observed for all maternal ages (Table 18B).

Maternal Age 20-24 Years

The distribution of payment source for women 20-24 years resembled that of all deliveries, although Medi-Cal also covered a disproportionate share of deliveries in this age group (Table 19A). The overall cesarean section rate in these women was 21.6%. Private Insurance (24.8%), Other HMOs (23.4%) and Medi-Cal (23.0%) had the highest rates (Table 19A). Kaiser (16.7%) and Self-Pay/Others (17.3%) had intermediate rates, while Indigent Services (13.5%) had the lowest rates. Odds ratios for Kaiser vs. Private (0.61 CL95% 0.55, 0.67) and Indigent vs. Private (0.47 CL95% 0.39, 0.57) are similar to those for all maternal ages combined (Table 19B).

Maternal Age 25-29 Years

The distribution of payment source and cesarean section rates in women aged 25-29 closely resembled the State as a whole (Table 20A). Cesarean rates within this age group show the typical pattern. Private Insurance (27.6%) and Other HMOs (26.8%) had the highest rates. Medi-Cal had slightly lower rates (24.7%), with Kaiser (19.3%) and Self-Pay/Others (19.9%) experiencing still lower rates. Indigent Services (15.0%) had the lowest rates. Odds ratios for Kaiser vs. Private (0.63 CL95% 0.58, 0.68) and Indigent vs. Private (0.46 CL95% 0.38, 0.56) were again similar to those for all maternal ages (Table 20B).

Maternal Age 30-34 Years

The distribution of payment source for women 30-34 indicates a decreased reliance on government programs, with 71% of women covered by Private Insurance or HMOs (Table 21A). The overall cesarean section rate in this age group was 28.0%. Private Insurance (31.2%) and Other HMOs (31.3%) had the highest rates. Medi-Cal had a cesarean section rate (26.1%) that was significantly lower than these payment sources, but higher than Kaiser (22.6%) or Self-Pay/Others (21.9%). Again, Indigent Services (18.6%) had the lowest cesarean section rate. The odds ratios for Kaiser vs. Private (0.64 CL95% 0.59, 0.70) and Indigent vs. Private (0.50 CL95% 0.39, 0.64) were again similar to those for all maternal ages (Table 21B).

Maternal Age 35 Years and Older

The distribution of payment source within the oldest age group was similar to that of women 30-34 years (Table 22A). Women 35 years of age

and older had a cesarean section rate of 31.6%. While the ordering of cesarean rates by payor are typical, Private Insurance (36.4%) had a rate that is higher than Other HMOs (32.5%). All of the other payors had rates between 27.3% (Medi-Cal) and 25.4% (Indigent). The odds ratio of Kaiser vs. Private (0.62 CL95% 0.54, 0.70) indicates a pattern similar to all ages combined. The odds ratio of Indigent vs. Private (0.59 CL95% 0.44, 0.81), however, suggests a more modest effect of payment source on cesarean section use (Table 22B).

Summary

There were statistically significant differences in cesarean section rates by payment source in all five age groups examined. As with indications for cesarean section, the patterns observed within each age group were consistent with those found for all deliveries. Within these age groups, cesarean section rates generally followed the ordering (from highest to lowest) of Private Insurance, Other HMOs, Medi-Cal, Self-Pay/Others, Kaiser, and Indigent Services. The position of Medi-Cal cesarean rates in this ordering showed variations by maternal age. In young women, Medi-Cal rates were above the State average, while in older women they were below the State average. Overall, the magnitude of the relationship between payment source and cesarean section was somewhat smaller in both the youngest and oldest age groups.

RACE/ETHNICITY AND CESAREAN SECTION USE

The distribution of deliveries by race/ethnicity reflects California's diverse population. Whites accounted for 53% of deliveries, followed by Hispanics (29%), Blacks (8%), Asians (7%), and Others/Unknown (3%) (Table 23 and Figure 11). Cesarean section rates showed

modest variations by race/ethnicity. Whites had the highest rates (26.0%), while Hispanics had the lowest (21.5%) (Figure 12).

Cesarean Section Use in Hispanics

The financing of obstetrical care for Hispanic deliveries showed a distinct pattern. While 37% of Hispanic deliveries were covered by Private Insurance or HMOs, Hispanics also relied heavily on Self-Pay (18%), Indigent Services (8%) and Other Payors (7%) (Table 24A). Hispanics were the predominant beneficiaries of Indigent Services (88%), and constituted nearly half of both Self-Pay (48%) and Other Payor (49%) categories. This pattern illustrates the heterogeneity present among those categorized as Hispanic. Hispanics had relatively low cesarean section rates (21.5%). Substantial differences in cesarean section rates were noted between payors. Private Insurance (28.0%) and Other HMOs (26.7%) had the highest rates. Medi-Cal (21.2%) and Kaiser (19.6%) had lower rates. Self-Pay/Others (17.3%) had still lower rates, while Indigent Services (15.0%) had the lowest cesarean section rates. Odds ratios for Kaiser vs. Private (0.63 CL95% 0.56, 0.70) and Indigent vs. Private (0.45 CL95% 0.40, 0.51) suggest a strong influence of payment source on cesarean section use in Hispanics (Table 24B).

Cesarean Section Use in Whites

Whites had 69% of their deliveries covered by Private Insurance or HMOs, while only 20% were covered by Medi-Cal (Table 25A). Whites had relatively high cesarean section rates (26.0%). Substantial differences in cesarean section rates were noted between payors. Women covered by Private Insurance had the highest cesarean section rates (28.9%) (Table 25B). Other HMOs had significantly lower rates (26.7%), while Medi-Cal

(25.3%), Self-Pay/Others (21.5%), Kaiser (19.3%) and Indigent Services (17.2%) had successively lower rates. Odds ratios for Kaiser vs. Private (0.59 CL95% 0.56, 0.63) and Indigent vs. Private (0.51 CL95% 0.35, 0.76) were similar to those for all racial/ethnic categories combined (Table 25B).

Cesarean Section Use in Blacks

The financing of obstetrical care for Blacks is distinct in that a larger fraction of Blacks were covered by HMOs (29%) and Medi-Cal (49%) than other racial/ethnic groups (Table 26A). Overall, Blacks had a cesarean section rate (25.7%) that was similar to that for Whites. Black women covered by Private Insurance had the highest cesarean section rates (30.4%). Other HMOs (26.8%) and Medi-Cal (26.6%) had lower rates. The rates of Kaiser (21.5%), Self-Pay/Others (19.7%), and Indigent Services (19.0%) were not significantly different from one another. Odds ratios for Kaiser vs. Private Insurance (0.61 CL95% 0.52, 0.72) and Indigent Services vs. Private Insurance (0.53 CL95% 0.32, 0.85) suggest a moderate influence of payment source on cesarean section use in Blacks (Table 26B).

Cesarean Section Use in Asians

Asians closely resembled the State-wide pattern for the financing of obstetrical care, except for their very limited coverage by Indigent Services (55 deliveries or 0.4% of all Asian deliveries) (Table 27A). Asians had an overall cesarean section rate of 22.1%. By payment source, the cesarean section rates of Asian women showed a distinct pattern. While Private Insurance (29.4%) and Other HMOs (26.3%) had typically high cesarean section rates, women covered by Medi-Cal

experienced the lowest rates (15.2%) (Table 27B). Kaiser (19.7%) and Self-Pay/Others (19.6%) had intermediate rates. Odds ratios are 0.59 (CL95% 0.50, 0.69) for Kaiser vs. Private and 0.43 (CL95% 0.38, 0.49) for Medi-Cal vs. Private. These figures suggest a strong relationship between payment source and cesarean section use, although not in the pattern observed in other subpopulations.

Cesarean Section Use in Other/Unknown Race/Ethnicity

The distribution of payment sources for obstetrical care in the race/ethnicity Other/Unknown category was similar to the State as a whole (Table 28A). Overall, women in this category had a cesarean section rate of 22.8%. Within this category, the effect of payment source on cesarean section use was less pronounced than in the other racial/ethnic categories. The lack of a strong effect of payment source and the small size of this group restricted statistically significant findings. However, Private Insurance (25.1%) had higher cesarean section rates than Medi-Cal (19.8%). Examination of odds ratios show a weaker effect of payment source on cesarean section use, although the associated confidence limits are large (Table 28B).

Summary

The three largest racial/ethnic categories showed a similar pattern of cesarean section use by payment source. For Whites, Hispanics and Blacks, Private Insurance and Other HMO coverage was associated with the highest cesarean section rates. Medi-Cal cesarean section rates were lower, while the rates of Kaiser and Self-Pay were lower still. Women covered by Indigent Services consistently experienced the lowest rates. Asians differed from this pattern in that Medi-Cal had the lowest

cesarean section rates. While some payor differences were evident for the Other/Unknown category, payor differences were less dramatic.

INDIRECT STANDARDIZATION

The effect of payment source on cesarean childbirth rates is also assessed by indirectly standardizing for distribution of age, race/ethnicity, and medical indications between the payor groups. Table 29A shows each payor's expected cesarean rate: the rate that would result if the payor's case-mix distribution experienced State-wide cesarean section rates for each case-mix category. The expected rates in Table 29A are based on 150 case-mix categories, representing all combinations of age-group (5 levels), race/ethnicity (5 levels) and medical indications (6 levels). The highest State-wide cesarean rate is 93.3% for race/ethnicity Other/Unknown, previous cesarean section, and less than 20 years of age. Several categories with no indications experienced no cesareans. This scheme assumes that dystocia represents a diagnostically valid indication for cesarean section.

The expected cesarean section rates indicate that the payor populations vary with regard to their inherent risk of cesarean section. Blue Cross would be expected to experience a rate of 27.6% if State-wide case-mix-specific rates were applied to its case-mix distribution. Indigent Services would expect a rate of 18.4% based on its case-mix distribution. Blue Cross, therefore, serves a population that is 1.50 times more cesarean-prone than Indigent Services.

While differences between payor populations explain part of the observed differences in actual cesarean section rates, there are still substantial differences attributable to the practice patterns of payors.

Standardized rates vary from 25.5% for Other HMOs to 20.3% for Indigent Services, a narrower range than observed for unstandardized rates (28.8% to 15.3%). Odds ratios based on standardized cesarean section rates confirm that the effect of payment source of cesarean section use is less pronounced following indirect standardization for case-mix variables.

These same findings are presented in a different manner in Table 29B and Figure 13. For each payor, the difference between its actual rate and the State-wide rate of 24.3% is apportioned into two components: an amount due to case-mix and an amount due to practice patterns. For example, Other Private Insurance has a rate (28.8%) that is 4.5% above the state-wide average rate. Of this 4.5%, 3.2% is explained by a more cesarean-prone population and 1.3% is explained by practice differences. In general, case-mix differences explain a greater proportion of payor differences than do variations in practice patterns.

These findings contrast with those found in analyzing cesarean section rates in individual subpopulations defined by age, race/ethnicity, and indications. The results of indirect standardization suggest that accounting for more than one case-mix variable at a time is necessary in order to capture all payor population differences. This occurs because of statistical interaction between the case-mix variables, where the combination of case-mix factors produce a different effect than can be predicted from each factor separately. For example, while Hispanics generally have lower cesarean section rates than Whites, the dystocia-specific cesarean rates in women over 35 are higher in Hispanics (68.9%) than in Whites (63.5%). This finding does not

invalidate the observations based on tabular analysis of cesarean section rates, but suggests that analysis of one case-mix variable at a time does not fully control for population differences between payors.

As indicated by the expected cesarean section rates, the payors with the highest standardized cesarean section rates also serve the most cesarean-prone populations. This suggests that indirect standardization may not be an appropriate method for evaluating payor differences in cesarean section use, because it is likely to overadjust for case-mix differences.

This overadjustment occurs through two mechanisms. First, the low cesarean section rates of some case-mix categories are due, in part, to who pays for deliveries in specific case-mix categories. For example, 30-34 year-old Hispanic women with breech presentation experience a rate of 79.3%, compared to the rate of 88.4% for 25-29 year-old White women with breech presentation. Holding constant age and indication, Hispanic women are almost twice as likely to deliver vaginally. Rather than representing inherent tendencies, however, some of this difference may be explained by differences in the distribution of payors. Of white women in this category 58.6% are covered by Private Insurance, compared to only 28.2% of Hispanic women. Thus, the differences in case-mix specific rates are in part attributable to practice differences, which are not accounted for by indirect standardization. Indirect standardization has the unfortunate characteristic of attributing all covariation between payment source and case-mix only to case-mix.

The second mechanism by which indirect standardization leads to overadjustment is through diagnostic bias. Particularly for dystocia, a diagnostic label may not represent an objective medical condition, but

may be more likely if a cesarean section was performed. If this is the case, diagnostic labels may be influenced by the performance of a cesarean section, as well as vis versa. The reporting of indications serves as a proxy for practice differences as well as objective clinical differences. As discussed above, indirect standardization in this situation leads to overadjustment, because legitimate differences in practice patterns are obscured.

The problem of covariation between case-mix and practice patterns is addressed by the use of multiple logistic regression, which apportions the covariation between payment source and case-mix, rather than solely to case-mix. The problem of diagnostic bias can be addressed by minimizing the role of dystocia in calculating expected cesarean section rates. This is accomplished by redefining the case-mix categories so that dystocia is combined with Other Indications. This redefinition of primary indications will reduce, but not completely eliminate the overcorrecting tendency of diagnostic bias.

Table 30A presents the results of indirect standardization with dystocia combined with Other Indications for cesarean section. There are 125 case-mix categories, representing combinations of age group (5 levels), race/ethnicity (5 levels), and modified medical indications (now 5 levels). Expected cesarean section rates show a smaller range compared to the standardization presented in Table 29: Blue Cross had an expected rate of 27.0%, while Indigent Services had an expected rate of 19.6%. Because payor differences in case-mix are not as pronounced, standardized cesarean section rates show a stronger payor gradient after adjustment for case-mix. The highest standardized rate is for Other HMOs (26.1%), while the lowest is for Indigent Services (19.0%). Odds

ratios based on these standardized rates indicate an effect of payment source that is stronger than that with dystocia included, yet more modest than for unstandardized rates (Table 30A). A larger portion of the unadjusted payor differences is attributable to practice differences, although case-mix still explains a large portion of the differences between payor cesarean section rates (Table 30B).

LOGISTIC REGRESSION

Multiple logistic regression provides an alternative approach to case-mix adjustment. As described in Chapter Five, a series of regression models was tested with cesarean section use defined as a dichotomous variable representing whether or not a cesarean section had been performed. Several alternative multiple logistic regression models were tested prior to selection of the model presented here.

Although more complicated models were tested, a simple regression model parsimoniously depicts the relationship between cesarean section use, payment source and case-mix variables. This model includes 24 parameters to evaluate the effects of race/ethnicity (4), age (2), medical indications (10) and payment source (8). As discussed above, a more detailed list of medical indications was included in this portion of the analysis.

While medical indications had the strongest effect on cesarean section use, all of the other variables had statistically significant effects on cesarean section use (Table 31). The model had an R of 0.725, indicating that just over half ($.725^2$) of the variation in cesarean section log odds could be explained by the model.

After accounting for the effect of the other variables, age showed a complex relationship to cesarean section use. In testing several alternative models, it was apparent that age could be best specified as a continuous variable with the inclusion of an age-squared term. The relationship depicted in Table 31 is a J-shaped curve where the minimum risk of cesarean section occurs at 18 years of age. At younger ages the risk of cesarean is not significantly increased (OR of 15 vs. 18 yrs = 1.01). As age increases above 18, the risk increases at an increasing rate, so that the odds ratio of 35 vs. 18 years is 1.26. This relationship differs from the more pronounced, essentially linear relationship suggested when the unadjusted rates of five-year age groups were examined.

Race is found to have a significant effect on cesarean section use, independent of the other variables. With Hispanics as the reference category, Blacks (OR = 1.30) and Whites (OR = 1.06) were found to be at a statistically significant increased risk of cesarean. Asians and Other/Unknown were not significantly different from Hispanics. These results differ from an examination of unadjusted rates, which showed Whites (26.0%) and Blacks (25.7%) to have similar high cesarean section rates. This discrepancy occurs because compared to Blacks, white women are older, have more medical indications, and are more frequently covered by payors with high cesarean section rates. After accounting for these factors, the independent risk attributable to being white per se is greatly diminished.

As expected, the presence of indications for cesarean section was a strong predictor of cesarean section use. With no indications as the reference category, the different indications predicted a broad range of

risk. Previous cesarean section carried the greatest risk of cesarean section use (OR = 55), followed by breech presentation (OR = 41), hypertension (OR = 13), dystocia (OR = 12), prolonged pregnancy (OR = 7.7), amniotic membrane complications (OR = 6.6), pre-term labor (OR = 3.7), other indications (OR = 3.1), fetal distress (OR = 2.8), and umbilical cord complications (OR = 1.6). The absolute odds ratios are essentially meaningless, however, because the reference category is women without indications. The relative relationships between odds ratios are more important. The range of odds ratios depicted by the logistic regression (eg. previous cesarean section vs. fetal distress OR = 19 or previous cesarean section vs. dystocia OR = 4.8) is almost identical to that observed in unadjusted cesarean rates (fetal distress vs. previous cesarean section OR = 20.4; dystocia vs. previous cesarean OR = 4.6).

Payment source had a substantial effect on the use of cesarean section when the effects of other variables were taken into account (Figure 14). Other Private Insurance had the highest risk and is defined as the reference category. Compared to Other Private Insurance, Other HMOs (OR = 0.98) and Blue Cross (OR = 0.94) had similar odds ratios. Medi-Cal (OR = 0.83) was significantly lower. Self-Pay (OR = 0.66), Other Payors (OR = 0.65), Kaiser Southern California (OR = 0.61), Kaiser Northern California (OR = 0.56), and Indigent Services (OR = 0.51) together had still lower odds ratios.

The gradient between payors is somewhat smaller than that observed on an unadjusted basis (Indigent Services vs. Private Insurance; OR = 0.45). This suggests that the payors with the highest cesarean rates

serve more cesarean-prone populations, confirming the conclusion of the indirect standardization analysis.

The payor gradient from logistic regression, however, is much more pronounced than that found for indirect standardization (Other Private Insurance vs. Indigent; OR = 0.67). As discussed above, this occurs because these two methods handle the statistical association between low risk populations and low risk payors is a different manner. Indirect standardization attributes all diminished risk to the population characteristics, while logistic regression apportions the risk between payment source and population characteristics.

CHAPTER SEVEN

DISCUSSION

This study demonstrates that the source of payment for obstetrical care has a substantial impact on cesarean section use. While suggested by other authors, the current study validates that this finding is not due to population differences between payors.

Several data and research design limitations of this study are recognized. However, despite the absence of several useful data elements, potential problems with data quality, and the exclusion of hospital characteristics from this analysis, these short-comings are not expected to affect materially the conclusions of this investigation.

Consonant with past research, this study has demonstrated the importance of non-clinical factors in medical decision-making. While several mechanisms may operate to produce differences in cesarean section rates, the findings suggest that financial incentives play a substantial role. The eight hypotheses presented in Chapter Four have been largely validated.

This research has several implications for health care policy and future research. Health care payors with high cesarean section use should attempt to alter cesarean section patterns in order to reduce health care costs and inappropriate medical practices. Repeat cesarean section rates, with their large payor differences, will be a particularly fruitful focus of attention.

Future research on medical practice variations should routinely account for payment source in assessing the role of other variables.

Future studies of cesarean section use and health care organization should concentrate on elucidating the interaction between payment source and other organizational factors.

RESEARCH FINDINGS

Women covered by private insurance or non-Kaiser health maintenance organizations invariably experienced the highest cesarean section rates, regardless of maternal age, race/ethnicity, and medical indications. Medi-Cal had rates significantly below those of private insurance or non-Kaiser HMOs, but well above the remaining payors. Women covered by Kaiser and Other Payors, and those without third-party coverage (Self-Pay), experienced relatively low cesarean section rates. Indigent women had the lowest rates of abdominal delivery.

When cesarean section use was examined within primary indication categories, a similar pattern by payment source was observed for every indication. From highest to lowest cesarean use, the ordering of 1) Private Insurance or Other HMOs, 2) Medi-Cal, 3) Kaiser Permanente or Self-Pay/Others, and 4) Indigent Services was observed for previous cesarean section, dystocia, fetal distress, and other indications. The noted differences between these four strata were usually, though not always, statistically significant. In the case of breech presentation, Kaiser had a significantly higher cesarean rate (88.8%) than Medi-Cal (84.1%). Payor gradients in cesarean section rates varied with indication. The most pronounced effect of payment source was in women with previous cesarean section, followed by breech presentation, other indications, fetal distress, and dystocia.

When cesarean section rates by payment source were examined for different age groups, a very similar pattern emerged. The ordering cited in the preceding paragraph held for women age 20-24, 25-29, 30-34, and those above 35. For women less than 20 years, Medi-Cal had relatively high cesarean rates. Payment source had a similar effect at all ages, although both the youngest and oldest age groups experienced slightly less pronounced gradients.

When these patterns were examined within racial/ethnic groups, the same relationship between payment source and cesarean section use was again observed. For Hispanics, Whites and Blacks, the familiar ordering of payors was present. Asians were distinguished by their low Medi-Cal rates. Gradients by payment source were similar for each race/ethnicity.

The results of the logistic regression analysis confirm these patterns of cesarean childbirth. Independent of the effects of race/ethnicity, maternal age, and medical indications, payment source had a pronounced effect on cesarean section use. Compared to unadjusted patterns, the process of accounting for these factors diminished the measured effect of payment source, although not to a statistically significant degree. Unadjusted cesarean section rates indicated an odds ratio of 0.45 (CL95% 0.41, 0.50) for Indigent Services vs. Private Insurance. After accounting for potential confounders, the odds ratio was 0.51 (CL95% 0.44, 0.59).

The logistic regression also evaluated the independent effects of age, race/ethnicity, and medical indications. The risk of cesarean section was at a minimum in 18 year-olds. Compared to unadjusted rates, the effect of increasing age was drastically reduced when all other

variables were statistically controlled. Blacks experienced the greatest risk of cesarean section, independent of the other variables. White women had an increased risk compared to Hispanics, Asians and Other/Unknown. A range of clinical risk factors was identified, with previous cesarean section and breech presentation associated with the greatest independent risk of cesarean section.

STUDY LIMITATIONS

Several potential limitations of this study must be acknowledged. The use of publicly available hospital discharge abstract data, while an efficient and statistically powerful approach, carries two disadvantages. First, there is a limited range of data elements available. This means, for instance, that differences between individual private insurers and health maintenance organizations could not be evaluated. Also, information on past obstetrical history, although present on birth certificates, is not recorded on hospital discharge abstracts. This limited the variables employed in case-mix adjustment.

Second, there are potential problems with data accuracy and completeness, particularly for the complex diagnostic information analyzed in this study. Most problematic are potential biases in the recording of dystocia and fetal distress, which may result in over-adjustment for case-mix if these diagnoses are inherently more common in women receiving cesareans. Rather than developing new categories of medical indications to reduce these problems, the current study has relied on a widely used classification scheme developed by other researchers. These data limitations, while potentially important, are unlikely to nullify the observed payor differences. If anything, these short-comings could

lead to a spurious underestimate of the effect of payment source.

While the analysis is based on a half-year of data, seasonal variations are unlikely to affect this study's conclusions. Finally, the use of two-year old data, while unusually current compared to most health services research, may diminish this study's generalizability, given the rapidity of changes in patterns of cesarean childbirth.

This study's research design has a limited focus on health care financing, because the impact of hospital characteristics and other organizational factors has not been assessed. For a full explanation of how payment source affects cesarean section use, it would be necessary to account for such factors as access to technology, hospital peer review systems, teaching hospital status, hospital size, and hospital ownership status, all of which are intertwined with the financing of obstetrical care. While inclusion of these variables might elucidate possible mechanisms, their exclusion does not invalidate this study's more focused findings.

INTERPRETATION OF THE FINDINGS

The results of this investigation largely confirm the eight hypotheses presented in Chapter Four. These results confirm and validate past research findings that indicate a prominent role of non-clinical factors in medical decision-making. In addition, these results allow an examination of several subsidiary aspects of medical practice variations.

Differences in Cesarean Section Rates by Payment Source

Direct or indirect financial incentives provide an explanation for this study's findings. Payors with incentives to perform cesarean

section have high rates, while those without such incentives experience low rates. These results support Hypotheses I and II of this thesis, which stated that there would be a regular and predictable relationship between payment source and cesarean section use, even when case-mix variables were taken into account. As suggested above, however, additional organizational mechanism may contribute to the observed payor differences.

The high cesarean rate for Private Insurance is consistent with the financial incentives of fee-for-service practice, which may lead to the performance of marginally indicated cesarean sections. The existence of incentives does not necessarily imply that physicians consciously seek greater income.[49] Such incentives may function subtly via implicit clinical standards.[75] The high cesarean section rates of women covered by private insurance may also be a function of the relatively unrestricted access to obstetrical technology characteristic of community hospitals. Additionally, while fee-for-service physicians have the greatest financial incentives to perform cesarean sections, they also experience greater concern regarding medical malpractice.

The cesarean section rates of Medi-Cal women are also consistent with financial incentives. While physicians and hospitals receive more Medi-Cal reimbursement for performing cesarean sections, these incentives may be less powerful because of the more limited physician and hospital payment levels provided by Medi-Cal.[204,205] At the same time, a substantial number of Medi-Cal women deliver in public and/or teaching hospitals where other factors may constrain the use of cesarean section.

While HMOs have been shown to have lower cesarean section use than private insurance,[208,209,219,227,228] the current findings suggest this is

the case only when there is a high degree of integration between HMO administration and medical practice.[40,44] Kaiser Permanente, with its centrally-managed system of Kaiser Hospitals, fits this description and has low cesarean section rates. Financial incentives favor vaginal delivery from the perspective of both Kaiser physicians and hospitals, since neither gains from the performance of a cesarean section. The greater integration of Kaiser also suggests a more explicit peer review process, independent of economic incentives. Finally, the fixed work schedules of Kaiser physicians allow them to remain isolated from the time pressures that may lead to marginally indicated cesarean section in a fee-for-service setting.[256-258]

While economic incentives may also operate in other HMOs, they do so with less force, particularly when HMO physicians make use of community hospitals, which stand to benefit from cesarean sections. For some HMOs, the loose association between physicians and HMO administration may lead to fee-for-service incentives for the physicians.

While women in the Self-Pay category are quite heterogeneous, two factors may explain their lower cesarean section rates. The desire of self-pay women to avoid the higher cost of cesarean childbirth may constrain physician incentives that might otherwise favor cesarean section. Additionally, Self-pay women make disproportionate use of public hospitals, which may have additional institutional constraints on cesarean section use.

The low rates of cesarean section in women covered by Indigent Services is consistent with the economic constraints of the County hospitals where these women deliver. These hospitals, and the physicians employed by them, have incentives to avoid the additional costs of

abdominal delivery. At the same time, many of these hospitals serve as teaching centers, which like Kaiser, have fixed work schedules and emphasize peer review.

Magnitude of Variations in Cesarean Section Use

This study also investigated the relationship between the magnitude of variations and the degree of discretion present in specific clinical situations. Based on past research findings, Hypothesis III predicted that the magnitude of variations in cesarean childbirth by payment source would increase with the degree of controversy surrounding a particular indication for cesarean section. It was hypothesized that previous cesarean section would show the largest variations, followed by dystocia, fetal distress and breech presentation.

The hypothesized ordering was confirmed in so far as previous cesarean section showed the largest variations in cesarean rates by payor, as measured by the odds ratio of Private Insurance vs. Indigent Services. Breech presentation showed less pronounced variations, while dystocia and fetal distress showed much smaller variations.

The magnitude of variation for dystocia and fetal distress may be affected by bias in the coding of these indications. Holding constant objective clinical conditions, dystocia and fetal distress may be reported more frequently when cesarean sections are performed. If this is the case, then the measured magnitude of variations in cesarean childbirth for these indications will be understated. This feature hampers the evaluation of the magnitude of variations for these indications.

The larger variations found in repeat cesarean rates compared to breech cesarean rates are consistent with a model predicting that greater discretion in the use of a surgical procedure will lead to larger variations in its use.[21,38,48] With less clinical discretion, there is less latitude for non-clinical factors to affect medical decision-making. The high breech cesarean rates for Kaiser, which has low rates for all other indications, is particularly informative. Consistent with the greater consensus regarding the need for abdominal delivery in breech presentation,[144] Kaiser adheres to this approach, despite a financial incentive to perform vaginal breech delivery. It is not known whether this practice pattern results from a conscious policy decision or through a less formal mechanism.

Two secondary hypotheses were concerned with the magnitude of variations by maternal age and race/ethnicity. Hypothesis IV predicted that whites would show greater variations in payor cesarean rates because their socioeconomic position is consistent with greater discretionary use of cesarean section. Hypothesis V predicted that teenagers would show the largest variations in cesarean section rates by payor, given the degree of uncertainty associated with their deliveries. Neither of these hypotheses were confirmed. As measured by odds ratios, payment source had a uniform effect on cesarean section rates regardless of age or race/ethnicity.

The uniform impact of payment source on the cesarean section use of different racial/ethnic groups may reflect the over-riding effect of payment source. Conversely, race/ethnicity may not predict socioeconomic status when stratified by payment source, which is also associated with socioeconomic status.

The effect of payment on obstetrical decision-making may also supercede the relative uncertainties of teenage delivery. In addition, specialized decision-making protocols developed for teenage pregnancy may serve to reduce its inherent uncertainty.[135] Teenagers also are less likely to have had previous cesarean section, an indication shown to be associated with greater clinical discretion.

Cesarean Section Use in Health Maintenance Organizations

Based on past studies of HMOs, Hypothesis VI predicted that Kaiser would have lower cesarean section rates than other, less-integrated HMOs. This hypothesis was substantiated in every one of the comparisons available in the data analysis. The magnitude of this differential was consistently similar to that observed with unadjusted rates, where Other HMOs (27.0%) performed abdominal delivery 36% more frequently than did Kaiser (19.8%).

This finding is consistent with past research indicating that the distinctive utilization patterns of HMOs result from their structure. The more similar HMO structure is to fee-for-service (FFS) practice, the more its utilization patterns will resemble FFS practice. Kaiser, with its central management and use of its own hospitals, shares less structural similarity to FFS than all other California HMOs. While a heterogenous group, these other HMOs generally provide inpatient obstetrical services within private community hospitals. In addition, many have Independent Practice Association (IPA) or Network types of structure that are characterized by much looser physician-administrative ties. These organizational factors allow a degree of physician latitude approaching that in fee-for-service practice.

It is surprising, however, that Other HMOs have patterns of abdominal delivery so similar to Private Insurance. In several subpopulations, Other HMOs have the highest cesarean rates of all payors. Past studies of cesarean section use have found lower HMO cesarean rates, despite examining HMOs that are smaller and less well-integrated than Kaiser.[227,228] Two explanations for the present study's findings are possible. First, increasing competition in the health care market may have forced a convergence of practice patterns between smaller HMOs and private insurance fee-for-service practice. Kaiser has been more isolated from these market pressures. Second, California may represent a unique market for smaller HMOs, because they are forced to distinguish themselves from Kaiser.

Differences between Kaiser Permanente Regions

Because of their shared organizational structure and identity, Hypothesis VII predicted that the two Kaiser regions in California would show similar patterns of cesarean section use. While a comparison with non-Kaiser HMOs shows the Kaiser regions to be relatively similar, the Southern California Region consistently experienced higher cesarean section rates than the Northern California Region. Adjustment for case-mix did not diminish the 8% difference noted for unadjusted rates between the Southern (20.5%) and Northern (19.0%) regions. These differences, however, were generally too small to attain statistical significance. A simple explanation for the observed differences may be geographical market differences. Hospitals in Los Angeles and San Diego Counties have higher cesarean section rates than hospitals in the Bay Area or Sacramento County.[209,242] These geographical differences,

however, may serve as proxies for underlying organizational differences between these two areas of the State.

Case-mix Differences Between Payors

Hypothesis VII predicted that the obstetrical populations served by different payors would differ in their inherent risk of cesarean section, with private insurance having the most cesarean-prone population, followed by Other HMOs, Kaiser, Medi-Cal and Self-Pay. Indirect standardization assessed this hypothesis by comparing expected cesarean section rates of each payor. Expected cesarean rates are those expected if a payor's case-mix distribution were to experience the State-wide cesarean section rates within each case-mix category. Indirect standardization by age, race/ethnicity, and indications produced expected cesarean rates that agree with the hypothesized ordering. This held whether or not the indication of dystocia was included as a separate case-mix attribute (Tables 21 and 22).

This finding suggests that there are differences in payor populations with respect to their inherent risk of cesarean section. This conclusion is also supported by the differences noted between odds ratios with logistic regression and those based on unadjusted rates. This suggests that analysis of the effect of health care financing or health care organization must account for population differences. Without proper statistical control for payor population characteristics, any differences noted will be spuriously large, although not to an extreme degree.

CONCLUSIONS

The present study not only confirms past research indicating the importance of non-clinical factors in medical practice, but also has important implications for public policy and future research.

Implications for Health Care Payors

The finding of widely differing cesarean section rates by payment source has significance for the payors of obstetrical services. For those with high cesarean section rates, such as private insurers and non-Kaiser health maintenance organizations, these results suggest a need to monitor the appropriateness of cesarean section use.

In reimbursing on a fee-for-service basis, Blue Cross and other private insurance plans make the implicit assumption that clinical characteristics are the overwhelming determinant of medical practices. A system that willingly pays physicians and hospitals for all services they provide functions effectively only when clinical imperatives restrain physicians from providing unnecessary or marginally necessary services. The results of this study, as well as a broad range of past research, question the validity of this assumption.

It is difficult to equate the high cesarean rates of private insurance and non-Kaiser HMOs with inappropriate medical practices, because these patterns, present for 45% of all deliveries, form a statistical norm of medical practice. Given past studies that question the need for cesarean section rates in the range of 20%,[81,82] it is unlikely that the rate of 28% found for private insurance and non-Kaiser HMOs can be justified on the basis of health outcomes. In the absence of clear benefits and the presence of small, but well established risks,

private insurance plans and Other HMOs appear to be paying too much for obstetrical services.

The magnitude of excess costs may be estimated by comparing the combined Private Insurance and Other HMO cesarean rate of 28.3% with Kaiser's rate of 19.8%. The choice of Kaiser as a reference group may understate excess costs, because Kaiser's cesarean section use does not represent a minimum achievable rate. However, using Kaiser as a reference may overstate excess costs because Kaiser serves a less cesarean-prone population.

Using private insurance cost estimates for the Western U.S.,[203] the difference in hospital and physician costs between cesarean sections ($5,000) and vaginal deliveries ($2,720) is $2,280. If the 97,000 deliveries covered by private insurance or non-Kaiser HMOs were to experience Kaiser's cesarean section rate, these payors would cover 7,300 fewer cesarean sections, a potential cost savings of $17 million every half year or $34 million annually. This calculation assumes that the cost of the avoided cesareans is comparable to the cost of the average cesarean.

The same argument can be made for the cesarean section rates of Medi-Cal Program beneficiaries. The public nature of the Program, however, should place it under even greater fiscal scrutiny. In comparison with Kaiser Permanente, Medi-Cal's 23.1% cesarean section rate implies an excess of 1,900 cesareans. Based on 1986 Medi-Cal reimbursement levels,[205] this implies an excess expenditure of $1.1 million to physicians. Using West Coast average hospitalization costs reduced to account for Medi-Cal's 47% lower levels of payment,[246] each cesarean costs Medi-Cal $1,980 more than a vaginal delivery in hospital costs.

This accounts for an excess of $1.8 million. The total excess is $2.9 million every half year or $5.8 million annually, which amounts to an estimated 3% of Medi-Cal's expenditures for inpatient obstetrical care. The existence of $2.9 million in potentially avoidable costs should be seen in the context of Medi-Cal's failure to provide adequate reimbursement for an array of needed services.[206]

This study suggests that repeat cesarean section use is a fruitful focus for reductions in cesarean childbirth. Cesarean section rates in women with previous cesarean sections are much higher in private insurance plans, non-Kaiser HMOs and Medi-Cal, compared to the other payors. While the issue of vaginal birth after cesarean (VBAC) remains controversial, recent statements by the American College of Obstetricians and Gynecologists suggest that trial of labor with anticipated VBAC is now the theoretical, although not statistical, standard of practice.[133] Because repeat cesarean sections constitute 36% of all cesareans in California, a focus on this indication is particularly important. While Kaiser's 19.2% VBAC rate is more than double those for Medi-Cal (9.1%) and Private Insurance (7.9%), it is not particularly high in relation to several published reports.[121,123,126] However, attempts by Medi-Cal and private insurance plans to achieve parity with Kaiser could result in substantial reductions in health care costs, as well as inappropriate medical practices.

Several specific strategies for reducing cesarean section use are possible. It is likely that strategies will need to be stronger than Blue Cross's requirement for pre-authorization on elective cesarean sections.[259] Successful strategies are likely to focus on instituting explicit clinical protocols or on restructuring reimbursement for

obstetrical services.

Myers and Gleicher[250,260] have recently reported on a program that successfully reduced cesarean section use through rigorous practice protocols. Although the program was voluntary and carried no explicit sanctions for enforcement, cesarean section use was reduced from 17.5% in 1985 to 11.5% in 1987. Other programs aimed at reducing cesarean section use through clinical protocols and/or utilization review have been reported in the past.[191,261,262] While this approach appears to be successful, it is dependent on the initiative of individual hospitals. It is not likely that health care payors could realistically enforce the use of explicit protocols. The hospitals most likely to adopt such an approach are those whose cesarean section rates are already low. In addition, given current reimbursement policies, this approach requires hospitals and physicians to act contrary to their economic interests.[250]

While also likely to encounter barriers to implementation, re-structuring physician or hospital reimbursement mechanisms is another possible strategy for reducing cesarean section use. In several states, Medicaid and Blue Cross have adopted a physician fee-schedule which reimbursed physicians the same amount for abdominal and vaginal deliveries.[204,206] The effectiveness of this policy in reducing cesarean section rates is not yet clear. This strategy has great potential for diminishing the financial incentives to perform cesarean sections. However, equal physician payments for cesarean and vaginal deliveries may not entirely remove financial incentives, because physician's hourly rate of renumeration is still likely to be higher for cesarean section compared to vaginal delivery.

Modifying hospital payments for cesarean section is a more radical

approach. One specific strategy would be to reimburse hospitals on a prospective basis,[263] as with Medicare's prospective payment system. Hospitals could be reimbursed at pre-determined payment levels for different types of patients, but without regard to whether a cesarean section was performed. For example, hospitals would receive the same reimbursement for a women with a previous cesarean section, regardless of the mode of delivery. A system based on this concept has been developed by the author, and is currently under consideration by Kaiser Permanente for the internal allocation of nursing resources in the Northern California Region.[264]

The low cesarean section rate observed for indigent women introduces the issue of whether cesarean sections are being under-utilized in this population. According to the statements of several authors,[81,82] the rate of 15.3% for this population constitutes an appropriate level of cesarean section use. The cesarean rate for indigent California women is far above the cesarean section rates observed in most European nations.[102] The potential financial barriers to adequate care that California public hospitals currently face, however, suggest the need to monitor the cesarean section practice patterns of these hospitals.

A last recommendation concerns how this study's findings might be used by consumers of obstetrical care. One issue is whether the information presented should have a bearing on the selection of health coverage. The results indicate that women wishing to avoid cesarean section will fair better under Kaiser than with traditional private insurance. However, the wide range of cesarean section rates in both community hospitals and Kaiser hospitals suggests that the choice of a particular hospital for delivery is also an important consideration.

Future Research Needs

While this investigation has revealed a sizable effect of payment source on cesarean section use, several unanswered questions remain. Future research should attempt to both account for the current study's results and overcome its limitations.

As discussed above, a more thorough examination of diagnostic information might yield a set of indications for cesarean section that are less likely to be affected by the potential recording bias. In particular, the reporting of dystocia and fetal distress may not faithfully represent objective clinical conditions. This study utilized an existing and widely used scheme of classifying indications,[108] despite its potential for introducing bias into the analysis. The extent to which improvements in the existing scheme are possible is not known.

Future research needs to account for the multi-dimensional nature of health care organization. A focus on health care financing alone taps only one aspect of a complicated and heterogenous health care system. In the interpretation of the results, the following aspects of health care organization have been mentioned: physicians' access to obstetrical technology, hospital peer review systems, teaching hospital status, hospital size, hospital ownership status, the extent of malpractice concerns, and geographical market differences. To the extent possible, these factors should be combined with payment source for a thorough investigation of the effect of health care organization on cesarean section use. Ongoing research by the author is attempting to address these needs through a detailed analysis of vaginal birth after

cesarean (VBAC) use in California that will analyze a variety of hospital and market characteristics.

An extension of the need to analyze other organizational variables is the need to search more specifically for mechanisms that explain the observed findings. From a theoretical perspective, the validity of this study's results does not necessarily require a reductionistic explanation of how payment source affects individual encounters between patient and physician. However, such explanations are often required for research to have an impact on public policy. The current study has suggested several possible linkages between payment source and medical practice, including:

- Direct economic incentives where physicians consciously seek to maximize income and leisure time, while minimizing their exposure to malpractice litigation.
- Indirect economic incentives operating through clinical norms of practice to affect how clinical situations are defined.
- Specific work environments of physicians that vary by clinical norms, access to and attitude towards technology, degree of peer review, and economic constraints.

These potential linkages should be examined more closely in future research. Not only will this make research more useful to public policy, but it will result in a more integrated explanation of the factors that influence medical decision-making.

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Table 1: Indications for Cesarean Section
United Stated, 1987

	Percent of all U.S. Deliveries	Percent of All Cesareans	Indication-Specific Cesarean Section Rate
Previous Cesarean	9.5%	35.3%	93.4%
Dystocia	11.5%	28.0%	65.2%
Breech Presentation	2.8%	9.8%	79.1%
Fetal Distress	6.4%	10.0%	45.6%
Other Indications	41.4%	16.8%	10.7%
No Indications	28.4%	0.1%	0.1%
Total	100.0%	100.0%	24.4%

Source: Taffel, 1988 [1].

Table 2: Comparison of Cesarean Section Rates in California and the United States, 1970-1987

	Cesarean Section Rates			Annual Percent
	California	United States	CA / US Ratio	Incr in U.S Rate
1970	6.9%	5.5%	1.25	
1971	7.6%	5.8%	1.31	5.5%
1972	8.7%	7.0%	1.24	20.7%
1973	9.9%	8.0%	1.24	14.3%
1974	11.3%	9.2%	1.23	15.0%
1975	12.8%	10.4%	1.23	13.0%
1976	14.0%	12.1%	1.16	16.3%
1977	15.4%	13.7%	1.12	13.2%
1978	15.7%	15.2%	1.03	10.9%
1979	16.5%	16.4%	1.01	7.9%
1980	17.1%	16.5%	1.03	0.6%
1981	17.3%	17.9%	0.97	8.5%
1982	18.5%	18.5%	1.00	3.4%
1983	20.0%	20.3%	0.99	9.7%
1984	20.8%	21.1%	0.99	4.9%
1985	21.6%	22.7%	0.95	7.6%
1986	23.1%	24.1%	0.95	6.2%
1987		24.4%		1.2%

Sources: United States - Taffel, 1988 [1],
California - Dumbauld, 1988 [101].

Table 3: Changing Indications for Cesarean Section
United Stated, 1970-1987

Changes in Cesarean Section Use Attributable to
Changing Incidence of Indications and Changing
Indication-Specific Cesarean Section Rates

	1970			1987		
	Percent of Deli's	Indicat Specific Rate	Contrib to Total	Percent of Deli's	Indicat Specific Rate	Contrib to Total
Previous CS	2.1	98.3	2.1	9.5	90.2	8.6
Dystocia	3.8	50.6	1.9	11.5	59.5	6.8
Breech	2.9	11.6	0.3	2.8	84.4	2.4
Fetal Dis	0.0	--	0.0	6.4	38.2	2.4
Other	91.2	1.5	1.4	69.8	5.9	4.4
Total	100.0		5.7	100.0		24.4

	Difference 1987 - 1970			Contribution to Total Increase*		
	Percent of Deli's	Indicat Specific Rate	Contrib to Total	Incidence of Indicat	Indicat Specific Rate	Both Factors
Previous CS	7.4	(8.1)	5.5	36%	(1%)	35%
Dystocia	6.7	8.9	3.9	24%	2%	26%
Breech	(0.1)	72.8	1.5	0%	11%	11%
Fetal Dis	6.4	--	1.9	13%	0%	13%
Others	(21.4)	4.4	2.7	(1%)	16%	15%
Total			18.7	71%	29%	100%

* Represents the portion of the 18.7% difference between 1970 and 1987 rates that can be attributed to changes in the incidence of a particular indication and to changes in the indication-specific cesarean section rates.

Sources: For 1970 - Shiono, 1987 [160],
For 1987 - Taffel, 1988 [1].

Table 4: Data Elements Submitted to the California Office of Statewide Health Planning and Development

Data Element	Description
Hospital License Number	Hospital Identifier
Date of Birth	Patient Birth Date
Sex	Sex of Patient
Race	Patient Race
Zip Code	Zip Code of Patient's Residence
Admission Date	Date that Patient is Admitted
Source of Admission	Indicator of Patient Transfer Status
Type of Admission	Condition of Patient at Admission
Discharge Date	Date Patient is Discharged
Principal Diagnosis	Condition Responsible for Admission
Other Diagnoses	Other Conditions (up to 24)
Principal Procedure	Procedure Used for Definitive Treatment
Date of Principal Proc	Date Procedure Performed
Other Procedures	Other Procedures Performed (up to 24)
Dates of Other Procedures	Dates Procedures Performed (up to 24)
Disposition of Patient	Status of Patient at Discharge
Expected Source of Payment	Expected Principal Source
Total Charges	Excluding Professional Component
Abstract Record Number	For Use by Individual Hospital

Source: OSHPD, 1986 [238].

Table 5: Data Elements Available on the Public OSHPD DataBase

Data Element	Coding of Variable
Hospital Facility Number	Unique Hospital Identifier
Hospital Type	1 = General Acute 2 = SNF or ICF 3 = Psychiatric 4 = Alcohol/Drug Rehabilitation 5 = Rehabilitation
County	County Code for Hospital Location
Patient Age	Age in Years
Sex	1 = Male 2 = Female 3 = Other 4 = Unknown
Race	1 = White 2 = Black 3 = Hispanic 4 = Native American/Eskimo 5 = Asian 6 = Other 7 = Unknown
Zip Code	Five Digit Zip Code
Length of Stay	Length of Hospital Stay in Days
Admission Day of Week	Day of Week Code
Admission Month and Year	Month Code and Year
Source of Admission	11 = Routine 12 = Emergency Room 13 = Short-term Acute Hospital 14 = Intermed. Care Facility(ICF) 15 = Skilled Nursing Facility 16 = Other Facility 17 = Home Health Service 18 = Newborn 19 = Other

(continued on the next page)

Table 5 (Continued): Data Elements Available on Public OSHPD Data Base

Type of Admission	1 = Emergency 2 = Urgent 3 = Elective 4 = Newborn 5 = Delivery 6 = Unknown
Principal Diagnosis	ICD-9-CM Diagnosis Code
Other Diagnoses	ICD-9-CM Diagnosis Codes (up to 24)
Principal Procedure	ICD-9-CM Procedure Code
Days from Admission to Principal Procedure	Number of Days
Other Procedures	ICD-9-CM Procedure Code (up to 24)
Days from Admission to Other Procedures	Number of Days (up to 24 codes)
Disposition of Patient	1 = Routine Discharge 2 = Short-term Acute Care Hospital 3 = ICF 4 = SNF 5 = Other Facility 6 = Left Against Medical Advice 7 = Home Health Service 8 = Died
Expected Source of Payment	1 = Medicare 2 = Medi-Cal 3 = Worker's Compensation 4 = Title V 5 = Other Government 6 = Blue Cross/Blue Shield 7 = Insurance Company 8 = Health Maintenance Organization/Pre-Paid Health Plan 9 = Self-Pay 10 = No Charge 11 = Other Non-Governmental 12 = Medically Indigent Services Under Section 17000
Total Charges	Charges in Dollars
Diagnosis Related Group	One of 471 DRG codes

Source: OSHPD, 1986 [238].

Table 6: Sources of Payment for Deliveries in California, 1986

Payment Source	Percent of California Deliveries	Management	Eligibility	Restrictions on Hospitals
Medi-Cal	26.3%	Federal/State	Low income	Severe
Blue Cross	6.1%	Non-Profit	Employed	PPO Only
Other Private Insurance	29.4%	For-Profit	Employed	PPO Only
Kaiser North	5.7%	Non-Profit	Employed	Severe
Kaiser South	6.0%	Non-Profit	Employed	Severe
Other HMOs	9.2%	For-Profit	Employed	Severe
Self-Pay	11.0%	------	Various	None
Indigent	2.5%	State/County	Poor, w/o Medi-Cal	Severe

Source: OSHPD, 1988 [239]

Table 7: Major HMOs in California, 1986

HMO Name	Members Year-End 1986 (x 1,000)	Federally Qualified	Profit Status*	Model Type
Kaiser Permanente, North	2,017	Yes	NP	Group
Kaiser Permanente, South	1,837	Yes	NP	Group
Health Net	450	Yes	NP	Network
CIGNA	400	Yes	P	Staff
Maxicare, Southern Calif	312	Yes	P	IPA
PacificCare of California	176	Yes	P	Network
FHP, Inc.	147	Yes	P	Staff
Foundation Health Plan	143	Yes	P	IPA
TakeCare Corporation	142	Yes	P	Network
General Med	119	Yes	P	Staff
Greater San Diego Health Plan	118	Yes	P	IPA
Lifeguard HMO	96	Yes	NP	IPA
All Others (37 HMOs)	781			
Total of 49 HMOs	6,738			

* NP = not-for-profit P = for profit

Source: Inter-Study, 1987 [247].

Table 8: Indications for Cesarean Section

Primary Indication Category	Component Indications	ICD-9-CM Code
Previous Cesarean Section		654.2
Breech Presentation	Breech Delivery	652.2
	Breech Extraction	669.6
Dystocia		
	Obstructed Labor	660
	Abnormal Labor	661 *
	Long Labor	662
	Disproportion	653
Fetal Distress		656.3
Other Indications		
	Umbilical Cord Complications	663
	Early or Threatened Labor	644
	Amniotic Membrane Complications	658
	Maternal Hypertension	642
	Prolonged Pregnancy	664

* except 661.3 precipitate labor.

Source: Taffel, 1987 [108], U.S. DHHS, 1980 [243].

Table 9A: Cesarean Section Rates by Payment Source, Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	13,163	6.1%	28.3
Other Private Insurance	63,997	29.4%	28.8
Other HMOs	20,045	9.2%	27.0
Medi-Cal	57,063	26.3%	23.1
Kaiser Northern Calif	12,323	5.7%	19.0
Kaiser Southern Calif	13,094	6.0%	20.5
Self-Pay	23,943	11.0%	19.2
Other Payors	8,385	3.9%	19.1
Indigent Services	5,355	2.5%	15.3
Total	217,368	100.0%	24.3

Table 9B: Cesarean Section Rates and Odds Ratios

Payment Source	Cesarean Section Rate (95% CL)		Odds Ratio (95% CL)	
Private Insurance*	28.7	(28.3, 29.1)	1.00	
Other HMOs	27.0	(26.2, 27.8)	0.92	(0.88, 0.96)
Medi-Cal	23.1	(22.6, 23.6)	0.75	(0.72, 0.77)
Kaiser Permanente**	19.8	(19.2, 20.4)	0.61	(0.59, 0.64)
Self-Pay/Other	19.2	(18.6, 19.8)	0.59	(0.57, 0.62)
Indigent Services	15.3	(14.0, 16.6)	0.45	(0.41, 0.50)
Total	24.3	(24.1, 24.5)		

* Includes Blue Cross/Blue Shield and Other Private Insurance.
** Includes Kaiser Northern and Kaiser Southern Regions.

Table 10A: Primary Cesarean Section Rates by Payment Source
Hospital Deliveries, California, Jan-June 1986

Payment Source	Deliveries	Percent of all At Risk*	Percent of Payor's Deliveries	Primary Cesarean Section Rate
Blue Cross/Blue Shield	11,709	6.0%	89.0%	20.5
Other Private Insurance	56,512	28.8%	88.3%	20.4
Other HMOs	17,853	9.1%	89.1%	19.1
Medi-Cal	51,736	26.4%	90.7%	16.1
Kaiser Northern Calif	11,355	5.8%	92.1%	13.9
Kaiser Southern Calif	11,937	6.1%	91.2	14.5
Self-Pay	22,294	11.4%	93.1%	14.6
Other Payors	7,793	4.0%	92.9%	14.4
Indigent Services	5,015	2.6%	93.7%	11.4
Total	196,204	100.0%	90.3%	17.3

Table 10B: Primary Cesarean Section Rates and Odds Ratios

Payment Source	Primary Cesarean Section Rate (95% CL)		Odds Ratio (95% CL)	
Private Insurance	20.4	(20.0, 20.8)	1.00	
Other HMOs	19.1	(18.3, 19.8)	0.92	(0.87, 0.97)
Medi-Cal	16.1	(15.7, 16.5)	0.75	(0.72, 0.78)
Kaiser Permanente	14.2	(13.6, 14.8)	0.65	(0.61, 0.68)
Self-Pay/Others	14.5	(14.0, 15.1)	0.66	(0.63, 0.70)
Indigent Services	11.4	(10.3, 12.6)	0.50	(0.45, 0.57)
Total	17.3	(17.1, 17.5)		

* Women without a previous cesarean section.

Table 11: Cesarean Section Rates by Primary Indication
Hospital Deliveries, California, Jan-June 1986

Primary Indication	Deliveries	Percent of all Delis.	Cesarean Sections	Percent of all Cesareans	Cesarean Section Rate
Previous Cesarean	21,164	9.7%	18,883	35.8%	89.2
Breech	6,650	3.1%	5,762	10.9%	86.6
Dystocia	26,027	12.0%	16,765	31.8%	64.4
Fetal Distress	17,850	8.2%	5,143	9.7%	28.8
Other Indications	52,789	24.3%	6,084	11.5%	11.5
No Indications	92,888	42.7%	167	0.3%	0.2
Total	217,368	100.0%	52,804	100.0%	24.3

Table 12A: Cesarean Section Rates by Payment Source
Previous Cesarean Section
Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all Prev CS	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	1,454	6.9%	11.0%	91.3
Other Private Insurance	7,485	35.4%	11.7%	92.2
Other HMOs	2,192	10.4%	10.9%	91.7
Medi-Cal	5,327	25.2%	9.3%	90.9
Kaiser Northern Calif	968	4.6%	7.9%	79.2
Kaiser Southern Calif	1,157	5.5%	8.8%	82.3
Self-Pay	1,649	7.8%	6.9%	81.7
Other Payors	592	2.8%	7.1%	80.9
Indigent Services	340	1.6%	6.3%	72.1
Total	21,164	100.0%	9.7%	89.2

Table 12B: Cesarean Section Rates and Odds Ratios,
Previous Cesarean Section

Payment Source	Cesarean Section Rate (95% CL)	Odds Ratio (95% CL)
Private Insurance	92.1 (91.4, 92.8)	1.00
Other HMOs	91.7 (90.2, 93.2)	0.95 (0.76, 1.19)
Medi-Cal	90.9 (89.9, 91.9)	0.86 (0.73, 1.00)
Kaiser Permanente	80.9 (78.7, 83.1)	0.36 (0.31, 0.43)
Self-Pay/Others	81.7 (79.6, 83.8)	0.38 (0.32, 0.46)
Indigent Services	72.1 (65.8, 78.4)	0.22 (0.16, 0.31)
Total	89.2 (88.7, 89.7)	

Table 13A: Cesarean Section Rates by Payment Source,
Breech Presentation
Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all Breech	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	474	7.1%	3.6%	88.2
Other Private Insurance	2,189	32.9%	3.5%	88.9
Other HMOs	631	9.5%	3.1%	91.6
Medi-Cal	1,569	23.6%	2.7%	84.1
Kaiser Northern Calif	378	5.7%	3.1%	90.2
Kaiser Southern Calif	375	5.6%	2.9%	87.5
Self-Pay	677	10.2%	2.8%	80.2
Other Payors	230	3.5%	2.7%	85.2
Indigent Services	127	1.9%	2.4%	74.0
Total	6,650	100.0%	3.1%	86.6

Table 13B: Cesarean Section Rates and Odds Ratios,
Breech Presentation

Payment Source	Cesarean Section Rate (95% CL)		Odds Ratio (95% CL)	
Private Insurance	88.8	(87.2, 90.4)	1.00	
Other HMOs	91.6	(88.7, 94.5)	1.38	(0.92, 2.06)
Medi-Cal	84.1	(81.7, 86.5)	0.67	(0.53, 0.85)
Kaiser Permanente	88.8	(85.8, 91.8)	1.00	(0.71, 1.40)
Self-Pay/Others	81.5	(78.2, 84.8)	0.56	(0.42, 0.73)
Indigent Services	74.0	(63.9, 84.1)	0.36	(0.21, 0.62)
Total	86.6	(85.5, 87.7)		

Table 14A: Cesarean Section Rates by Payment Source, Dystocia Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all Dystocia	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	1,935	7.4%	14.7%	63.5
Other Private Insurance	8,873	34.1%	13.9%	66.4
Other HMOs	2,529	9.7%	12.6%	66.8
Medi-Cal	6,009	23.1%	10.5%	65.2
Kaiser Northern Calif	1,319	5.1%	10.7%	54.1
Kaiser Southern Calif	1,350	5.2%	10.3%	61.9
Self-Pay	2,680	10.3%	11.2%	62.2
Other Payors	899	3.5%	10.7%	64.5
Indigent Services	433	1.7%	8.1%	55.7
Total	26,027	100.0%	12.0%	64.4

Table 14B: Cesarean Section Rates and Odds Ratios, Dystocia

Payment Source	Cesarean Section Rate (95% CL)		Odds Ratio (95% CL)	
Private Insurance	65.9	(64.7, 67.1)	1.00	
Other HMOs	66.8	(64.4, 69.2)	1.04	(0.92, 1.17)
Medi-Cal	65.2	(63.6, 66.8)	0.97	(0.89, 1.06)
Kaiser Permanente	58.0	(55.5, 60.5)	0.71	(0.64, 0.80)
Self-Pay/Others	62.8	(60.7, 64.9)	0.87	(0.79, 0.97)
Indigent Services	55.7	(49.5, 61.9)	0.65	(0.50, 0.84)
Total	64.4	(63.6, 65.2)		

Table 15A: Cesarean Section Rates by Payment Source, Fetal Distress Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all Fet Dis	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	919	5.1%	7.0%	33.2
Other Private Insurance	4,765	26.7%	7.4%	31.4
Other HMOs	1,533	8.6%	7.6%	34.1
Medi-Cal	5,319	29.8%	9.3%	27.1
Kaiser Northern Calif	946	5.3%	7.7%	27.6
Kaiser Southern Calif	1,115	6.2%	8.5%	26.0
Self-Pay	2,079	11.6%	8.7%	25.7
Other Payors	597	3.3%	7.1%	26.5
Indigent Services	577	3.2%	10.8%	23.4
Total	17,850	100.0%	8.2%	28.8

Table 15B: Cesarean Section Rates and Odds Ratios, Fetal Distress

Payment Source	Cesarean Section Rate (95% CL)	Odds Ratio (95% CL)
Private Insurance	31.7 (30.1, 33.3)	1.00
Other HMOs	34.1 (31.0, 37.2)	1.11 (0.95, 1.30)
Medi-Cal	27.1 (25.5, 28.7)	0.80 (0.72, 0.89)
Kaiser Permanente	26.7 (24.2, 29.2)	0.78 (0.68, 0.91)
Self-Pay/Others	25.9 (23.7, 28.1)	0.75 (0.66, 0.86)
Indigent Services	23.4 (18.9, 27.9)	0.66 (0.51, 0.86)
Total	28.8 (27.9, 29.7)	

Table 16A: Cesarean Section Rates by Payment Source, Other Indications
Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all Other Ind	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	3,185	6.0%	24.2%	13.7
Other Private Insurance	15,261	28.9%	23.8%	14.0
Other HMOs	4,493	8.5%	22.4%	13.0
Medi-Cal	14,884	28.2%	26.1%	10.9
Kaiser Northern Calif	2,425	4.6%	19.7%	10.2
Kaiser Southern Calif	2,729	5.2%	20.8%	9.8
Self-Pay	5,832	11.0%	24.4%	8.5
Other Payors	2,577	4.9%	30.7%	7.3
Indigent Services	1,403	2.7%	26.2%	7.4
Total	52,789	100.0%	24.3%	11.5

Table 16B: Cesarean Section Rates and Odds Ratios
Other Indications

Payment Source	Cesarean Section Rate (95% CL)	Odds Ratio (95% CL)
Private Insurance	14.0 (13.3, 14.7)	1.00
Other HMOs	13.0 (11.7, 14.3)	0.92 (0.81, 1.04)
Medi-Cal	10.9 (10.2, 11.6)	0.75 (0.69, 0.82)
Kaiser Permanente	10.0 (8.9, 11.1)	0.68 (0.60, 0.78)
Self-Pay/Others	8.1 (7.3, 8.9)	0.54 (0.48, 0.61)
Indigent Services	7.4 (5.6, 9.2)	0.49 (0.38, 0.64)
Total	11.5 (11.1, 11.9)	

Table 17: Cesarean Section Rates by Maternal Age
Hospital Deliveries, California, Jan-June 1986

Primary Indication	Deliveries	Percent of all Delis.	Cesarean Sections	Percent of all Cesareans	Cesarean Section Rate
< 20 years	24,366	11.2%	4,356	8.2%	17.9
20-24 years	60,833	28.0%	13,119	24.8%	21.6
25-29 years	69,003	31.7%	16,986	32.2%	24.6
30-34 years	44,301	20.4%	12,389	23.5%	28.0
35+ years	18,865	8.7%	5,954	11.3%	31.6
Total	217,368	100.0%	52,804	100.0%	24.3

Table 18A: Cesarean Section Rates by Payment Source, Age < 20 Years
Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all < 20	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	332	1.4%	2.5%	21.4
Other Private Insurance	2,356	9.7%	3.7%	19.8
Other HMOs	1,312	5.4%	6.5%	18.4
Medi-Cal	13,156	54.0%	23.1%	19.3
Kaiser Northern Calif	907	3.7%	7.4%	13.9
Kaiser Southern Calif	1,222	5.0%	9.3%	14.6
Self-Pay	2,876	11.8%	12.0%	14.8
Other Payors	1,308	5.4%	15.6%	15.1
Indigent Services	897	3.7%	16.8%	12.6
Total	24,366	100.0%	11.2%	17.9

Table 18B: Cesarean Section Rates and Odds Ratios, Age < 20 Years

Payment Source	Cesarean Section Rate (95% CL)	Odds Ratio (95% CL)
Private Insurance	20.0 (18.0, 22.0)	1.00
Other HMOs	18.4 (15.6, 21.2)	0.90 (0.72, 1.13)
Medi-Cal	19.3 (18.4, 20.2)	0.96 (0.83, 1.10)
Kaiser Permanente	14.3 (12.3, 16.3)	0.67 (0.55, 0.82)
Self-Pay/Others	14.9 (13.5, 16.3)	0.70 (0.59, 0.83)
Indigent Services	12.6 (9.7, 15.5)	0.58 (0.43, 0.77)
Total	17.9 (17.3, 18.5)	

Table 19A: Cesarean Section Rates by Payment Source, Age 20-24 Years
Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all 20-24	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	2,184	3.6%	16.6%	24.8
Other Private Insurance	13,783	22.7%	21.5%	24.8
Other HMOs	5,006	8.2%	25.0%	23.4
Medi-Cal	21,330	35.1%	37.4%	23.0
Kaiser Northern Calif	2,932	4.8%	23.8%	14.9
Kaiser Southern Calif	3,152	5.2%	24.1%	18.4
Self-Pay	7,427	12.2%	31.0%	17.0
Other Payors	3,150	5.2%	37.6%	17.9
Indigent Services	1,869	3.1%	34.9%	13.5
Total	60,833	100.0%	28.0%	21.6

Table 19B: Cesarean Section Rates and Odds Ratios, Age 20-24 years

Payment Source	Cesarean Section Rate (95% CL)	Odds Ratio (95% CL)
Private Insurance	24.8 (23.9, 25.7)	1.00
Other HMOs	23.4 (21.9, 24.9)	0.93 (0.84, 1.02)
Medi-Cal	23.0 (22.3, 23.7)	0.91 (0.85, 0.96)
Kaiser Permanente	16.7 (15.5, 17.9)	0.61 (0.55, 0.67)
Self-Pay/Others	17.3 (16.3, 18.2)	0.63 (0.58, 0.69)
Indigent Services	13.5 (11.5, 15.5)	0.47 (0.39, 0.57)
Total	21.6 (21.2, 22.0)	

Table 20A: Cesarean Section Rates by Payment Source, Age 25-29
Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all 25-29	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	4,944	7.2%	37.6%	27.1
Other Private Insurance	24,047	34.8%	37.6%	27.7
Other HMOs	7,253	10.5%	36.2%	26.8
Medi-Cal	13,158	19.1%	23.1%	24.7
Kaiser Northern Calif	4,177	6.1%	33.9%	18.7
Kaiser Southern Calif	4,324	6.3%	33.0%	19.8
Self-Pay	7,291	10.6%	30.5%	20.1
Other Payors	2,352	3.4%	28.1%	19.2
Indigent Services	1,457	2.1%	27.2%	15.0
Total	69,003	100.0%	31.7%	24.6

Table 20B: Cesarean Section Rates and Odds Ratios, Age 25-29 Years

Payment Source	Cesarean Section Rate (95% CL)	Odds Ratio (95% CL)
Private Insurance	27.6 (26.9, 28.3)	1.00
Other HMOs	26.8 (25.5, 28.1)	0.96 (0.89, 1.04)
Medi-Cal	24.7 (23.7, 25.7)	0.86 (0.81, 0.92)
Kaiser Permanente	19.3 (18.2, 20.4)	0.63 (0.58, 0.68)
Self-Pay/Others	19.9 (18.8, 20.9)	0.65 (0.60, 0.70)
Indigent Services	15.0 (12.6, 17.4)	0.46 (0.38, 0.56)
Total	24.6 (24.2, 25.0)	

Table 21A: Cesarean Section Rates by Payment Source, Age 30-34 Years
Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all 30-34	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	3,993	9.0%	30.3%	29.2
Other Private Insurance	17,006	38.4%	26.6%	31.7
Other HMOs	4,665	10.5%	23.3%	31.3
Medi-Cal	6,430	14.5%	11.3%	26.1
Kaiser Northern Calif	2,969	6.7%	24.1%	21.5
Kaiser Southern Calif	2,972	6.7%	22.7%	23.7
Self-Pay	4,396	9.9%	18.4%	21.5
Other Payors	1,124	2.5%	13.4%	23.7
Indigent Services	746	1.7%	13.9%	18.6
Total	44,301	100.0%	20.4%	28.0

Table 21B: Cesarean Section Rates and Odds Ratios, Age 30-34 Years

Payment Source	Cesarean Section Rate (95% CL)		Odds Ratio (95% CL)	
Private Insurance	31.2	(30.4, 32.0)	1.00	
Other HMOs	31.3	(29.5, 33.1)	1.00	(0.92, 1.10)
Medi-Cal	26.1	(24.7, 27.5)	0.78	(0.72, 0.85)
Kaiser Permanente	22.6	(21.2, 24.0)	0.64	(0.59, 0.70)
Self-Pay/Others	21.9	(20.5, 23.4)	0.62	(0.56, 0.68)
Indigent Services	18.6	(14.9, 22.3)	0.50	(0.39, 0.64)
Total	28.0	(27.4, 28.6)		

Table 22A: Cesarean Section Rates by Payment Source, Age 35 and Older Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all 35+	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	1,710	9.1%	13.0%	35.6
Other Private Insurance	6,805	36.1%	10.6%	36.6
Other HMOs	1,809	9.6%	9.0%	32.5
Medi-Cal	2,989	15.8%	5.2%	27.3
Kaiser Northern Calif	1,338	7.1%	10.9%	26.5
Kaiser Southern Calif	1,424	7.5%	10.9%	25.6
Self-Pay	1,953	10.4%	8.2%	26.0
Other Payors	451	2.4%	5.4%	27.7
Indigent Services	386	2.0%	7.2%	25.4
Total	18,865	100.0%	8.7%	31.6

Table 22B: Cesarean Section Rates and Odds Ratios, Age 35 and Older

Payment Source	Cesarean Section Rate (95% CL)	Odds Ratio (95% CL)
Private Insurance	36.4 (35.1, 37.7)	1.00
Other HMOs	32.5 (29.7, 35.3)	0.84 (0.73, 0.97)
Medi-Cal	27.3 (25.2, 29.4)	0.66 (0.58, 0.74)
Kaiser Permanente	26.0 (23.9, 28.2)	0.62 (0.54, 0.70)
Self-Pay/Others	26.3 (24.0, 28.6)	0.62 (0.55, 0.71)
Indigent Services	25.4 (19.7, 31.1)	0.59 (0.44, 0.81)
Total	31.6 (30.7, 32.5)	

Table 23: Cesarean Section Rates by Race/Ethnicity
Hospital Deliveries, California, Jan-June 1986

Race/Ethnicity	Deliveries	Percent of all Delis.	Cesarean Sections	Percent of all Cesareans	Cesarean Section Rate
Hispanic	63,287	29.1%	13,608	25.8%	21.5
White	115,453	53.1%	29,979	56.8%	26.0
Black	17,394	8.0%	4,477	8.5%	25.7
Asian	15,636	7.2%	3,462	6.5%	22.1
Other/Unknown	5,598	2.6%	1,278	2.4%	22.8
Total	217,368	100.0%	52,804	100.0%	24.3

Table 24A: Cesarean Section Rates by Payment Source, Hispanic Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all Hispanics	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	1,463	2.3%	11.1%	29.6
Other Private Insurance	12,400	19.6%	19.4%	27.8
Other HMOs	4,561	7.2%	22.8%	26.7
Medi-Cal	19,501	30.8%	34.2%	21.2
Kaiser Northern Calif	1,530	2.4%	12.4%	18.0
Kaiser Southern Calif	3,379	5.3%	25.8%	20.3
Self-Pay	11,591	18.3%	48.4%	18.0
Other	4,137	6.5%	49.3%	15.2
Indigent Services	4,725	7.5%	88.2%	15.0
Total	63,287	100.0%	29.1%	21.5

Table 24B: Cesarean Section Rates and Odds Ratios, Hispanic

Payment Source	Cesarean Section Rate (95% CL)		Odds Ratio (95% CL)	
Private Insurance	28.0	(27.0, 29.0)	1.00	
Other HMOs	26.7	(25.0, 28.4)	0.94	(0.85, 1.03)
Medi-Cal	21.2	(20.4, 22.0)	0.69	(0.65, 0.74)
Kaiser Permanente	19.6	(18.1, 21.0)	0.63	(0.56, 0.70)
Self-Pay/Others	17.3	(16.5, 18.0)	0.54	(0.50, 0.58)
Indigent Services	15.0	(13.7, 16.3)	0.45	(0.40, 0.51)
Total	21.5	(21.1, 21.9)		

Table 25A: Cesarean Section Rates by Payment Source, Whites
Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all Whites	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	9,875	8.6%	75.0%	28.3
Other Private Insurance	43,667	37.8%	68.2%	29.0
Other HMOs	11,692	10.1%	58.3%	27.2
Medi-Cal	23,086	20.0%	40.5%	25.3
Kaiser Northern Calif	7,877	6.8%	63.9%	18.8
Kaiser Southern Calif	6,549	5.7%	50.0%	20.0
Self-Pay	9,506	8.2%	39.7%	20.8
Other	2,892	2.5%	34.5%	24.0
Indigent Services	309	0.3%	5.8%	17.2
Total	115,453	100.0%	53.1%	26.0

Table 25B: Cesarean Section Rates and Odds Ratios, Whites

Payment Source	Cesarean Section Rate (95% CL)	Odds Ratio (95% CL)
Private Insurance	28.9 (28.4, 29.4)	1.00
Other HMOs	27.2 (26.1, 28.3)	0.92 (0.87, 0.98)
Medi-Cal	25.3 (24.6, 26.0)	0.83 (0.80, 0.87)
Kaiser Permanente	19.3 (18.5, 20.2)	0.59 (0.56, 0.63)
Self-Pay/Others	21.5 (20.6, 22.5)	0.68 (0.64, 0.72)
Indigent Services	17.2 (11.7, 22.7)	0.51 (0.35, 0.76)
Total	26.0 (25.7, 26.3	

Table 26A: Cesarean Section Rates by Payment Source, Blacks
Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all Blacks	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	396	2.3%	3.0%	29.5
Other Private Insurance	2,090	12.0%	3.3%	31.1
Other HMOs	1,882	10.8%	9.4%	26.8
Medi-Cal	8,428	48.5%	14.8%	26.6
Kaiser Northern Calif	1,204	6.9%	9.8%	20.8
Kaiser Southern Calif	2,013	11.6%	15.4%	21.9
Self-Pay	535	3.1%	2.2%	20.6
Other	651	3.7%	7.8%	19.0
Indigent Services	195	1.1%	3.6%	19.0
Total	17,394	100.0%	8.0%	25.7

Table 26B: Cesarean Section Rates and Odds Ratios, Blacks

Payment Source	Cesarean Section Rate (95% CL)		Odds Ratio (95% CL)	
Private Insurance	30.8	(28.5, 33.2)	1.00	
Other HMOs	26.8	(24.2, 29.4)	0.82	(0.69, 0.98)
Medi-Cal	26.6	(25.4, 27.8)	0.81	(0.71, 0.92)
Kaiser Permanente	21.5	(19.6, 23.4)	0.61	(0.52, 0.72)
Self-Pay/Others	19.7	(16.7, 22.7)	0.55	(0.44, 0.69)
Indigent Services	19.0	(11.8, 26.2)	0.53	(0.32, 0.85)
Total	25.7	(24.8, 26.6)		

Table 27A: Cesarean Section Rates by Payment Source, Asian Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of all Asians	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	1,061	6.8%	8.1%	28.4
Other Private Insurance	4,213	26.9%	6.6%	29.7
Other HMOs	1,216	7.8%	6.1%	26.3
Medi-Cal	4,671	29.9%	8.2%	15.2
Kaiser Northern Calif	1,534	9.8%	12.4%	18.8
Kaiser Southern Calif	753	4.8%	5.8%	21.4
Self-Pay	1,686	10.8%	7.0%	19.0
Other	447	2.9%	5.3%	22.1
Indigent Services	55	0.4%	1.0%	20.0
Total	15,636	100.0%	7.2%	22.1

Table 27B: Cesarean Section Rates and Odds Ratios, Asians

Payment Source	Cesarean Section Rate (95% CL)	Odds Ratio (95% CL)
Private Insurance	29.4 (27.8, 31.1)	1.00
Other HMOs	26.3 (23.0, 29.6)	0.86 (0.71, 1.03)
Medi-Cal	15.2 (13.8, 16.6)	0.43 (0.38, 0.49)
Kaiser Permanente	19.7 (17.5, 21.8)	0.59 (0.50, 0.69)
Self-Pay/Others	19.6 (17.4, 21.9)	0.59 (0.50, 0.69)
Indigent Services	20.0 (6.1, 33.9)	0.60 (0.25, 1.43)
Total	22.1 (21.2, 23.0)	

Table 28A: Cesarean Section Rates by Payment Source, Race Other/Unknown, Hospital Deliveries, California, Jan-June 1986

Payment Source	Total Deliveries	Percent of Oth/Unk	Percent of Payor's Deliveries	Cesarean Section Rate
Blue Cross/Blue Shield	368	6.6%	2.8%	23.1
Other Private Insurance	1,627	29.1%	2.5%	25.6
Other HMOs	694	12.4%	3.5%	26.5
Medi-Cal	1,377	24.6%	2.4%	19.8
Kaiser Northern Calif	178	3.2%	1.4%	23.6
Kaiser Southern Calif	400	7.1%	3.1%	22.8
Self-Pay	625	11.2%	2.6%	18.9
Other	258	4.6%	3.1%	22.1
Indigent Services	71	1.3%	1.3%	18.3
Total	5,598	100.0%	2.6%	22.8

Table 28B: Cesarean Section Rates and Odds Ratios, Other/Unknown Race

Payment Source	Cesarean Section Rate (95% CL)		Odds Ratio (95% CL)	
Private Insurance	25.1	(22.6, 27.6)	1.00	
Other HMOs	26.5	(22.2, 30.8)	1.07	(0.83, 1.39)
Medi-Cal	19.8	(17.0, 22.6)	0.74	(0.59, 0.92)
Kaiser Permanente	23.0	(18.5, 27.6)	0.89	(0.67, 1.19)
Self-Pay/Others	19.8	(16.4, 23.3)	0.74	(0.57, 0.95)
Indigent Services	18.3	(6.5, 30.1)	0.67	(0.30, 1.49)
Total	22.8	(21.4, 24.2)		

Table 29A: Indirectly Standardized Cesarean Section Rates
Hospital Deliveries, California, Jan-June 1986

Based on 150 Case-mix Categories
Dystocia Included as a Separate Indication

Payment Source	Actual Cesarean Rate	Expected Cesarean Rate	Adjusted Cesarean Rate	Adj CSR Odds Ratio
Other Private Insurance	28.8	27.5	25.5	1.00
Blue Cross/Blue Shield	28.3	27.6	24.9	0.97
Other HMOs	27.0	25.6	25.6	1.01
Medi-Cal	23.1	23.1	24.3	0.94
Kaiser Northern	19.0	21.3	21.6	0.81
Kaiser Southern	20.5	22.2	22.4	0.85
Self-Pay	19.2	20.9	22.4	0.84
Other Payors	19.1	20.9	22.3	0.84
Indigent Services	15.3	18.4	20.2	0.74
Total	24.3	24.3	24.3	

Table 29B: Estimate of Excess Due to Practice Differences

Based on 150 Case-mix Categories
Dystocia Included as a Separate Indication

Payment Source	Excess Over State Average	Excess Due to Patient Case-mix	Excess Due to Practice Differences
Other Private Insurance	4.5	3.2	1.3
Blue Cross/Blue Shield	4.0	3.4	0.7
Other HMOs	2.7	1.3	1.4
Medi-Cal	(1.2)	(1.2)	0.0
Kaiser Northern	(5.3)	(3.0)	(2.4)
Kaiser Southern	(3.8)	(2.1)	(1.7)
Self-Pay	(5.1)	(3.4)	(1.7)
Other Payors	(5.2)	(3.4)	(1.7)
Indigent Services	(9.0)	(5.9)	(3.1)
Total	0.0	0.0	0.0

Table 30A: Indirectly Standardized Cesarean Section Rates
Hospital Deliveries, California, Jan-June 1986

Based on 125 Case-mix Categories
Dystocia Combined with Other Indications

Payment Source	Actual Cesarean Rate	Expected Cesarean Rate	Adjusted Cesarean Rate	Adj CSR Odds Ratio
Other Private Insurance	28.8	26.9	26.0	1.00
Blue Cross/Blue Shield	28.3	27.0	25.5	0.98
Other HMOs	27.0	25.1	26.1	1.00
Medi-Cal	23.1	23.7	23.6	0.88
Kaiser Northern	19.0	21.1	21.8	0.80
Kaiser Southern	20.5	22.1	22.6	0.83
Self-Pay	19.2	21.0	22.2	0.81
Other Payors	19.1	22.2	20.9	0.75
Indigent Services	15.3	19.6	19.0	0.67
Total	24.3	24.3	24.3	

Table 30B: Estimate of Excess Due to Practice Differences

Based on 125 Case-mix Categories
Dystocia Combined with Other Indications

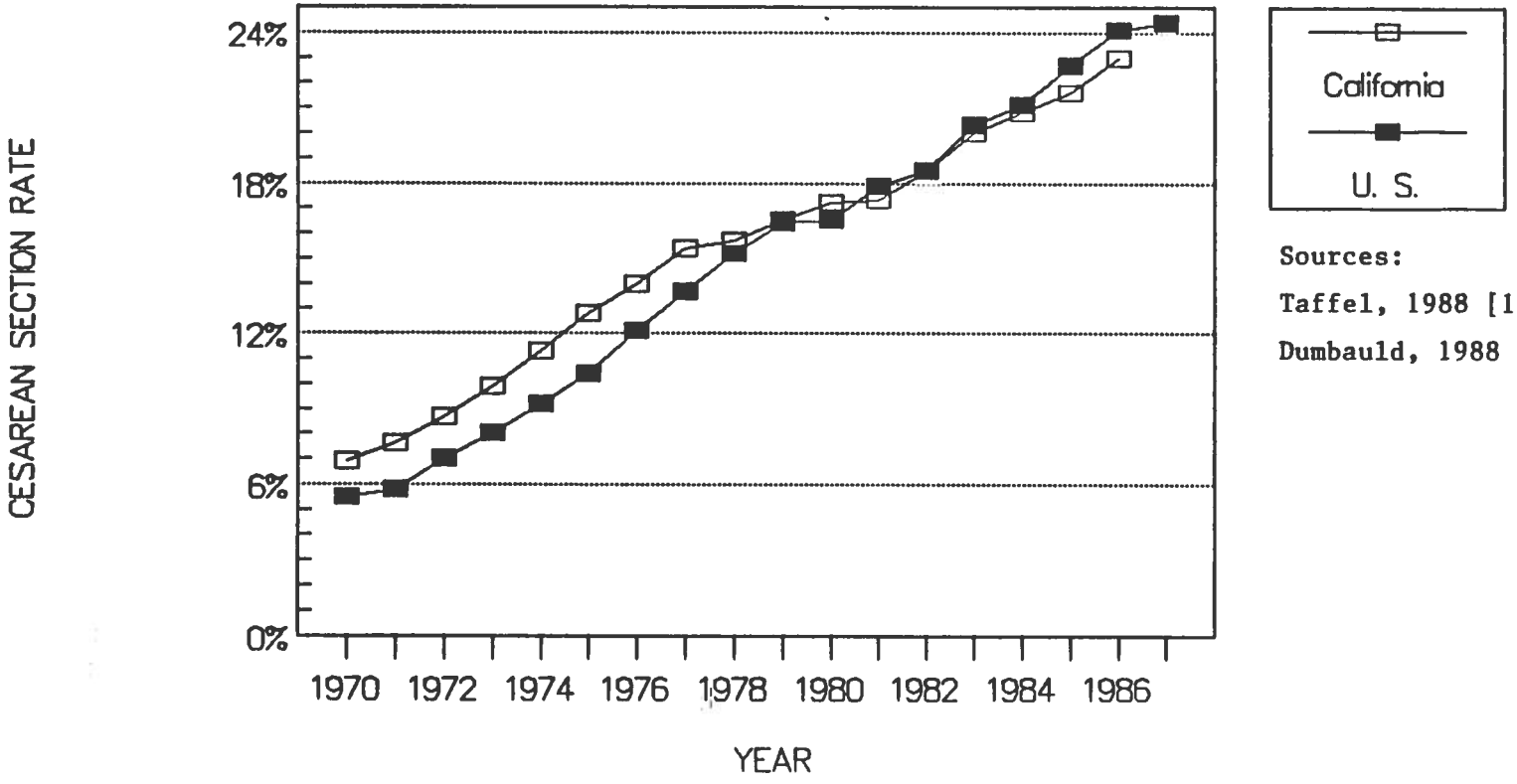
Payment Source	Excess Over State Average	Excess Due to Patient Case-mix	Excess Due to Practice Differences
Other Private Insurance	4.5	2.6	1.9
Blue Cross/Blue Shield	4.0	2.7	1.3
Other HMOs	2.7	0.8	1.8
Medi-Cal	(1.2)	(0.6)	(0.6)
Kaiser Northern	(5.3)	(3.2)	(2.1)
Kaiser Southern	(3.8)	(2.2)	(1.6)
Self-Pay	(5.1)	(3.3)	(1.8)
Other Payors	(5.2)	(2.1)	(3.1)
Indigent Services	(9.0)	(4.7)	(4.3)
Total	0.0	0.0	0.0

Table 31: Logistic Regression of Cesarean Section Use
Hospital Deliveries, California, Jan-June 1986

	Coefficient	SE	Q (Wald)	Odds Ratio (95% Confid Limits)
RACE				
Hispanic				1.00*
Black	0.263	0.031	73.6	1.30 (1.20, 1.41)
White	0.054	0.019	8.1	1.06 (1.01, 1.11)
Asian	-0.062	0.034	3.5	0.94 (0.86, 1.02)
Oth/Unkn	-0.038	0.050	0.6	0.96 (0.85, 1.10)
INDICATIONS				
No Indications				1.00*
Breech	3.718	0.040	8815	41.18 (37.2, 45.6)
Prev Cesarean	4.010	0.027	22057	55.15 (51.4, 59.1)
Dystocia	2.447	0.018	17597	11.56 (11.0, 12.1)
Fetal Dis	1.042	0.020	2774	2.84 (2.69, 2.98)
Cord Compl	0.448	0.029	244	1.57 (1.45, 1.69)
Pre-term Labor	1.317	0.035	1440	3.73 (3.41, 4.08)
Hypertension	2.550	0.031	6616	12.81 (11.8, 13.9)
Amniotic Cmpl	1.886	0.028	4383	6.59 (6.13, 7.10)
Post-date	2.040	0.037	3098	7.69 (7.00, 8.45)
Other Indic	1.143	0.112	104	3.14 (2.35, 4.19)
MATERNAL AGE				
Age	-0.031	0.011	8.6	0.97 (0.94, 1.00)
Age*Age	0.00085	0.00019	19.8	1.001 (1.000, 1.001)
PAYMENT SOURCE				
Other Private				1.00*
Blue Cross	-0.062	0.033	3.5	0.94 (0.86, 1.02)
Other HMOs	-0.018	0.028	0.4	0.98 (0.91, 1.06)
Medi-Cal	-0.190	0.022	76	0.83 (0.78, 0.87)
Kaiser North	-0.575	0.037	237	0.56 (0.51, 0.62)
Kaiser South	-0.499	0.036	192	0.61 (0.55, 0.67)
Self-Pay	-0.419	0.028	217	0.66 (0.61, 0.71)
Other Payors	-0.426	0.043	96	0.65 (0.58, 0.73)
Indigent	-0.683	0.058	140	0.51 (0.44, 0.59)

* Reference category, odds ratio set equal to 1.00.

Figure 1: Cesarean Section Rates U.S. and California, 1970–1987

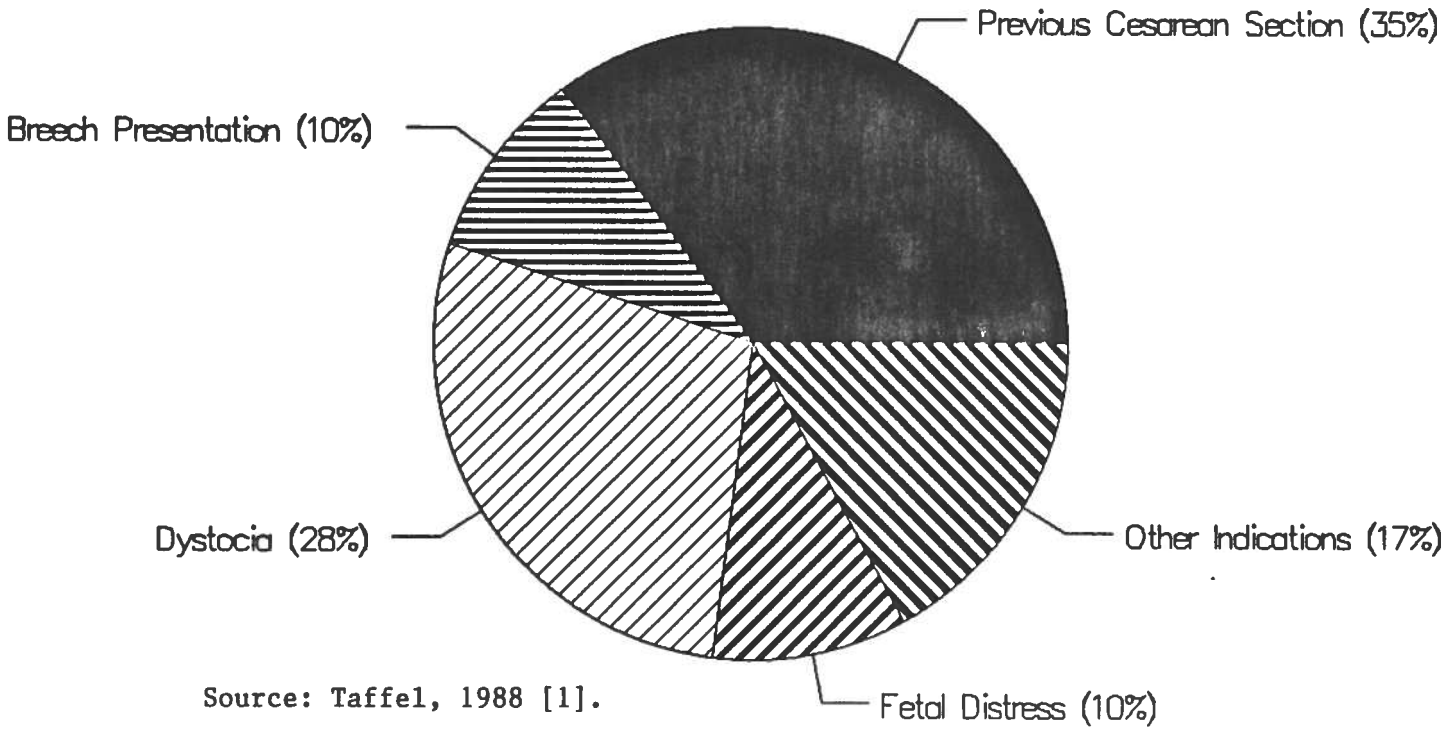


Sources:

Taffel, 1988 [1]

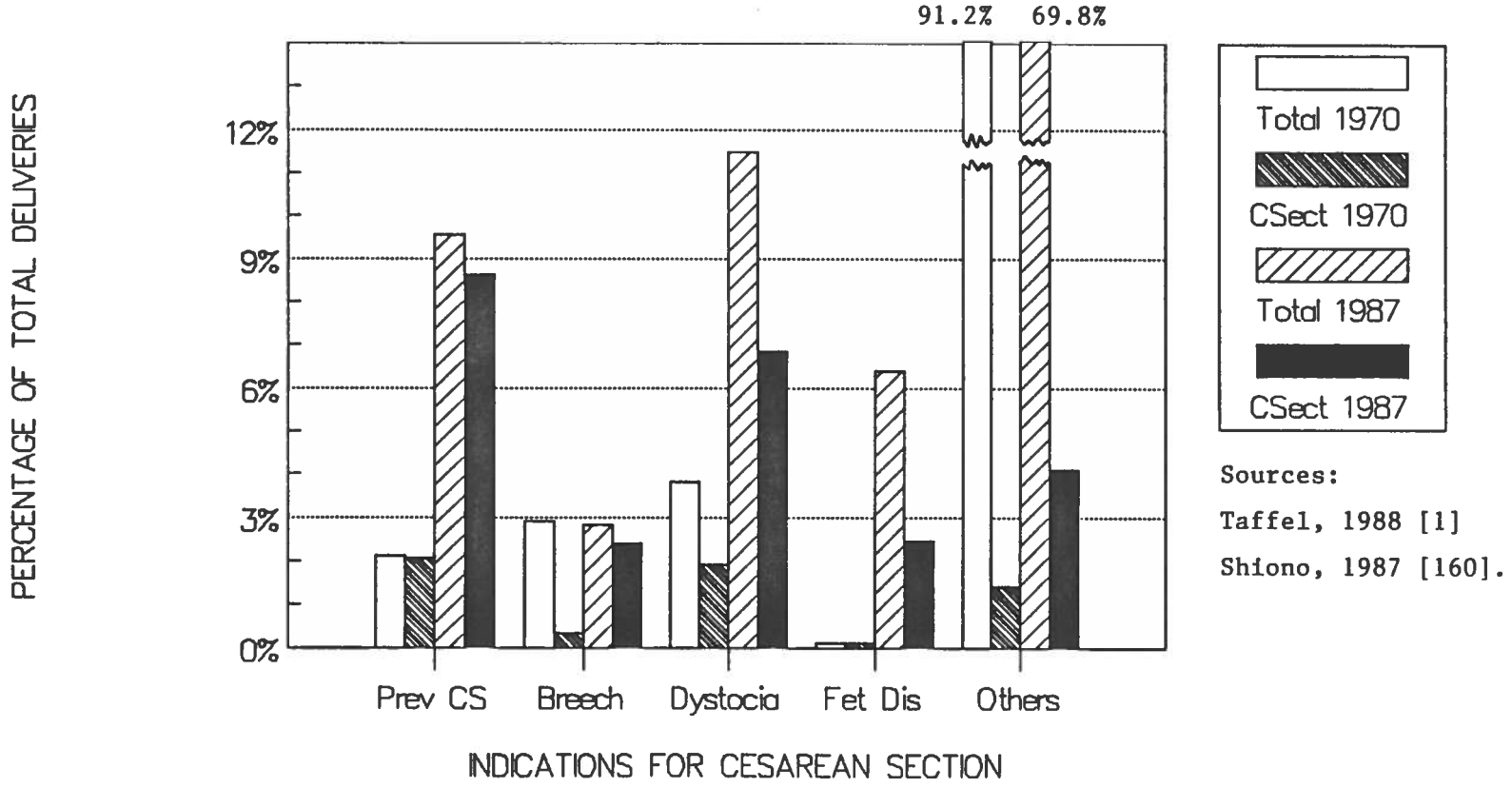
Dumbauld, 1988 [101].

Figure 2: Cesarean Sections by Primary Indication, U.S., 1987



Source: Taffel, 1988 [1].

Figure 3: Changing Indications for Cesarean Section, U.S., 1970–1987



Sources:

Taffel, 1988 [1]

Shiono, 1987 [160].

Figure 4: Cesarean Section Rates By Payor, Calif., Jan–June 1986

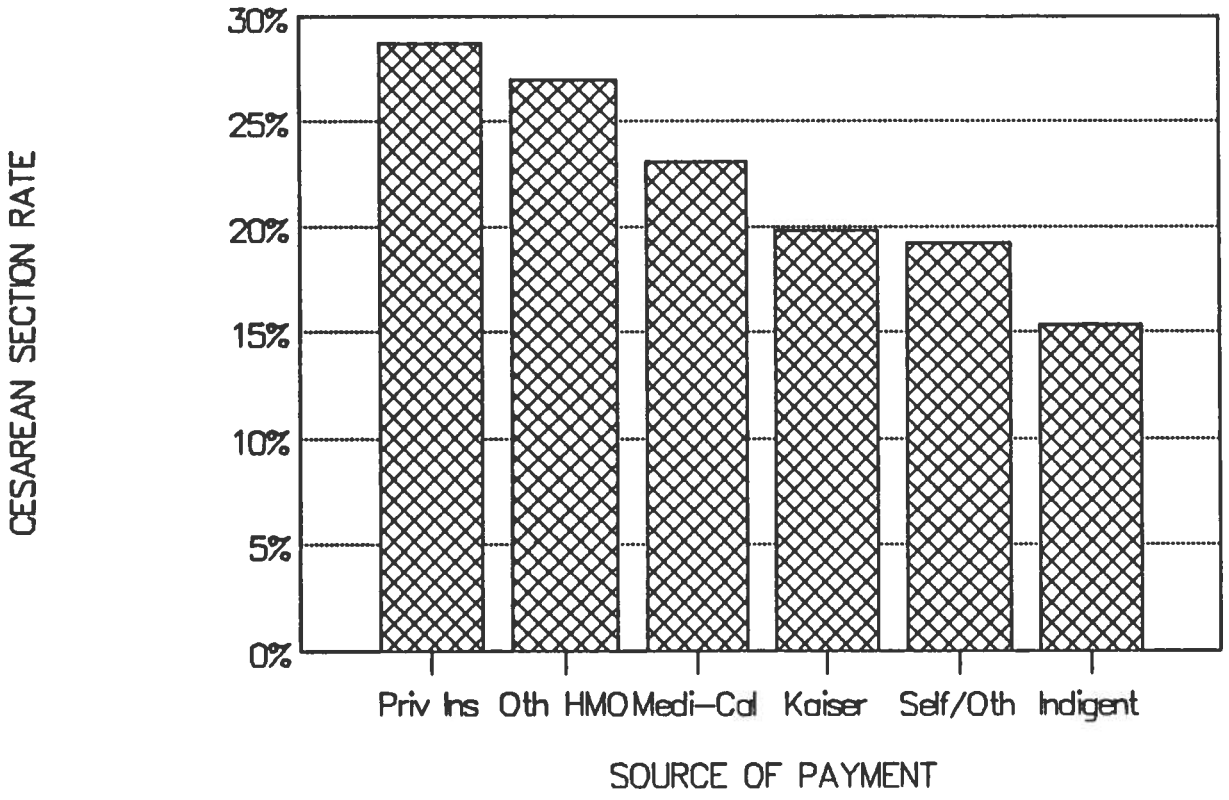


Figure 5: Deliveries by Payment Source
Calif. Hosp. Deliveries, Jan–June 1986

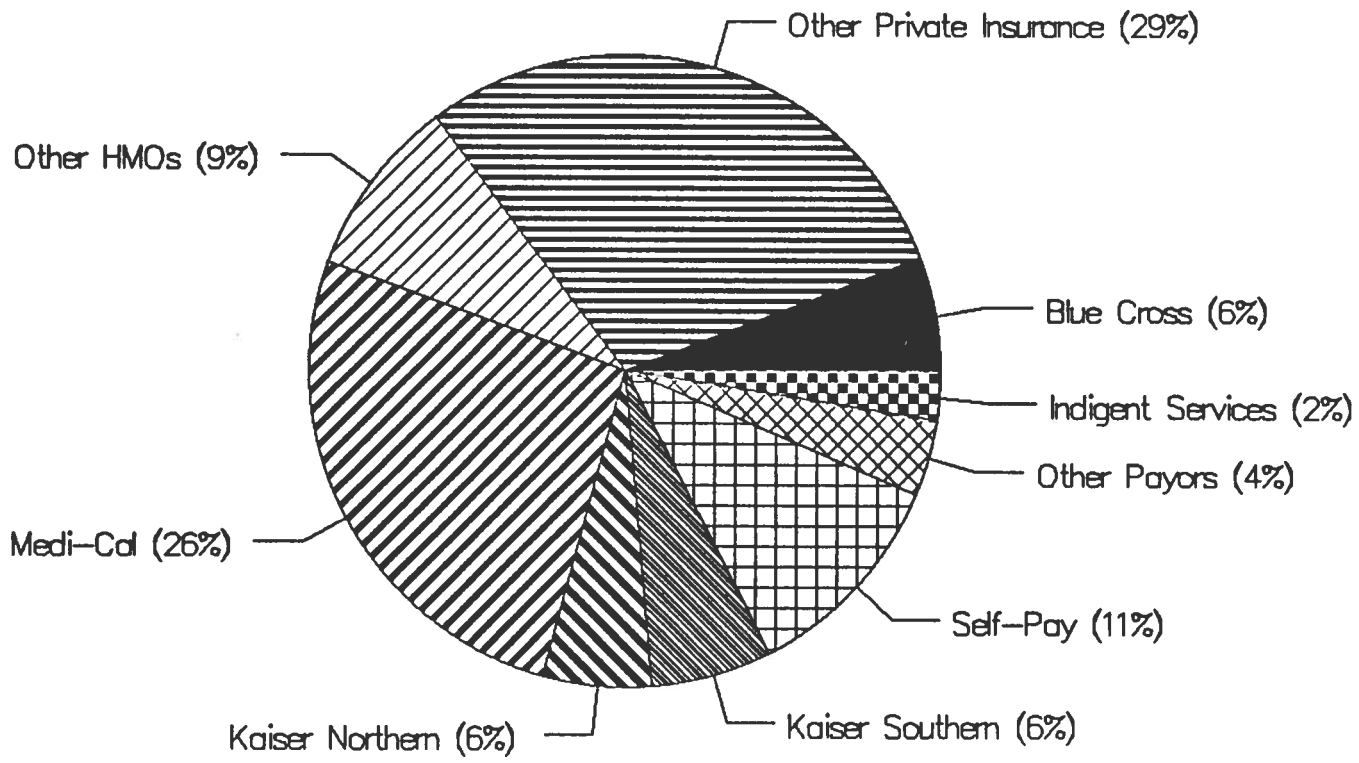


Figure 6: Deliveries by Primary Indication, Calif., Jan–June 1986

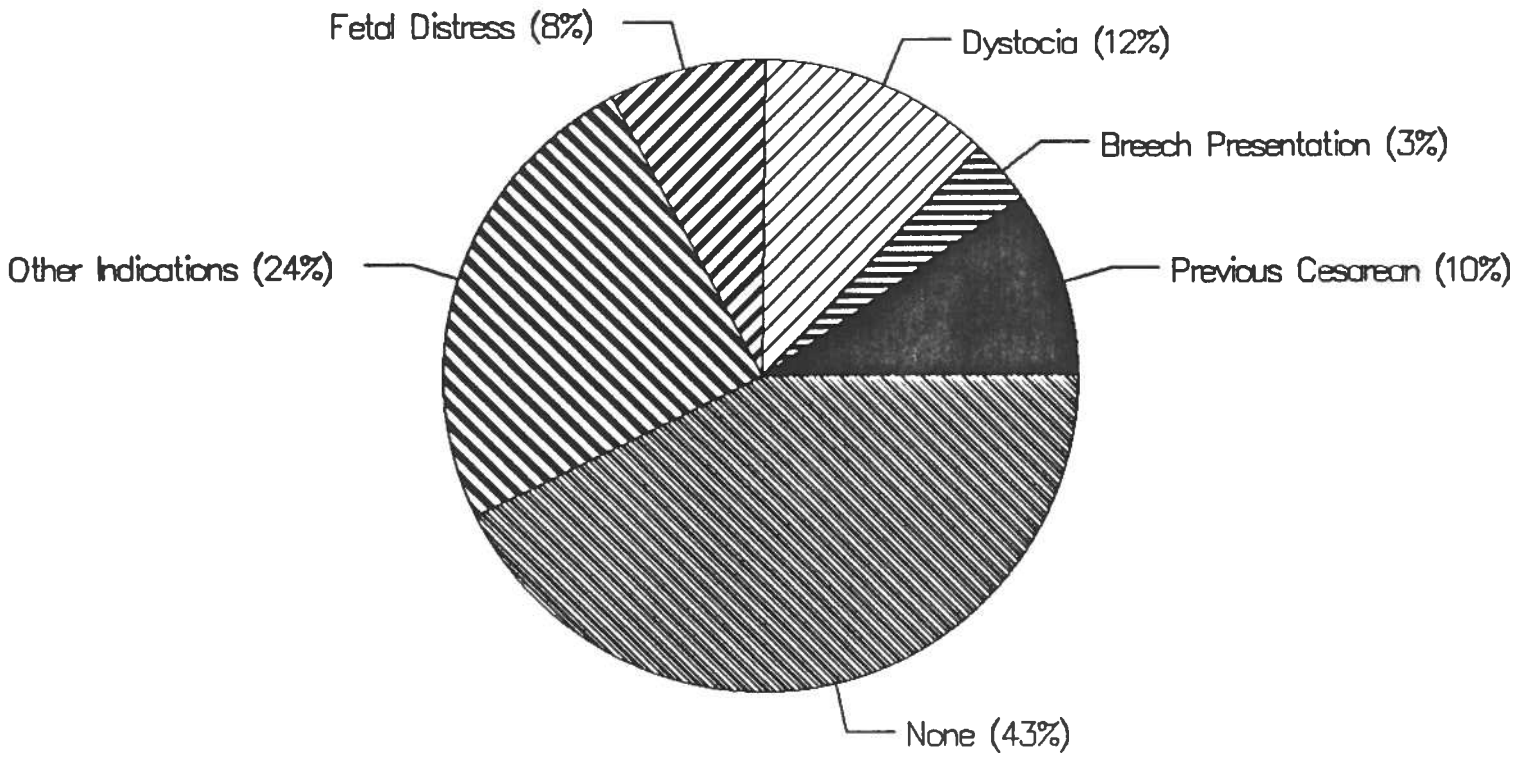


Figure 7: Cesarean Section Rates by Indication, Calif., Jan–June 1986

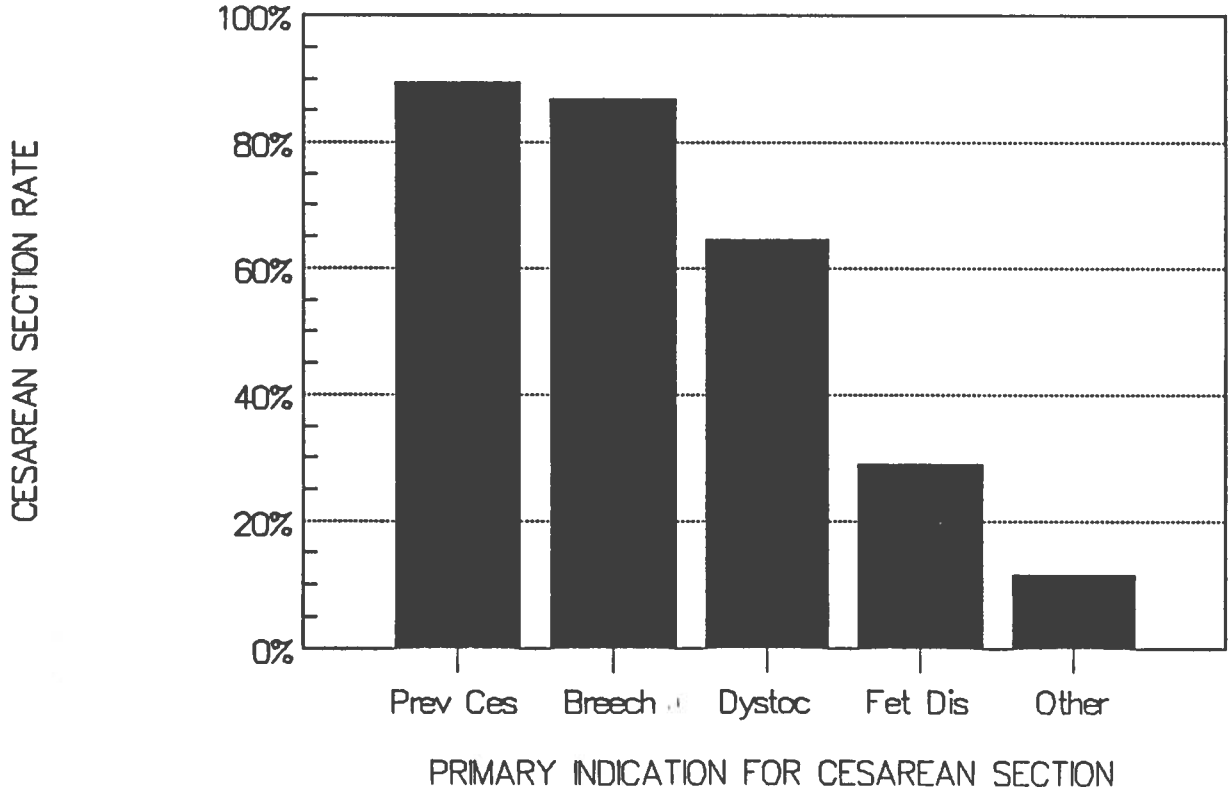


Figure 8: VBAC Rates by Payor

Calif. Hosp. Deliveries, Jan–June 1986

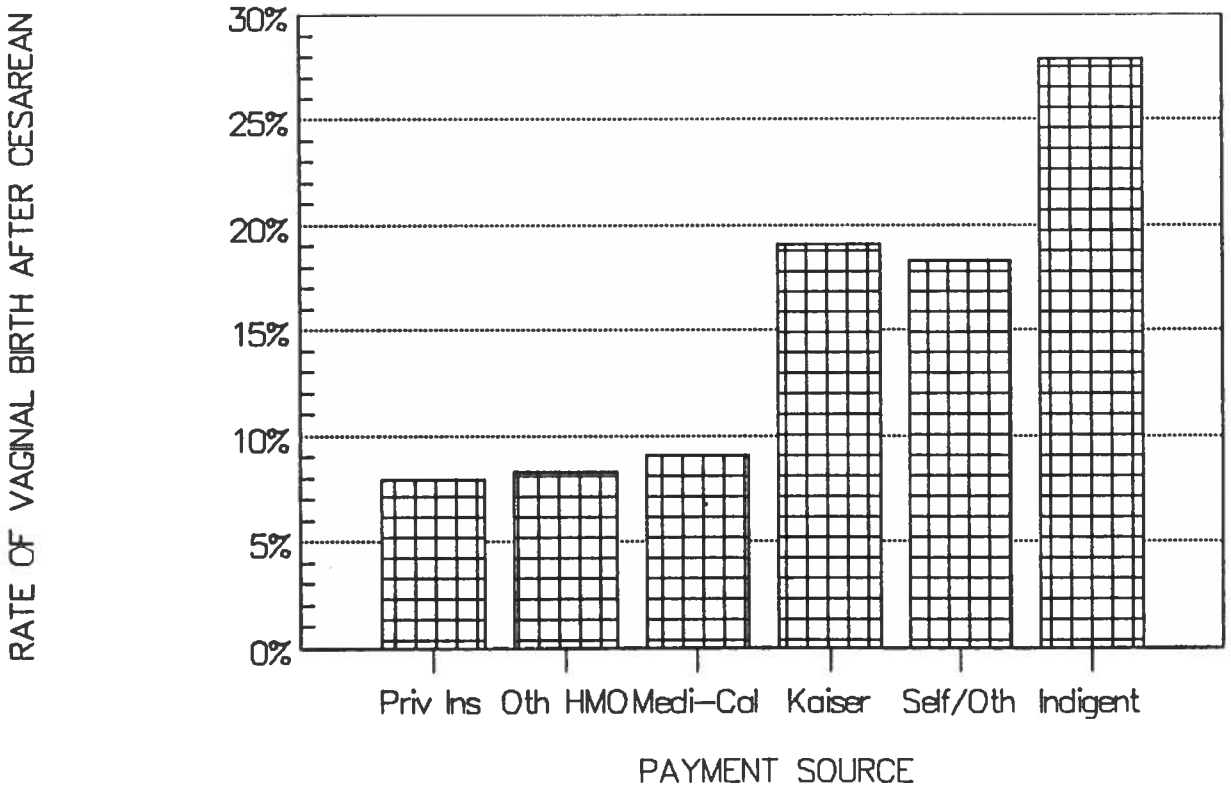


Figure 9: Deliveries by Age Group
Calif. Hosp. Deliveries, Jan–June 1986

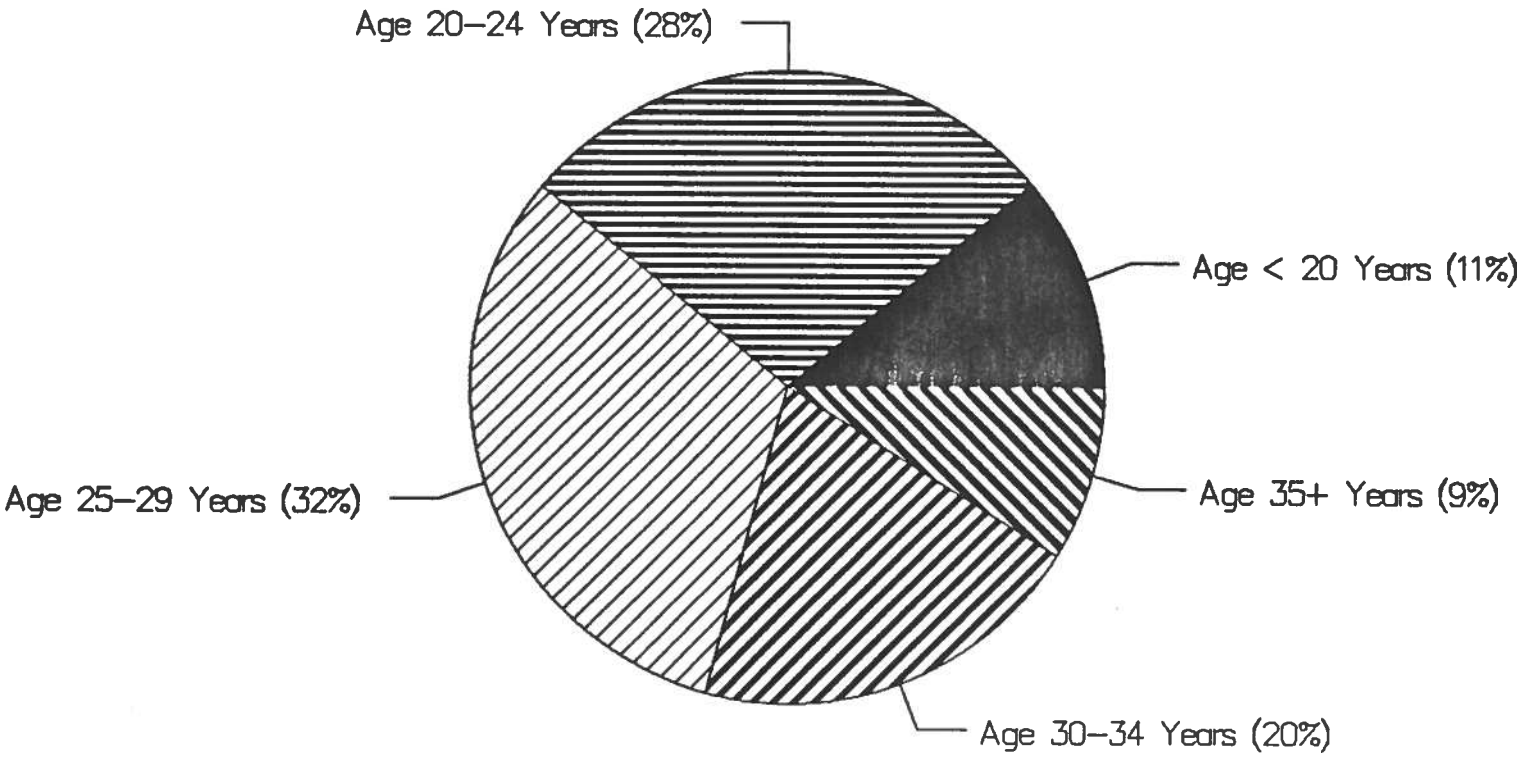


Figure 10: Cesarean Section Rates by Age Group, Calif., Jan–June 1986

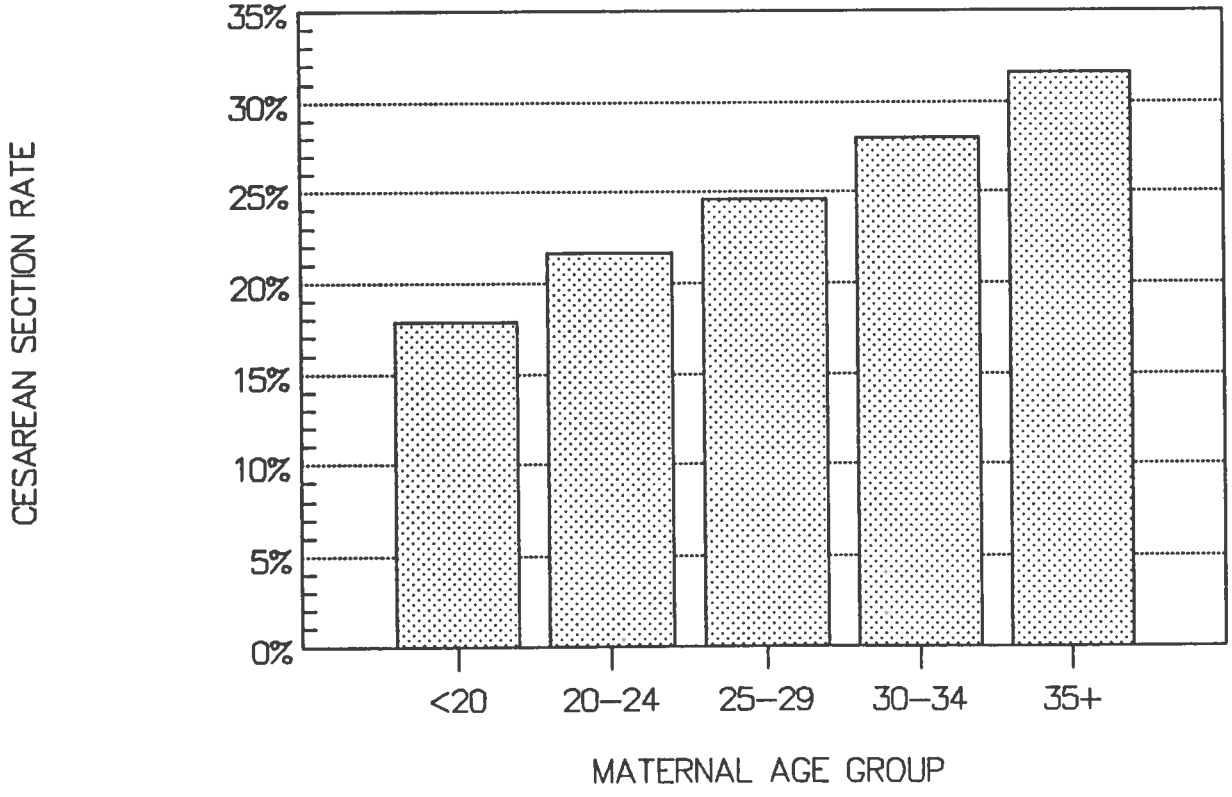


Figure 11: Deliveries by Race/Ethnicity
Calif. Hosp. Deliveries, Jan–June 1986

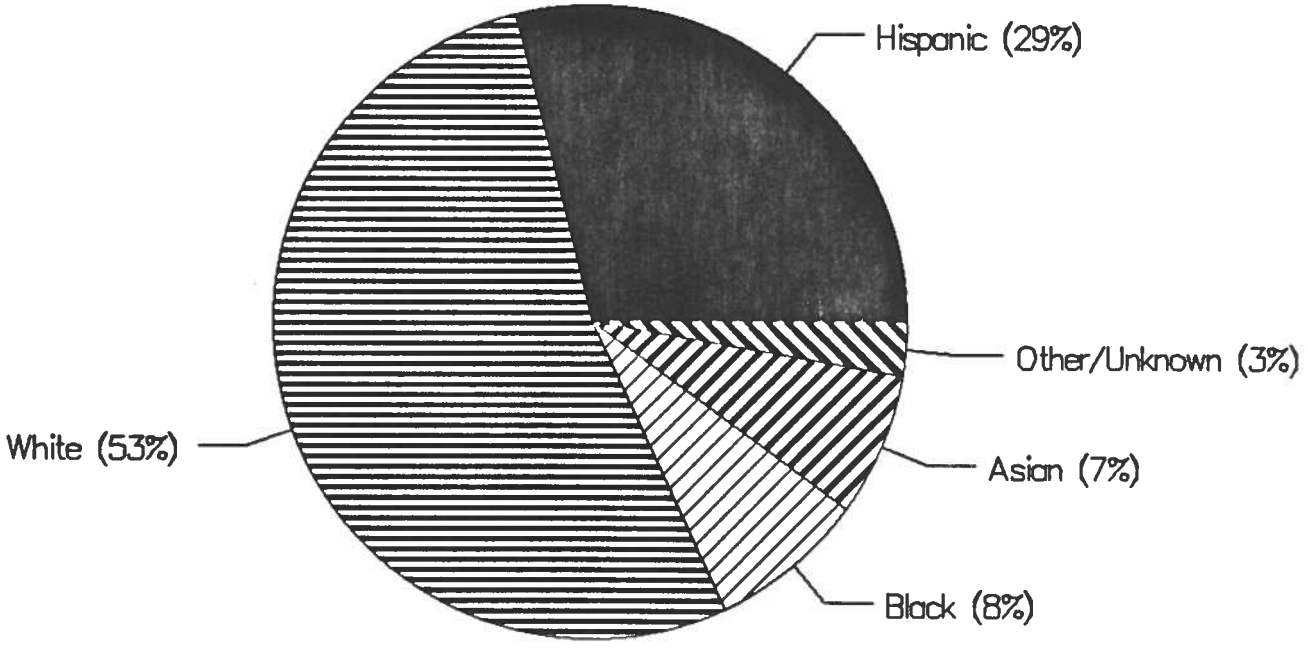


Figure 12: Cesarean Section Rates by Race/Ethnicity, Calif., Jan–June 1986

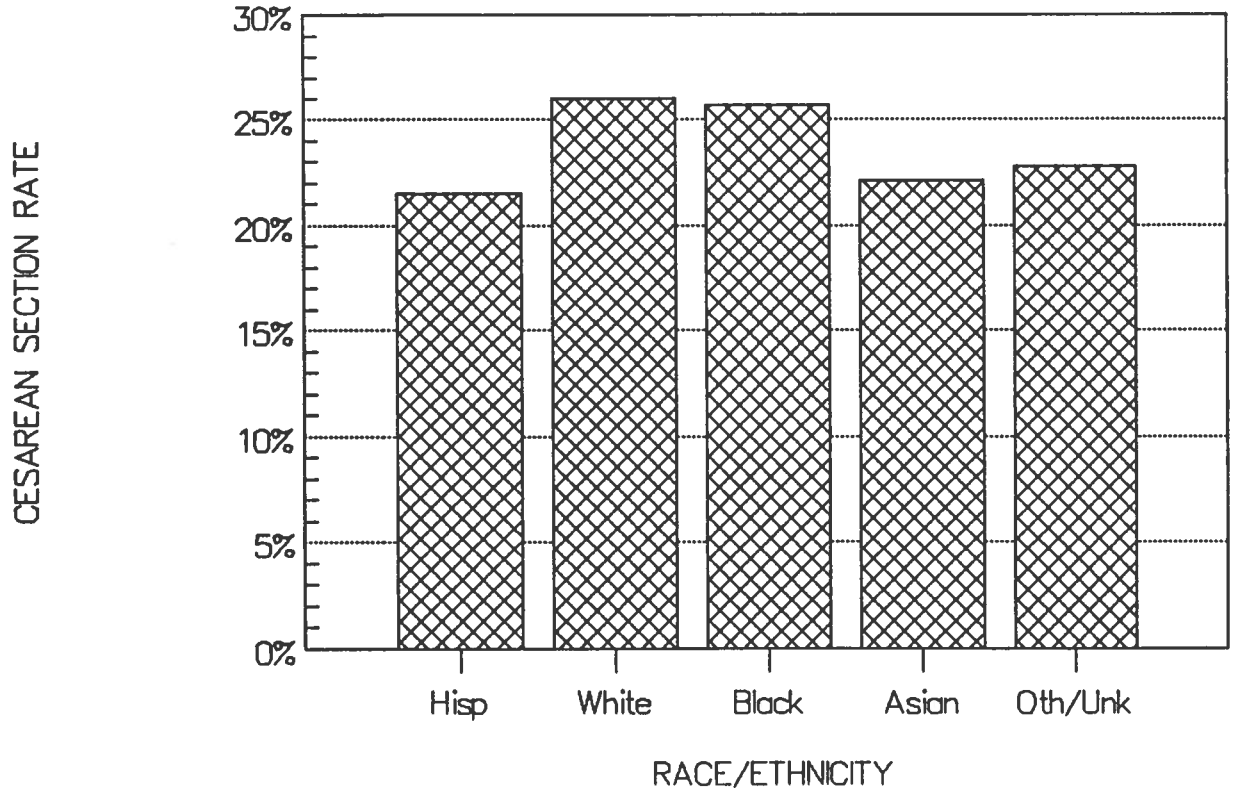


Figure 13: Excess in Cesarean Rates Due to Case-Mix and Practice Patterns

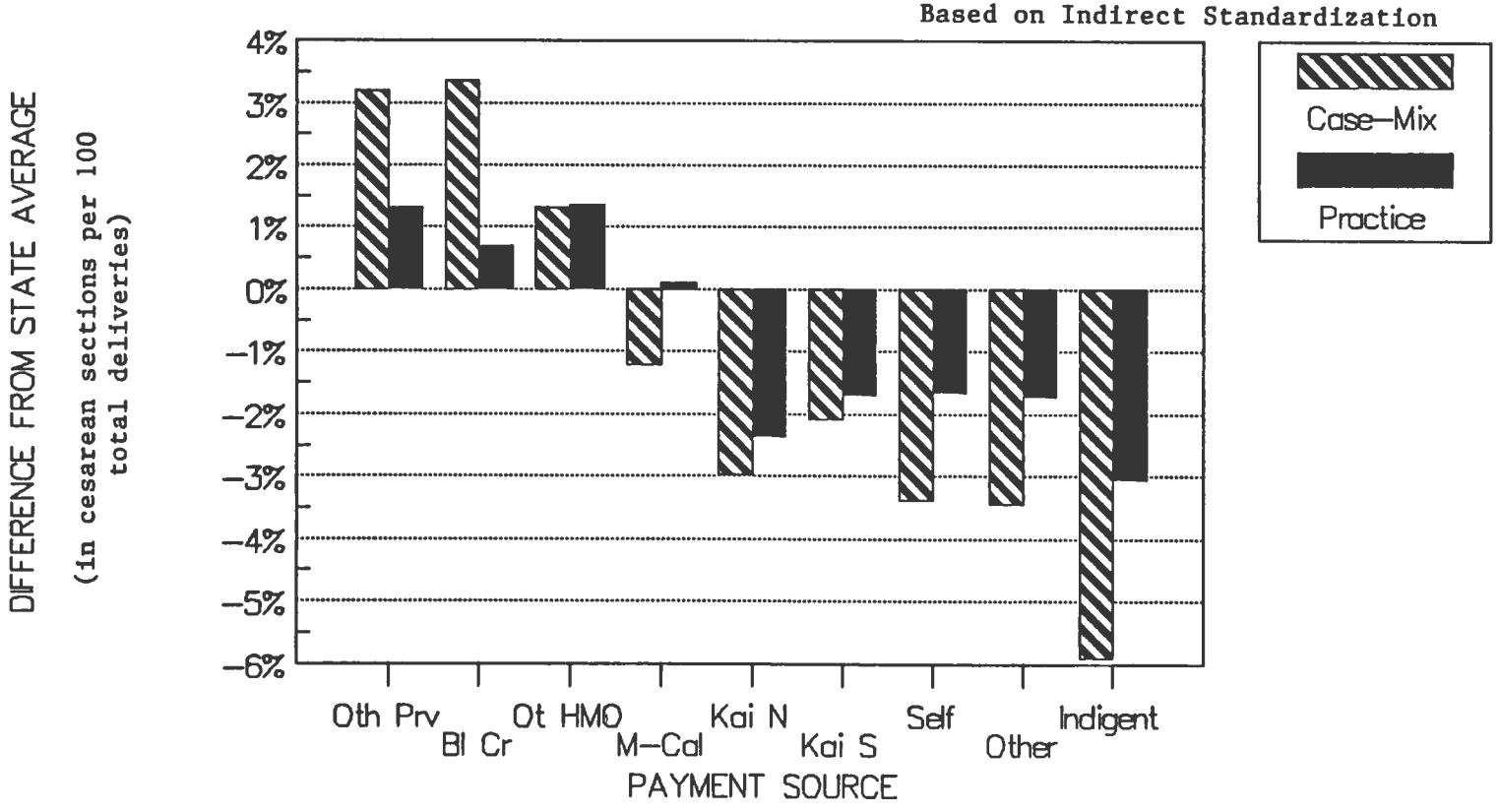
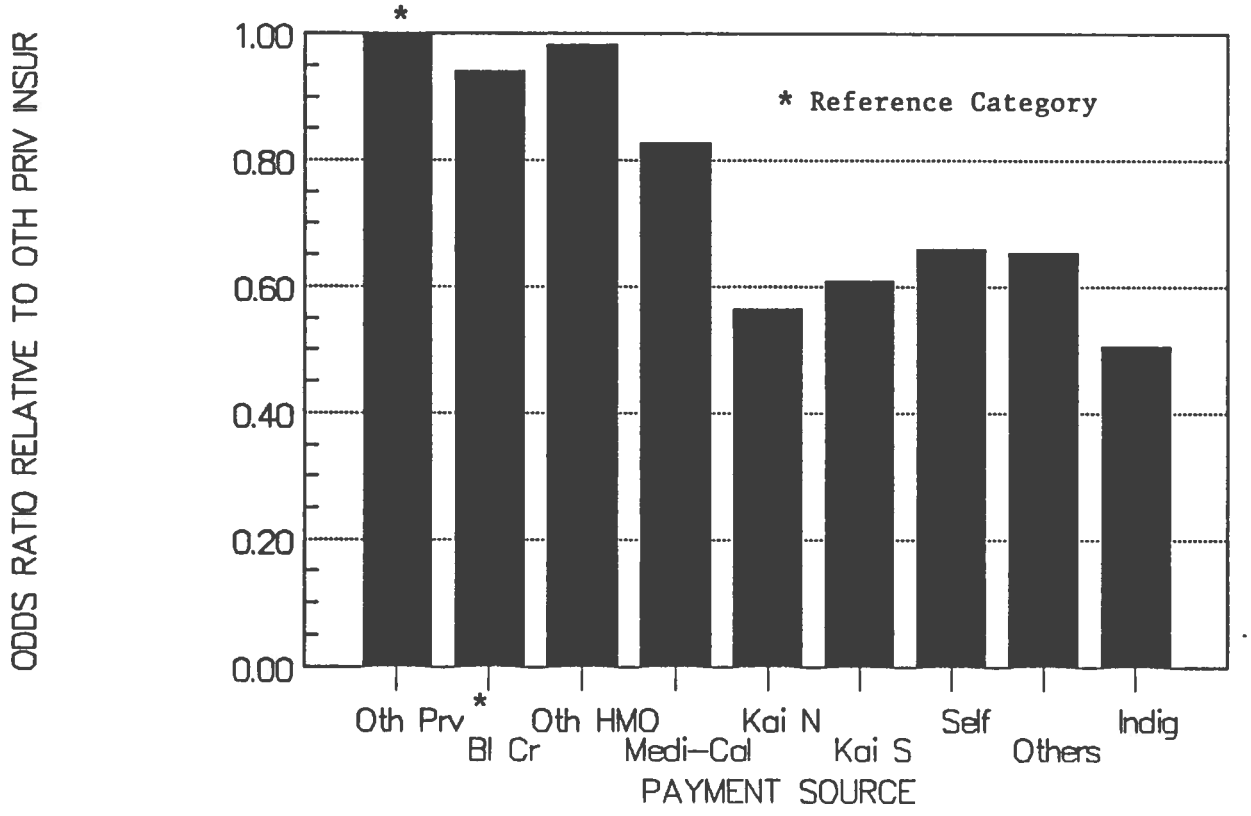


Figure 14: Logistic Regression Odds Ratios, Adjusted for Case-Mix



12:10 THURSDAY, DECEMBER 15, 1988

TOTAL

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																	
		< 20			20-24			25-29			30-34			35+			TOTAL		
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
PREV CS	MEDI_CAL	430	91.4	1.35	1998	91.3	0.63	1745	90.9	0.69	817	90.5	1.03	337	89.3	1.69	5327	90.9	0.39
	BL CROSS	3	100.0	0.00	139	89.2	2.64	527	92.4	1.15	521	91.2	1.24	264	90.5	1.81	1454	91.3	0.74
	OTH INSR	53	88.7	4.39	1058	93.2	0.77	2683	92.1	0.52	2549	91.6	0.55	1142	93.3	0.74	7485	92.2	0.31
	NKP HMO	39	92.3	4.32	417	94.0	1.16	784	90.9	1.03	679	92.2	1.03	273	89.4	1.87	2192	91.7	0.59
	SELF PAY	52	78.8	5.72	357	79.6	2.14	614	83.2	1.51	429	81.8	1.86	197	84.3	2.60	1649	82.0	0.95
	INDIGENT	19	68.4	10.96	110	67.3	4.49	95	74.7	4.48	71	74.6	5.20	45	75.6	6.48	340	72.1	2.44
	KP NCR	11	63.6	15.21	154	68.8	3.74	347	79.3	2.18	286	83.6	2.20	170	82.4	2.93	968	79.2	1.30
	KP SCR	19	84.2	8.59	190	76.3	3.09	412	79.9	1.98	366	85.5	1.84	170	87.6	2.53	1157	82.3	1.12
	OTHERS	22	81.8	8.42	188	76.1	3.12	226	81.9	2.57	105	83.8	3.61	51	88.2	4.56	592	80.9	1.62
	TOTAL	648	88.6	1.25	4611	88.5	0.47	7433	89.2	0.36	5823	89.6	0.40	2649	90.0	0.58	21164	89.2	0.21
BREECH	PAY SRCE																		
	MEDI_CAL	346	84.1	1.97	563	85.1	1.50	359	86.1	1.83	196	78.6	2.94	105	81.9	3.78	1569	84.1	0.92
	BL CROSS	12	100.0	0.00	67	91.0	3.51	181	91.7	2.05	136	84.6	3.11	78	82.1	4.37	474	88.2	1.48
	OTH INSR	52	84.6	5.05	409	91.2	1.40	807	90.7	1.02	628	87.1	1.34	293	85.0	2.09	2189	88.9	0.67
	NKP HMO	35	97.1	2.86	136	88.2	2.77	214	93.0	1.75	178	93.3	1.88	68	86.8	4.14	631	91.6	1.11
	SELF PAY	76	81.6	4.48	206	80.1	2.79	193	78.8	2.95	135	80.7	3.41	67	82.1	4.72	677	80.2	1.53
	INDIGENT	21	76.2	9.52	37	83.8	6.14	31	64.5	8.74	27	74.1	8.59	11	63.6	15.21	127	74.0	3.91
	KP NCR	24	91.7	5.76	79	91.4	3.22	123	91.1	2.58	103	88.3	3.18	49	89.8	4.37	378	90.2	1.53
	KP SCR	28	85.7	6.73	104	93.3	2.47	110	85.5	3.38	90	87.8	3.47	43	79.1	6.28	375	87.5	1.71
	OTHERS	38	84.2	5.99	79	84.8	4.06	57	87.7	4.39	44	81.8	5.88	12	91.7	8.33	230	85.2	2.35
	TOTAL	632	85.0	1.42	1680	87.2	0.82	2075	88.4	0.70	1537	85.7	0.89	726	83.9	1.37	6650	86.6	0.42

(CONTINUED)

TOTAL

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+						
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION				C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE		DELI	RATE	SE
PRM IND	PAY SRCE																			
DYSTOC	MEDI_CAL	1700	69.5	1.12	2320	64.8	0.99	1120	61.3	1.46	570	61.6	2.04	299	65.9	2.75		6009	65.2	0.61
	BL CROSS	57	64.9	6.38	354	69.2	2.46	730	61.5	1.80	541	62.3	2.09	253	63.6	3.03		1935	63.5	1.09
	OTH INSR	363	66.4	2.48	1943	68.0	1.06	3355	65.6	0.82	2285	65.4	1.00	927	68.2	1.53		8873	66.4	0.50
	NKP HMO	152	75.7	3.49	591	68.0	1.92	937	66.3	1.55	604	65.1	1.94	245	64.5	3.06		2529	66.8	0.94
	SELF PAY	341	61.9	2.63	804	64.3	1.69	818	62.5	1.69	479	58.0	2.26	238	63.0	3.14		2680	62.2	0.94
	INDIGENT	88	56.8	5.31	132	60.6	4.27	127	48.8	4.45	56	51.8	6.74	30	66.7	8.75		433	55.7	2.39
	KP NCR	100	61.0	4.90	303	53.1	2.87	426	56.1	2.41	344	50.3	2.70	146	54.1	4.14		1319	54.1	1.37
	KP SCR	124	65.3	4.29	328	65.5	2.63	452	58.6	2.32	310	57.7	2.81	136	69.9	3.95		1350	61.9	1.32
	OTHERS	152	67.8	3.80	375	62.9	2.50	202	61.4	3.43	118	72.0	4.15	52	61.5	6.81		899	64.5	1.60
	TOTAL	3077	67.6	0.84	7150	65.5	0.56	8167	63.2	0.53	5307	62.6	0.66	2326	65.5	0.99		26027	64.4	0.30
FET DIS	PAY SRCE																			
	MEDI_CAL	1343	25.4	1.19	1939	28.1	1.02	1108	25.5	1.31	621	29.3	1.83	308	29.2	2.60		5319	27.1	0.61
	BL CROSS	29	34.5	8.98	165	32.7	3.66	329	27.4	2.46	275	34.2	2.87	121	47.1	4.56		919	33.2	1.55
	OTH INSR	211	30.3	3.17	1099	31.9	1.41	1730	29.1	1.09	1200	31.0	1.34	525	39.6	2.14		4765	31.4	0.67
	NKP HMO	107	28.0	4.36	406	35.7	2.38	540	32.8	2.02	346	33.5	2.54	134	40.3	4.25		1533	34.1	1.21
	SELF PAY	306	23.2	2.42	644	25.9	1.73	575	24.2	1.79	374	26.5	2.28	180	32.2	3.49		2079	25.7	0.96
	INDIGENT	91	22.0	4.36	203	20.2	2.82	152	19.1	3.20	83	28.9	5.01	48	43.8	7.24		577	23.4	1.76
	KP NCR	88	26.1	4.71	198	27.8	3.19	298	25.2	2.52	235	25.5	2.85	127	37.8	4.32		946	27.6	1.45
	KP SCR	108	35.2	4.62	280	28.6	2.70	338	20.4	2.20	264	23.1	2.60	125	33.6	4.24		1115	26.0	1.31
	OTHERS	113	19.5	3.74	217	27.2	3.03	149	27.5	3.67	83	24.1	4.72	35	45.7	8.54		597	26.5	1.81
	TOTAL	2396	25.8	0.89	5151	29.0	0.63	5219	26.9	0.61	3481	29.5	0.77	1603	37.1	1.21		17850	28.8	0.34

(CONTINUED)

TOTAL

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																	
		< 20			20-24			25-29			30-34			35+			TOTAL		
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
OTH COM	MEDI_CAL	3546	9.2	0.48	5385	9.8	0.41	3320	11.6	0.56	1751	13.9	0.83	882	15.8	1.23	14884	10.9	0.26
	BL CROSS	85	10.6	3.36	538	10.2	1.31	1185	12.1	0.95	955	14.9	1.15	422	20.4	1.96	3185	13.7	0.61
	OTH INSR	653	10.9	1.22	3349	11.1	0.54	5604	13.2	0.45	3991	15.8	0.58	1664	19.8	0.98	15261	14.0	0.28
	NKP HMO	296	8.8	1.65	1082	10.1	0.92	1625	13.8	0.86	1067	14.5	1.08	423	16.8	1.82	4493	13.0	0.50
	SELF PAY	730	5.3	0.83	1829	6.7	0.58	1672	9.1	0.70	1063	9.7	0.91	538	14.3	1.51	5832	8.5	0.36
	INDIGENT	247	5.7	1.47	485	5.4	1.02	371	9.7	1.54	193	6.7	1.81	107	14.0	3.37	1403	7.4	0.70
	KP NCR	201	6.5	1.74	607	6.8	1.02	787	10.3	1.08	564	12.8	1.41	266	15.4	2.22	2425	10.2	0.62
	KP SCR	267	6.7	1.54	633	6.5	0.98	899	10.6	1.03	585	12.0	1.34	345	12.8	1.80	2729	9.8	0.57
	OTHERS	447	4.9	1.02	927	6.3	0.80	713	7.2	0.97	337	10.7	1.69	153	13.1	2.73	2577	7.3	0.51
	TOTAL	6472	8.3	0.34	14835	9.1	0.24	16176	11.8	0.25	10506	13.9	0.34	4800	17.1	0.54	52789	11.5	0.14
NO COMP	PAY SRCE																		
	MEDI_CAL	5791	0.1	0.04	9125	0.2	0.05	5506	0.1	0.05	2475	0.3	0.11	1058	0.3	0.16	23955	0.2	0.03
	BL CROSS	146	0.0	0.00	921	0.2	0.15	1992	0.4	0.13	1565	0.3	0.13	572	0.2	0.17	5196	0.3	0.07
	OTH INSR	1024	0.0	0.00	5925	0.2	0.05	9868	0.2	0.05	6353	0.3	0.06	2254	0.4	0.13	25424	0.2	0.03
	NKP HMO	683	0.0	0.00	2374	0.2	0.09	3153	0.2	0.08	1791	0.2	0.10	666	0.3	0.21	8667	0.2	0.05
	SELF PAY	1371	0.1	0.10	3587	0.2	0.07	3419	0.1	0.05	1916	0.2	0.10	733	0.1	0.14	11026	0.1	0.04
	INDIGENT	431	0.0	0.00	902	0.0	0.00	681	0.1	0.15	316	0.0	0.00	145	0.7	0.69	2475	0.1	0.06
	KP NCR	483	0.0	0.00	1591	0.1	0.06	2196	0.0	0.05	1437	0.1	0.10	580	0.3	0.24	6287	0.1	0.04
	KP SCR	676	0.3	0.21	1617	0.2	0.11	2113	0.2	0.09	1357	0.2	0.13	605	0.2	0.17	6368	0.2	0.06
	OTHERS	536	0.0	0.00	1364	0.1	0.07	1005	0.0	0.00	437	0.2	0.23	148	0.7	0.68	3490	0.1	0.05
	TOTAL	11141	0.1	0.03	27406	0.2	0.02	29933	0.2	0.02	17647	0.2	0.04	6761	0.3	0.07	92888	0.2	0.01

(CONTINUED)

TOTAL

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																	
		< 20			20-24			25-29			30-34			35+			TOTAL		
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
TOTAL	PAY SRCE																		
	MEDI_CAL	13156	19.3	0.34	21330	23.0	0.29	13158	24.7	0.38	6430	26.1	0.55	2989	27.3	0.82	57063	23.1	0.18
	BL CROSS	332	21.4	2.25	2184	24.8	0.92	4944	27.1	0.63	3993	29.2	0.72	1710	35.6	1.16	13163	28.3	0.39
	OTH INSR	2356	19.8	0.82	13783	24.8	0.37	24047	27.7	0.29	17006	31.7	0.36	6805	36.6	0.58	63997	28.8	0.18
	NKP HMO	1312	18.4	1.07	5006	23.4	0.60	7253	26.8	0.52	4665	31.3	0.68	1809	32.5	1.10	20045	27.0	0.31
	SELF PAY	2876	14.8	0.66	7427	17.0	0.44	7291	20.1	0.47	4396	21.5	0.62	1953	26.0	0.99	23943	19.2	0.25
	INDIGENT	897	12.6	1.11	1869	13.5	0.79	1457	15.0	0.94	746	18.6	1.43	386	25.4	2.22	5355	15.3	0.49
	KP NCR	907	13.9	1.15	2932	14.9	0.66	4177	18.7	0.60	2969	21.5	0.75	1338	26.5	1.21	12323	19.0	0.35
	KP SCR	1222	14.6	1.01	3152	18.4	0.69	4324	19.8	0.61	2972	23.7	0.78	1424	25.6	1.16	13094	20.5	0.35
	OTHERS	1308	15.1	0.99	3150	17.9	0.68	2352	19.2	0.81	1124	23.7	1.27	451	27.7	2.11	8385	19.1	0.43
	TOTAL	24366	17.9	0.25	60833	21.6	0.17	69003	24.6	0.16	44301	28.0	0.21	18865	31.6	0.34	217E3	24.3	0.09

RACE/ETHNICITY HISPAN

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
PREV CS	MEDI_CAL	150	88.0	2.66	660	86.1	1.35	563	87.2	1.41	319	88.1	1.82	157	86.0	2.78	1849	86.9	0.78
	BL CROSS	2	100.0	0.00	22	100.0	0.00	72	95.8	2.37	54	98.1	1.85	23	95.7	4.35	173	97.1	1.28
	OTH INSR	17	100.0	0.00	322	92.5	1.47	575	94.1	0.98	398	94.5	1.15	218	96.8	1.20	1530	94.3	0.59
	NKP HMO	15	86.7	9.09	144	93.8	2.02	173	90.2	2.27	148	95.3	1.75	53	94.3	3.20	533	92.9	1.12
	SELF PAY	30	80.0	7.43	196	74.5	3.12	295	79.0	2.38	185	76.2	3.14	105	83.8	3.61	811	77.9	1.46
	INDIGENT	18	66.7	11.43	97	66.0	4.84	85	72.9	4.85	63	73.0	5.64	41	75.6	6.79	304	70.7	2.61
	KP NCR	3	66.7	33.33	26	65.4	9.51	45	84.4	5.46	33	84.8	6.34	25	88.0	6.63	132	81.1	3.42
	KP SCR	5	80.0	20.00	57	80.7	5.27	114	78.1	3.89	95	87.4	3.43	44	90.9	4.38	315	83.2	2.11
	OTHERS	14	71.4	12.53	66	66.7	5.85	103	73.8	4.35	40	75.0	6.93	18	83.3	9.04	241	72.6	2.88
	TOTAL	254	85.0	2.24	1590	84.3	0.91	2025	86.7	0.76	1335	88.3	0.88	684	89.8	1.16	5888	86.7	0.44
BREECH	PAY SRCE																		
	MEDI_CAL	119	77.3	3.86	168	81.0	3.04	102	84.3	3.62	67	79.1	5.00	38	76.3	6.99	494	80.2	1.80
	BL CROSS	1	100.0	.	11	90.9	9.09	21	90.5	6.56	8	75.0	16.37	7	57.1	20.20	48	83.3	5.44
	OTH INSR	17	88.2	8.05	86	88.4	3.48	107	84.1	3.55	75	81.3	4.53	46	76.1	6.36	331	83.7	2.03
	NKP HMO	17	94.1	5.88	44	86.4	5.23	41	85.4	5.59	30	90.0	5.57	10	80.0	13.33	142	87.3	2.80
	SELF PAY	41	68.3	7.36	107	83.2	3.63	82	74.4	4.85	48	75.0	6.32	31	93.5	4.49	309	78.6	2.34
	INDIGENT	19	78.9	9.61	31	80.6	7.21	24	54.2	10.39	19	68.4	10.96	10	60.0	16.33	103	69.9	4.54
	KP NCR	2	50.0	50.00	13	92.3	7.69	8	100.0	0.00	8	100.0	0.00	5	100.0	0.00	36	94.4	3.87
	KP SCR	8	75.0	16.37	32	87.5	5.94	28	96.4	3.57	21	71.4	10.10	12	91.7	8.33	101	86.1	3.46
	OTHERS	14	92.9	7.14	34	82.4	6.64	23	78.3	8.79	18	77.8	10.08	6	100.0	0.00	95	83.2	3.86
	TOTAL	238	78.6	2.67	526	84.0	1.60	436	81.9	1.85	294	79.3	2.37	165	80.6	3.09	1659	81.5	0.95

(CONTINUED)

RACE/ETHNICITY HISPAN

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																		
		< 20			20-24			25-29			30-34			35+			TOTAL		
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
DYSTOC	MEDI_CAL	560	71.8	1.90	662	68.1	1.81	309	62.8	2.75	169	65.7	3.66	110	69.1	4.43	1810	68.2	1.10
	BL CROSS	18	77.8	10.08	55	74.5	5.93	74	74.3	5.11	36	61.1	8.24	14	64.3	13.29	197	71.6	3.22
	OTH INSR	128	68.8	4.11	445	73.3	2.10	486	69.5	2.09	290	69.7	2.70	140	72.9	3.77	1489	70.9	1.18
	NKP HMO	57	82.5	5.08	150	79.3	3.32	148	70.3	3.77	64	71.9	5.66	45	82.2	5.76	464	76.1	1.98
	SELF PAY	205	62.0	3.40	386	66.8	2.40	295	62.0	2.83	168	61.3	3.77	93	61.3	5.08	1147	63.5	1.42
	INDIGENT	80	57.5	5.56	120	60.8	4.47	106	50.0	4.88	48	52.1	7.29	27	63.0	9.47	381	56.2	2.55
	KP NCR	16	62.5	12.50	52	48.1	7.00	46	54.3	7.43	46	47.8	7.45	8	75.0	16.37	168	52.4	3.86
	KP SCR	39	64.1	7.78	100	67.0	4.73	101	61.4	4.87	71	54.9	5.95	31	67.7	8.53	342	62.6	2.62
	OTHERS	71	66.2	5.65	162	61.1	3.84	88	68.2	4.99	40	67.5	7.50	17	52.9	12.48	378	64.0	2.47
	TOTAL	1174	68.7	1.35	2132	68.4	1.01	1653	65.0	1.17	932	64.1	1.57	485	68.9	2.10	6376	67.0	0.59
FET DIS	PAY SRCE																		
	MEDI_CAL	431	26.2	2.12	539	24.5	1.85	329	24.0	2.36	189	23.8	3.11	96	22.9	4.31	1584	24.7	1.08
	BL CROSS	6	16.7	16.67	24	33.3	9.83	24	37.5	10.09	16	50.0	12.91	11	36.4	15.21	81	37.0	5.40
	OTH INSR	83	25.3	4.80	257	38.1	3.04	292	33.9	2.78	166	33.1	3.66	89	51.7	5.33	887	36.0	1.61
	NKP HMO	36	25.0	7.32	124	33.9	4.27	100	28.0	4.51	66	33.3	5.85	30	40.0	9.10	356	31.7	2.47
	SELF PAY	168	23.2	3.27	363	24.2	2.25	257	24.5	2.69	171	28.1	3.45	76	32.9	5.43	1035	25.4	1.35
	INDIGENT	79	19.0	4.44	184	19.6	2.93	133	20.3	3.50	73	27.4	5.26	41	41.5	7.79	510	22.5	1.85
	KP NCR	16	18.8	10.08	32	18.8	7.01	33	3.0	3.03	27	14.8	6.97	16	25.0	11.18	124	14.5	3.18
	KP SCR	30	30.0	8.51	56	26.8	5.97	75	22.7	4.87	49	20.4	5.82	29	34.5	8.98	239	25.5	2.83
	OTHERS	61	14.8	4.58	103	25.2	4.30	62	32.3	5.99	39	17.9	6.23	10	30.0	15.28	275	23.6	2.57
	TOTAL	910	24.1	1.42	1682	26.8	1.08	1305	26.3	1.22	796	27.5	1.58	398	35.9	2.41	5091	27.0	0.62

(CONTINUED)

RACE/ETHNICITY HISPAN

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																		
		< 20			20-24			25-29			30-34			35+			TOTAL		
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
OTH COM	MEDI_CAL	1346	8.5	0.76	1758	7.3	0.62	1055	9.6	0.91	629	13.2	1.35	355	16.1	1.95	5143	9.4	0.41
	BL CROSS	17	5.9	5.88	92	8.7	2.95	113	15.9	3.46	71	22.5	4.99	43	16.3	5.70	336	14.9	1.94
	OTH INSR	196	10.2	2.17	788	8.9	1.01	907	11.4	1.05	575	15.1	1.50	313	20.4	2.28	2779	12.4	0.62
	NKP HMO	93	8.6	2.92	272	9.2	1.75	289	18.3	2.28	171	14.6	2.71	77	20.8	4.65	902	14.1	1.16
	SELF PAY	409	6.8	1.25	910	5.2	0.73	734	7.2	0.96	435	10.8	1.49	250	12.4	2.09	2738	7.5	0.50
	INDIGENT	212	5.7	1.59	426	5.2	1.07	320	10.0	1.68	158	7.0	2.03	100	13.0	3.38	1216	7.4	0.75
	KP NCR	40	7.5	4.22	86	1.2	1.16	107	14.0	3.37	59	8.5	3.66	32	9.4	5.24	324	8.3	1.54
	KP SCR	70	7.1	3.10	160	3.8	1.51	197	12.7	2.38	136	12.5	2.85	95	7.4	2.69	658	9.1	1.12
	OTHERS	267	4.1	1.22	464	4.1	0.92	368	4.6	1.10	171	9.4	2.23	78	7.7	3.04	1348	5.1	0.60
	TOTAL	2650	7.6	0.52	4956	6.6	0.35	4090	10.2	0.47	2405	12.8	0.68	1343	15.2	0.98	15444	9.4	0.24
NO COMP	PAY SRCE																		
	MEDI_CAL	2223	0.2	0.10	3246	0.2	0.08	1905	0.1	0.07	837	0.2	0.17	410	0.2	0.24	8621	0.2	0.05
	BL CROSS	36	0.0	0.00	172	0.0	0.00	219	1.4	0.79	137	0.7	0.73	64	0.0	0.00	628	0.6	0.32
	OTH INSR	398	0.0	0.00	1661	0.1	0.09	1893	0.2	0.11	1009	0.2	0.14	423	0.5	0.33	5384	0.2	0.06
	NKP HMO	232	0.0	0.00	736	0.3	0.19	675	0.0	0.00	362	0.8	0.48	159	0.0	0.00	2164	0.2	0.10
	SELF PAY	832	0.2	0.17	1980	0.3	0.11	1563	0.1	0.06	832	0.2	0.17	344	0.0	0.00	5551	0.2	0.06
	INDIGENT	378	0.0	0.00	813	0.0	0.00	613	0.2	0.16	278	0.0	0.00	129	0.0	0.00	2211	0.0	0.05
	KP NCR	87	0.0	0.00	215	0.0	0.00	248	0.4	0.40	151	0.7	0.66	45	0.0	0.00	746	0.3	0.19
	KP SCR	193	0.5	0.52	469	0.0	0.00	553	0.2	0.18	336	0.0	0.00	173	0.0	0.00	1724	0.1	0.08
	OTHERS	323	0.0	0.00	730	0.0	0.00	496	0.0	0.00	188	0.0	0.00	63	0.0	0.00	1800	0.0	0.00
	TOTAL	4702	0.2	0.06	10022	0.1	0.04	8165	0.2	0.04	4130	0.3	0.08	1810	0.2	0.10	28829	0.2	0.02

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RACE/ETHNICITY HISPAN

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
TOTAL	PAY SRCE																		
	MEDI_CAL	4829	17.8	0.55	7033	20.2	0.48	4263	22.4	0.64	2210	26.0	0.93	1166	27.4	1.31	19501	21.2	0.29
	BL CROSS	80	23.8	4.79	376	23.7	2.19	523	33.1	2.06	322	32.9	2.62	162	28.4	3.55	1463	29.6	1.19
	OTH INSR	839	19.2	1.36	3559	24.4	0.72	4260	27.6	0.68	2513	31.2	0.92	1229	37.4	1.38	12400	27.8	0.40
	NKP HMO	450	20.7	1.91	1470	24.6	1.12	1426	26.4	1.17	841	31.4	1.60	374	32.9	2.43	4561	26.7	0.65
	SELF PAY	1685	14.7	0.86	3942	16.1	0.58	3226	18.4	0.68	1839	20.5	0.94	899	25.6	1.46	11591	18.0	0.36
	INDIGENT	786	12.7	1.19	1671	13.2	0.83	1281	14.7	0.99	639	18.0	1.52	348	24.1	2.30	4725	15.0	0.52
	KP NCR	164	11.6	2.51	424	14.4	1.71	487	18.1	1.75	324	21.0	2.27	131	30.5	4.04	1530	18.0	0.98
	KP SCR	345	14.5	1.90	874	18.5	1.32	1068	20.7	1.24	708	23.2	1.59	384	23.2	2.16	3379	20.3	0.69
	OTHERS	750	12.0	1.19	1559	13.9	0.88	1140	16.8	1.11	496	19.0	1.76	192	20.3	2.91	4137	15.2	0.56
	TOTAL	9928	16.5	0.37	20908	19.3	0.27	17674	22.4	0.31	9892	25.7	0.44	4885	29.3	0.65	63287	21.5	0.16

RACE/ETHNICITY WHITE

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
PREV CS	MEDI_CAL	170	95.9	1.53	900	94.0	0.79	756	92.3	0.97	290	92.4	1.56	94	91.5	2.89	2210	93.3	0.53
	BL CROSS	.	.	.	104	87.5	3.26	402	91.3	1.41	391	89.5	1.55	204	89.2	2.18	1101	89.9	0.91
	OTH INSR	26	92.3	5.33	639	94.4	0.91	1856	91.4	0.65	1827	91.1	0.67	737	92.4	0.98	5085	91.8	0.38
	NKP HMO	13	92.3	7.69	187	94.7	1.65	468	90.8	1.34	423	90.5	1.42	168	86.9	2.61	1259	90.8	0.82
	SELF PAY	17	76.5	10.60	135	85.2	3.07	263	89.0	1.94	183	84.2	2.71	68	89.7	3.71	666	86.6	1.32
	INDIGENT	1	100.0	.	9	88.9	11.11	6	83.3	16.67	6	83.3	16.67	3	66.7	33.33	25	84.0	7.48
	KP NCR	6	50.0	22.36	103	65.0	4.72	218	78.9	2.77	172	84.3	2.78	98	80.6	4.01	597	78.1	1.70
	KP SCR	10	90.0	10.00	93	74.2	4.56	215	80.5	2.71	190	83.2	2.72	72	87.5	3.92	580	81.4	1.62
	OTHERS	5	100.0	0.00	83	80.7	4.36	72	93.1	3.02	47	91.5	4.11	24	91.7	5.76	231	88.3	2.12
	TOTAL	248	92.7	1.65	2253	90.7	0.61	4256	90.2	0.46	3529	89.8	0.51	1468	90.1	0.78	11754	90.2	0.27
BREECH	PAY SRCE																		
	MEDI_CAL	166	89.8	2.36	281	89.3	1.85	175	92.0	2.06	77	83.1	4.30	35	85.7	6.00	734	89.2	1.14
	BL CROSS	10	100.0	0.00	48	91.7	4.03	139	91.4	2.39	110	86.4	3.29	60	86.7	4.43	367	89.4	1.61
	OTH INSR	32	84.4	6.52	286	94.1	1.40	591	90.9	1.19	458	87.8	1.53	207	87.9	2.27	1574	90.0	0.76
	NKP HMO	12	100.0	0.00	75	93.3	2.90	129	96.1	1.71	121	95.9	1.82	46	93.5	3.68	383	95.3	1.08
	SELF PAY	29	100.0	0.00	79	79.7	4.55	76	78.9	4.71	64	85.9	4.38	26	65.4	9.51	274	81.8	2.34
	INDIGENT	1	100.0	.	1	100.0	.	5	100.0	0.00	5	100.0	0.00	1	100.0	.	13	100.0	0.00
	KP NCR	19	94.7	5.26	59	89.8	3.97	90	91.1	3.02	66	86.4	4.26	31	93.5	4.49	265	90.2	1.83
	KP SCR	16	93.8	6.25	50	98.0	2.00	55	87.3	4.54	50	94.0	3.39	20	75.0	9.93	191	91.1	2.07
	OTHERS	17	88.2	8.05	36	88.9	5.31	25	96.0	4.00	19	84.2	8.59	4	75.0	25.00	101	89.1	3.12
	TOTAL	302	91.4	1.62	915	90.9	0.95	1285	90.9	0.80	970	88.4	1.03	430	86.5	1.65	3902	89.8	0.48

(CONTINUED)

RACE/ETHNICITY WHITE

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
DYSTOC	MEDI_CAL	791	64.7	1.70	1197	62.5	1.40	507	59.8	2.18	230	58.7	3.25	105	60.0	4.80	2830	62.2	0.91
	BL CROSS	35	54.3	8.54	266	68.4	2.86	555	58.9	2.09	406	61.6	2.42	202	63.4	3.40	1464	61.9	1.27
	OTH INSR	195	65.6	3.41	1314	66.4	1.30	2443	64.4	0.97	1660	64.2	1.18	632	65.8	1.89	6244	64.9	0.60
	NKP HMO	59	69.5	6.05	351	62.4	2.59	616	64.8	1.93	424	63.0	2.35	161	58.4	3.90	1611	63.3	1.20
	SELF PAY	118	65.3	4.40	343	63.6	2.60	382	64.9	2.44	218	55.5	3.37	94	66.0	4.91	1155	62.9	1.42
	INDIGENT	7	42.9	20.20	4	25.0	25.00	12	41.7	14.86	5	60.0	24.49	.	.	.	28	42.9	9.52
	KP NCR	61	59.0	6.35	178	56.7	3.72	283	56.9	2.95	200	50.5	3.54	92	51.1	5.24	814	54.8	1.75
	KP SCR	40	62.5	7.75	154	57.8	3.99	250	56.4	3.14	164	57.3	3.87	65	73.8	5.49	673	59.0	1.90
	OTHERS	52	73.1	6.21	165	66.7	3.68	70	58.6	5.93	53	69.8	6.37	24	62.5	10.09	364	66.2	2.48
	TOTAL	1358	64.7	1.30	3972	63.9	0.76	5118	62.5	0.68	3360	61.7	0.84	1375	63.5	1.30	15183	63.0	0.39
FET DIS	PAY SRCE																		
	MEDI_CAL	554	25.1	1.84	912	28.6	1.50	458	22.7	1.96	204	32.4	3.28	107	39.3	4.74	2235	27.4	0.94
	BL CROSS	19	36.8	11.37	123	32.5	4.24	265	25.7	2.69	223	33.2	3.16	90	46.7	5.29	720	32.1	1.74
	OTH INSR	102	34.3	4.72	701	28.5	1.71	1216	29.0	1.30	859	31.0	1.58	341	35.2	2.59	3219	30.3	0.81
	NKP HMO	50	26.0	6.27	204	35.8	3.36	319	33.2	2.64	216	30.1	3.13	77	37.7	5.56	866	33.0	1.60
	SELF PAY	119	23.5	3.90	231	27.7	2.95	245	24.9	2.77	155	25.8	3.53	78	28.2	5.13	828	26.0	1.52
	INDIGENT	5	20.0	20.00	12	16.7	11.24	9	0.0	0.00	4	0.0	0.00	1	100.0	.	31	12.9	6.12
	KP NCR	51	19.6	5.61	123	26.8	4.01	172	30.2	3.51	134	28.4	3.91	73	39.7	5.77	553	29.3	1.94
	KP SCR	42	23.8	6.65	149	24.8	3.55	191	18.8	2.84	147	21.8	3.42	61	27.9	5.79	590	22.4	1.72
	OTHERS	38	28.9	7.46	85	27.1	4.85	59	18.6	5.11	32	28.1	8.08	18	55.6	12.05	232	27.6	2.94
	TOTAL	980	25.9	1.40	2540	28.9	0.90	2934	27.0	0.82	1974	29.9	1.03	846	36.9	1.66	9274	28.9	0.47

(CONTINUED)

RACE/ETHNICITY WHITE

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
OTH COM	MEDI_CAL	1413	9.4	0.78	2380	11.6	0.66	1315	13.8	0.95	567	16.4	1.56	237	17.7	2.49	5912	12.3	0.43
	BL CROSS	53	9.4	4.05	390	10.5	1.56	899	11.6	1.07	748	14.7	1.30	314	21.7	2.33	2404	13.6	0.70
	OTH INSR	372	11.3	1.64	2175	11.9	0.69	4006	13.8	0.55	2811	16.1	0.69	1116	18.8	1.17	10480	14.5	0.34
	NKP HMO	129	9.3	2.57	644	10.1	1.19	1068	13.0	1.03	685	14.3	1.34	249	16.1	2.33	2775	12.8	0.63
	SELF PAY	256	3.5	1.15	732	8.5	1.03	716	11.6	1.20	452	8.0	1.27	224	17.9	2.56	2380	9.7	0.61
	INDIGENT	22	4.5	4.55	28	3.6	3.57	28	0.0	0.00	16	6.3	6.25	3	0.0	0.00	97	3.1	1.77
	KP NCR	105	6.7	2.45	368	8.4	1.45	485	10.3	1.38	370	13.0	1.75	169	16.0	2.83	1497	10.9	0.81
	KP SCR	107	8.4	2.70	302	5.3	1.29	492	11.2	1.42	282	9.2	1.73	148	13.5	2.82	1331	9.5	0.80
	OTHERS	124	7.3	2.34	349	8.6	1.50	234	10.3	1.99	108	15.7	3.52	53	24.5	5.97	868	10.7	1.05
	TOTAL	2581	8.8	0.56	7368	10.6	0.36	9243	12.9	0.35	6039	14.6	0.45	2513	18.3	0.77	27744	12.8	0.20
NO COMP	PAY SRCE																		
	MEDI_CAL	2315	0.0	0.00	3808	0.3	0.08	1985	0.2	0.09	818	0.4	0.21	239	0.0	0.00	9165	0.2	0.04
	BL CROSS	95	0.0	0.00	644	0.3	0.22	1481	0.3	0.13	1188	0.3	0.15	411	0.2	0.24	3819	0.3	0.08
	OTH INSR	525	0.0	0.00	3709	0.2	0.07	6831	0.2	0.05	4464	0.3	0.08	1536	0.3	0.15	17065	0.2	0.04
	NKP HMO	268	0.0	0.00	1202	0.2	0.14	1852	0.3	0.13	1085	0.0	0.00	391	0.3	0.26	4798	0.2	0.07
	SELF PAY	446	0.0	0.00	1294	0.1	0.08	1378	0.1	0.07	796	0.0	0.00	289	0.3	0.35	4203	0.1	0.04
	INDIGENT	18	0.0	0.00	44	0.0	0.00	31	0.0	0.00	17	0.0	0.00	5	0.0	0.00	115	0.0	0.00
	KP NCR	276	0.0	0.00	1061	0.1	0.09	1488	0.0	0.00	948	0.1	0.11	378	0.3	0.26	4151	0.1	0.04
	KP SCR	274	0.0	0.00	778	0.1	0.13	1101	0.3	0.16	727	0.3	0.19	304	0.3	0.33	3184	0.2	0.08
	OTHERS	142	0.0	0.00	448	0.2	0.22	322	0.0	0.00	134	0.0	0.00	50	0.0	0.00	1096	0.1	0.09
	TOTAL	4359	0.0	0.00	12988	0.2	0.04	16469	0.2	0.03	10177	0.2	0.05	3603	0.3	0.09	47596	0.2	0.02

(CONTINUED)

RACE/ETHNICITY WHITE

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
TOTAL	PAY SRCE																		
	MEDI_CAL	5409	20.3	0.55	9478	25.2	0.45	5196	27.9	0.62	2186	28.8	0.97	817	32.2	1.64	23086	25.3	0.29
	BL CROSS	212	19.3	2.72	1575	25.4	1.10	3741	26.7	0.72	3066	28.8	0.82	1281	36.9	1.35	9875	28.3	0.45
	OTH INSR	1252	20.4	1.14	8824	25.0	0.46	16943	27.9	0.34	12079	32.0	0.42	4569	35.3	0.71	43667	29.0	0.22
	NKP HMO	531	16.9	1.63	2663	22.8	0.81	4452	26.9	0.66	2954	31.4	0.85	1092	32.3	1.42	11692	27.2	0.41
	SELF PAY	985	15.8	1.16	2814	18.6	0.73	3060	22.5	0.75	1868	21.7	0.95	779	26.1	1.57	9506	20.8	0.42
	INDIGENT	54	13.0	4.61	98	13.3	3.44	91	16.5	3.91	53	26.4	6.11	13	30.8	13.32	309	17.2	2.15
	KP NCR	518	14.3	1.54	1892	15.1	0.82	2736	18.9	0.75	1890	20.6	0.93	841	25.2	1.50	7877	18.8	0.44
	KP SCR	489	13.9	1.57	1526	17.1	0.96	2304	19.8	0.83	1560	23.0	1.07	670	24.5	1.66	6549	20.0	0.49
	OTHERS	378	20.6	2.08	1166	22.6	1.22	782	21.4	1.47	393	31.0	2.34	173	36.4	3.67	2892	24.0	0.79
	TOTAL	9828	19.0	0.40	30036	23.2	0.24	39305	26.0	0.22	26049	29.2	0.28	10235	32.7	0.46	115E3	26.0	0.13

RACE/ETHNICITY BLACK

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
PREV CS	MEDI_CAL	93	89.2	3.23	357	93.8	1.27	313	94.6	1.28	133	89.5	2.67	40	95.0	3.49	936	93.1	0.83
	BL CROSS	1	100.0	.	4	100.0	0.00	13	100.0	0.00	17	88.2	8.05	6	100.0	0.00	41	95.1	3.41
	OTH INSR	8	50.0	18.90	65	92.3	3.33	91	95.6	2.16	58	93.1	3.36	27	96.3	3.70	249	92.8	1.64
	NKP HMO	11	100.0	0.00	66	95.5	2.58	85	92.9	2.79	42	92.9	4.02	15	86.7	9.09	219	93.6	1.66
	SELF PAY	3	100.0	0.00	14	92.9	7.14	17	82.4	9.53	11	90.9	9.09	1	0.0	.	46	87.0	5.02
	INDIGENT	.	.	.	1	100.0	.	3	100.0	0.00	1	100.0	.	.	.	.	5	100.0	0.00
	KP NCR	2	100.0	0.00	19	84.2	8.59	48	77.1	6.13	19	89.5	7.23	13	84.6	10.42	101	82.2	3.83
	KP SCR	4	75.0	25.00	34	70.6	7.93	57	80.7	5.27	42	85.7	5.46	20	90.0	6.88	157	80.9	3.15
	OTHERS	.	.	.	22	90.9	6.27	28	78.6	7.90	10	70.0	15.28	1	100.0	.	61	82.0	4.96
	TOTAL	122	87.7	2.99	582	92.1	1.12	655	91.1	1.11	333	89.5	1.68	123	91.9	2.47	1815	91.0	0.67
BREECH	PAY SRCE																		
	MEDI_CAL	43	88.4	4.95	76	81.6	4.48	45	84.4	5.46	18	77.8	10.08	14	92.9	7.14	196	84.2	2.61
	BL CROSS	.	.	.	2	100.0	0.00	5	80.0	20.00	3	33.3	33.33	1	0.0	.	11	63.6	15.21
	OTH INSR	2	50.0	50.00	10	50.0	16.67	23	95.7	4.35	9	77.8	14.70	3	100.0	0.00	47	80.9	5.80
	NKP HMO	3	100.0	0.00	9	66.7	16.67	21	90.5	6.56	6	66.7	21.08	4	75.0	25.00	43	81.4	6.00
	SELF PAY	3	100.0	0.00	5	60.0	24.49	5	100.0	0.00	5	60.0	24.49	.	.	.	18	77.8	10.08
	INDIGENT	1	0.0	.	4	100.0	0.00	2	100.0	0.00	1	100.0	.	.	.	.	8	87.5	12.50
	KP NCR	1	100.0	.	4	100.0	0.00	13	76.9	12.16	8	87.5	12.50	3	66.7	33.33	29	82.8	7.14
	KP SCR	4	75.0	25.00	20	90.0	6.88	12	50.0	15.08	11	81.8	12.20	5	80.0	20.00	52	76.9	5.90
	OTHERS	3	0.0	0.00	3	66.7	33.33	3	66.7	33.33	3	66.7	33.33	.	.	.	12	50.0	15.08
	TOTAL	60	81.7	5.04	133	79.7	3.50	129	83.7	3.26	64	75.0	5.46	30	83.3	6.92	416	80.8	1.93

(CONTINUED)

RACE/ETHNICITY BLACK .

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
DYSTOC	MEDI_CAL	260	79.2	2.52	322	69.9	2.56	142	67.6	3.94	53	73.6	6.11	24	62.5	10.09	801	72.5	1.58
	BL CROSS	2	100.0	0.00	9	66.7	16.67	13	84.6	10.42	18	55.6	12.05	6	83.3	16.67	48	70.8	6.63
	OTH INSR	26	65.4	9.51	64	68.8	5.84	109	73.4	4.25	55	69.1	6.29	17	76.5	10.60	271	70.8	2.77
	NKP HMO	29	79.3	7.66	43	76.7	6.52	66	65.2	5.91	32	81.3	7.01	17	64.7	11.95	187	72.7	3.27
	SELF PAY	7	57.1	20.20	14	64.3	13.29	14	85.7	9.71	7	14.3	14.29	4	25.0	25.00	46	58.7	7.34
	INDIGENT	1	100.0	.	7	71.4	18.44	1	100.0	.	2	50.0	50.00	2	100.0	0.00	13	76.9	12.16
	KP NCR	20	65.0	10.94	38	60.5	8.04	33	66.7	8.33	23	47.8	10.65	9	55.6	17.57	123	60.2	4.43
	KP SCR	39	66.7	7.65	55	83.6	5.03	56	58.9	6.63	34	64.7	8.32	15	73.3	11.82	199	69.3	3.28
	OTHERS	21	66.7	10.54	27	44.4	9.75	13	46.2	14.39	4	100.0	0.00	1	0.0	.	66	54.5	6.18
	TOTAL	405	75.6	2.14	579	69.6	1.91	447	68.0	2.21	228	66.7	3.13	95	66.3	4.87	1754	70.0	1.09
FET DIS	PAY SRCE																		
	MEDI_CAL	286	26.2	2.61	366	34.2	2.48	212	36.8	3.32	130	40.8	4.33	40	40.0	7.84	1034	33.6	1.47
	BL CROSS	1	100.0	.	6	50.0	22.36	14	35.7	13.29	14	21.4	11.38	7	71.4	18.44	42	40.5	7.67
	OTH INSR	20	40.0	11.24	60	50.0	6.51	76	21.1	4.71	47	40.4	7.24	41	51.2	7.90	244	38.5	3.12
	NKP HMO	17	41.2	12.30	48	43.8	7.24	60	46.7	6.49	26	57.7	9.88	5	60.0	24.49	156	47.4	4.01
	SELF PAY	11	27.3	14.08	16	43.8	12.81	17	23.5	10.60	10	20.0	13.33	3	66.7	33.33	57	31.6	6.21
	INDIGENT	7	57.1	20.20	5	40.0	24.49	4	50.0	28.87	.	.	.	3	33.3	33.33	19	47.4	11.77
	KP NCR	17	52.9	12.48	22	59.1	10.73	37	24.3	7.15	17	29.4	11.39	10	50.0	16.67	103	39.8	4.85
	KP SCR	31	58.1	9.01	59	45.8	6.54	47	21.3	6.03	33	42.4	8.74	13	46.2	14.39	183	41.0	3.65
	OTHERS	6	33.3	21.08	18	33.3	11.43	13	46.2	14.39	6	33.3	21.08	4	50.0	28.87	47	38.3	7.17
	TOTAL	396	32.1	2.35	600	39.0	1.99	480	32.9	2.15	283	39.9	2.92	126	48.4	4.47	1885	36.8	1.11

(CONTINUED)

RACE/ETHNICITY BLACK

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
OTH COM	MEDI_CAL	598	11.4	1.30	810	11.9	1.14	512	11.7	1.42	222	15.8	2.45	80	16.3	4.15	2222	12.2	0.70
	BL CROSS	8	37.5	18.30	19	10.5	7.23	36	13.9	5.85	22	31.8	10.16	12	25.0	13.06	97	20.6	4.13
	OTH INSR	58	12.1	4.31	139	17.3	3.22	177	16.9	2.83	127	18.1	3.43	49	18.4	5.59	550	16.9	1.60
	NKP HMO	64	7.8	3.38	110	13.6	3.29	118	16.1	3.40	69	14.5	4.27	28	14.3	6.73	389	13.6	1.74
	SELF PAY	32	6.3	4.35	45	4.4	3.11	35	11.4	5.46	19	15.8	8.59	7	0.0	0.00	138	8.0	2.31
	INDIGENT	12	8.3	8.33	19	10.5	7.23	12	25.0	13.06	10	0.0	0.00	.	.	.	53	11.3	4.39
	KP NCR	46	6.5	3.68	70	11.4	3.83	82	12.2	3.64	43	9.3	4.48	18	16.7	9.04	259	10.8	1.93
	KP SCR	76	5.3	2.58	130	13.1	2.97	145	7.6	2.21	93	18.3	4.03	56	16.1	4.95	500	11.6	1.43
	OTHERS	38	2.6	2.63	68	8.8	3.47	49	10.2	4.37	27	3.7	3.70	7	0.0	0.00	189	6.9	1.85
	TOTAL	932	10.1	0.99	1410	12.2	0.87	1166	12.6	0.97	632	15.8	1.45	257	16.0	2.29	4397	12.6	0.50
NO COMP	PAY SRCE																		
	MEDI_CAL	907	0.0	0.00	1237	0.1	0.08	719	0.3	0.20	283	1.1	0.61	93	2.2	1.51	3239	0.2	0.09
	BL CROSS	6	0.0	0.00	35	0.0	0.00	62	0.0	0.00	39	0.0	0.00	15	0.0	0.00	157	0.0	0.00
	OTH INSR	58	0.0	0.00	199	0.0	0.00	278	0.4	0.36	150	0.0	0.00	44	2.3	2.27	729	0.3	0.19
	NKP HMO	161	0.0	0.00	289	0.0	0.00	294	0.0	0.00	109	0.0	0.00	35	2.9	2.86	888	0.1	0.11
	SELF PAY	47	0.0	0.00	80	0.0	0.00	51	0.0	0.00	37	0.0	0.00	15	0.0	0.00	230	0.0	0.00
	INDIGENT	30	0.0	0.00	34	0.0	0.00	16	0.0	0.00	12	0.0	0.00	5	0.0	0.00	97	0.0	0.00
	KP NCR	88	0.0	0.00	174	0.0	0.00	177	0.0	0.00	108	0.0	0.00	42	2.4	2.38	589	0.2	0.17
	KP SCR	181	0.6	0.55	258	0.4	0.39	293	0.0	0.00	140	0.0	0.00	50	0.0	0.00	922	0.2	0.15
	OTHERS	51	0.0	0.00	99	0.0	0.00	74	0.0	0.00	45	2.2	2.22	7	0.0	0.00	276	0.4	0.36
	TOTAL	1529	0.1	0.07	2405	0.1	0.06	1964	0.2	0.09	923	0.4	0.22	306	1.6	0.73	7127	0.2	0.05

(CONTINUED)

RACE/ETHNICITY BLACK

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
TOTAL	PAY SRCE																		
	MEDI_CAL	2187	21.5	0.88	3168	26.6	0.79	1943	29.3	1.03	839	31.3	1.60	291	33.3	2.77	8428	26.6	0.48
	BL CROSS	18	38.9	11.82	75	22.7	4.87	143	26.6	3.71	113	31.9	4.40	47	40.4	7.24	396	29.5	2.30
	OTH INSR	172	21.5	3.14	537	30.4	1.99	754	31.3	1.69	446	31.6	2.20	181	40.3	3.66	2090	31.1	1.01
	NKP HMO	285	17.2	2.24	565	24.4	1.81	644	29.2	1.79	284	33.1	2.80	104	33.7	4.66	1882	26.8	1.02
	SELF PAY	103	14.6	3.49	174	19.5	3.01	139	28.1	3.82	89	21.3	4.37	30	10.0	5.57	535	20.6	1.75
	INDIGENT	51	11.8	4.56	70	20.0	4.82	38	28.9	7.46	26	11.5	6.39	10	30.0	15.28	195	19.0	2.82
	KP NCR	174	16.1	2.79	327	19.6	2.20	390	22.6	2.12	218	20.2	2.72	95	28.4	4.65	1204	20.8	1.17
	KP SCR	335	16.4	2.03	556	23.9	1.81	610	17.4	1.54	353	27.8	2.39	159	30.2	3.65	2013	21.9	0.92
	OTHERS	119	14.3	3.22	237	19.4	2.57	180	22.8	3.13	95	17.9	3.95	20	15.0	8.19	651	19.0	1.54
	TOTAL	3444	19.9	0.68	5709	25.5	0.58	4841	27.2	0.64	2463	29.0	0.91	937	32.9	1.54	17394	25.7	0.33

RACE/ETHNICITY ASIAN

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
PREV CS	MEDI_CAL	6	66.7	21.08	43	95.3	3.25	83	86.7	3.74	54	96.3	2.59	40	90.0	4.80	226	90.7	1.94
	BL CROSS	.	.	.	6	83.3	16.67	27	100.0	0.00	45	100.0	0.00	26	92.3	5.33	104	97.1	1.65
	OTH INSR	2	100.0	0.00	19	89.5	7.23	117	92.3	2.47	199	91.0	2.04	133	94.7	1.94	470	92.3	1.23
	NKP HMO	.	.	.	8	75.0	16.37	33	90.9	5.08	45	97.8	2.22	30	93.3	4.63	116	93.1	2.36
	SELF PAY	.	.	.	5	60.0	24.49	30	80.0	7.43	44	93.2	3.84	16	68.8	11.97	95	83.2	3.86
	INDIGENT	.	.	.	.	.	.	.	.	.	1	100.0	.	.	.	.	1	100.0	.
	KP NCR	.	.	.	4	100.0	0.00	29	72.4	8.45	59	78.0	5.44	32	81.3	7.01	124	78.2	3.72
	KP SCR	.	.	.	4	100.0	0.00	14	71.4	12.53	28	92.9	4.96	23	87.0	7.18	69	87.0	4.08
	OTHERS	1	100.0	.	7	71.4	18.44	17	88.2	8.05	7	100.0	0.00	5	100.0	0.00	37	89.2	5.18
	TOTAL	9	77.8	14.70	96	88.5	3.27	350	87.7	1.76	482	91.9	1.24	305	90.5	1.68	1242	90.0	0.85
BREECH	PAY SRCE																		
	MEDI_CAL	11	72.7	14.08	29	72.4	8.45	26	61.5	9.73	27	70.4	8.96	15	73.3	11.82	108	69.4	4.45
	BL CROSS	.	.	.	5	80.0	20.00	13	100.0	0.00	13	84.6	10.42	9	77.8	14.70	40	87.5	5.30
	OTH INSR	1	100.0	.	18	77.8	10.08	57	98.2	1.75	71	90.1	3.56	29	82.8	7.14	176	90.3	2.23
	NKP HMO	1	100.0	.	5	80.0	20.00	13	92.3	7.69	18	94.4	5.56	6	66.7	21.08	43	88.4	4.95
	SELF PAY	3	66.7	33.33	8	62.5	18.30	23	87.0	7.18	17	88.2	8.05	8	87.5	12.50	59	83.1	4.93
	INDIGENT	.	.	.	1	100.0	.	.	.	.	.	.	.	.	.	.	1	100.0	.
	KP NCR	.	.	.	3	100.0	0.00	9	100.0	0.00	19	94.7	5.26	9	77.8	14.70	40	92.5	4.22
	KP SCR	.	.	.	1	100.0	.	9	77.8	14.70	6	100.0	0.00	3	66.7	33.33	19	84.2	8.59
	OTHERS	2	100.0	0.00	4	75.0	25.00	3	100.0	0.00	3	100.0	0.00	2	100.0	0.00	14	92.9	7.14
	TOTAL	18	77.8	10.08	74	75.7	5.02	153	88.9	2.55	174	87.9	2.48	81	79.0	4.55	500	84.6	1.62

(CONTINUED)

RACE/ETHNICITY ASIAN

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																		
		< 20			20-24			25-29			30-34			35+			TOTAL		
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
DYSTOC	MEDI_CAL	63	68.3	5.91	91	54.9	5.24	130	57.7	4.35	101	57.4	4.94	50	76.0	6.10	435	60.7	2.34
	BL CROSS	1	100.0	.	18	61.1	11.82	59	67.8	6.14	68	70.6	5.57	20	65.0	10.94	166	68.1	3.63
	OTH INSR	7	42.9	20.20	79	59.5	5.56	229	67.7	3.10	220	65.5	3.21	114	74.6	4.10	649	66.9	1.85
	NKP HMO	.	.	.	22	68.2	10.16	68	72.1	5.48	61	65.6	6.13	18	66.7	11.43	169	68.6	3.58
	SELF PAY	4	25.0	25.00	41	41.5	7.79	99	53.5	5.04	66	59.1	6.10	38	65.8	7.80	248	54.4	3.17
	INDIGENT	.	.	.	.	.	.	5	40.0	24.49	.	.	.	1	100.0	.	6	50.0	22.36
	KP NCR	3	66.7	33.33	32	37.5	8.70	61	45.9	6.43	68	50.0	6.11	33	54.5	8.80	197	47.7	3.57
	KP SCR	2	50.0	50.00	11	54.5	15.75	24	66.7	9.83	36	52.8	8.44	19	63.2	11.37	92	58.7	5.16
	OTHERS	2	50.0	50.00	12	66.7	14.21	21	57.1	11.07	17	82.4	9.53	9	77.8	14.70	61	68.9	5.98
	TOTAL	82	63.4	5.35	306	54.2	2.85	696	61.8	1.84	637	62.2	1.92	302	69.9	2.64	2023	62.0	1.08
FET DIS	PAY SRCE																		
	MEDI_CAL	45	20.0	6.03	71	21.1	4.88	78	20.5	4.60	71	19.7	4.76	51	17.6	5.39	316	19.9	2.25
	BL CROSS	.	.	.	2	100.0	0.00	18	33.3	11.43	19	42.1	11.64	10	50.0	16.67	49	42.9	7.14
	OTH INSR	3	0.0	0.00	50	26.0	6.27	105	26.7	4.34	92	25.0	4.54	42	42.9	7.73	292	28.1	2.63
	NKP HMO	2	0.0	0.00	17	23.5	10.60	33	27.3	7.87	22	45.5	10.87	13	53.8	14.39	87	34.5	5.13
	SELF PAY	6	0.0	0.00	23	34.8	10.15	42	23.8	6.65	30	23.3	7.85	15	46.7	13.33	116	27.6	4.17
	INDIGENT	.	.	.	.	.	.	3	0.0	0.00	5	60.0	24.49	1	0.0	.	9	33.3	16.67
	KP NCR	4	25.0	25.00	16	12.5	8.54	51	23.5	6.00	56	21.4	5.53	26	30.8	9.23	153	22.9	3.41
	KP SCR	2	0.0	0.00	9	0.0	0.00	20	30.0	10.51	20	15.0	8.19	19	42.1	11.64	70	24.3	5.16
	OTHERS	2	0.0	0.00	6	33.3	21.08	6	50.0	22.36	3	0.0	0.00	3	33.3	33.33	20	30.0	10.51
	TOTAL	64	15.6	4.57	194	23.7	3.06	356	25.3	2.31	318	25.2	2.44	180	35.0	3.57	1112	26.0	1.32

(CONTINUED)

RACE/ETHNICITY ASIAN

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP															TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
OTH COM	MEDI_CAL	118	5.1	2.03	320	5.0	1.22	335	9.6	1.61	274	9.1	1.74	182	12.1	2.42	1229	8.2	0.78
	BL CROSS	2	0.0	0.00	27	11.1	6.16	110	13.6	3.29	82	8.5	3.10	43	14.0	5.35	264	11.7	1.99
	OTH INSR	13	0.0	0.00	156	8.3	2.22	363	10.2	1.59	358	14.2	1.85	152	25.7	3.55	1042	13.4	1.06
	NKP HMO	4	25.0	25.00	35	2.9	2.86	84	7.1	2.83	100	12.0	3.27	47	14.9	5.25	270	10.0	1.83
	SELF PAY	17	0.0	0.00	83	3.6	2.06	138	6.5	2.11	122	7.4	2.38	37	10.8	5.18	397	6.3	1.22
	INDIGENT	1	0.0	.	5	0.0	0.00	3	33.3	33.33	4	25.0	25.00	1	100.0	.	14	21.4	11.38
	KP NCR	8	0.0	0.00	68	0.0	0.00	103	4.9	2.13	85	15.3	3.93	41	17.1	5.95	305	8.2	1.57
	KP SCR	7	0.0	0.00	26	0.0	0.00	36	0.0	0.00	50	10.0	4.29	40	20.0	6.41	159	8.2	2.18
	OTHERS	6	0.0	0.00	20	5.0	5.00	37	2.7	2.70	23	8.7	6.01	12	8.3	8.33	98	5.1	2.23
	TOTAL	176	4.0	1.48	740	5.0	0.80	1209	8.8	0.81	1098	11.4	0.96	555	17.1	1.60	3778	9.8	0.48
NO COMP	PAY SRCE																		
	MEDI_CAL	240	0.0	0.00	634	0.0	0.00	742	0.0	0.00	458	0.0	0.00	283	0.0	0.00	2357	0.0	0.00
	BL CROSS	4	0.0	0.00	47	0.0	0.00	163	0.0	0.00	157	0.0	0.00	67	0.0	0.00	438	0.0	0.00
	OTH INSR	21	0.0	0.00	214	0.0	0.00	596	0.5	0.29	560	0.2	0.18	193	0.0	0.00	1584	0.3	0.13
	NKP HMO	8	0.0	0.00	80	0.0	0.00	206	0.5	0.49	172	0.0	0.00	65	0.0	0.00	531	0.2	0.19
	SELF PAY	19	0.0	0.00	149	0.0	0.00	329	0.0	0.00	206	0.5	0.49	68	0.0	0.00	771	0.1	0.13
	INDIGENT	1	0.0	.	2	0.0	0.00	11	0.0	0.00	7	0.0	0.00	3	0.0	0.00	24	0.0	0.00
	KP NCR	25	0.0	0.00	119	0.0	0.00	255	0.0	0.00	210	0.0	0.00	106	0.0	0.00	715	0.0	0.00
	KP SCR	13	0.0	0.00	57	0.0	0.00	109	0.0	0.00	108	0.9	0.93	57	0.0	0.00	344	0.3	0.29
	OTHERS	10	0.0	0.00	48	0.0	0.00	84	0.0	0.00	55	0.0	0.00	20	0.0	0.00	217	0.0	0.00
	TOTAL	341	0.0	0.00	1350	0.0	0.00	2495	0.2	0.08	1933	0.2	0.09	862	0.0	0.00	6981	0.1	0.04

(CONTINUED)

RACE/ETHNICITY ASIAN

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
TOTAL	PAY SRCE																		
	MEDI_CAL	483	14.5	1.60	1188	12.0	0.94	1394	15.1	0.96	985	17.1	1.20	621	18.7	1.57	4671	15.2	0.52
	BL CROSS	7	14.3	14.29	105	23.8	4.18	390	25.9	2.22	384	31.0	2.36	175	31.4	3.52	1061	28.4	1.38
	OTH INSR	47	12.8	4.92	536	19.4	1.71	1467	26.4	1.15	1500	30.9	1.19	663	44.0	1.93	4213	29.7	0.70
	NKP HMO	15	13.3	9.09	167	18.0	2.98	437	24.5	2.06	418	29.4	2.23	179	32.4	3.51	1216	26.3	1.26
	SELF PAY	49	6.1	3.46	309	11.7	1.83	661	17.5	1.48	485	23.1	1.92	182	29.7	3.40	1686	19.0	0.96
	INDIGENT	2	0.0	0.00	8	12.5	12.50	22	13.6	7.49	17	29.4	11.39	6	33.3	21.08	55	20.0	5.44
	KP NCR	40	7.5	4.22	242	8.7	1.81	508	14.8	1.58	497	24.7	1.94	247	26.7	2.82	1534	18.8	1.00
	KP SCR	24	4.2	4.17	108	10.2	2.92	212	18.4	2.67	248	24.2	2.72	161	31.1	3.66	753	21.4	1.50
	OTHERS	23	17.4	8.08	97	19.6	4.05	168	20.2	3.11	108	24.1	4.13	51	31.4	6.56	447	22.1	1.97
	TOTAL	690	13.0	1.28	2760	14.1	0.66	5259	20.4	0.56	4642	25.9	0.64	2285	31.0	0.97	15636	22.1	0.33

RACE/ETHNICITY OTH_UNKN

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
PREV CS	MEDI_CAL	11	100.0	0.00	38	92.1	4.43	30	96.7	3.33	21	90.5	6.56	6	100.0	0.00	106	94.3	2.26
	BL CROSS	.	.	.	3	66.7	33.33	13	84.6	10.42	14	85.7	9.71	5	100.0	0.00	35	85.7	6.00
	OTH INSR	.	.	.	13	61.5	14.04	44	88.6	4.84	67	88.1	3.99	27	81.5	7.62	151	84.8	2.93
	NKP HMO	.	.	.	12	91.7	8.33	25	92.0	5.54	21	90.5	6.56	7	100.0	0.00	65	92.3	3.33
	SELF PAY	2	50.0	50.00	7	100.0	0.00	9	66.7	16.67	6	83.3	16.67	7	85.7	14.29	31	80.6	7.21
	INDIGENT	.	.	.	3	33.3	33.33	1	100.0	.	.	.	.	1	100.0	.	5	60.0	24.49
	KP NCR	.	.	.	2	100.0	0.00	7	100.0	0.00	3	100.0	0.00	2	100.0	0.00	14	100.0	0.00
	KP SCR	.	.	.	2	100.0	0.00	12	91.7	8.33	11	90.9	9.09	11	72.7	14.08	36	86.1	5.85
	OTHERS	2	100.0	0.00	10	70.0	15.28	6	83.3	16.67	1	100.0	.	3	66.7	33.33	22	77.3	9.14
	TOTAL	15	93.3	6.67	90	83.3	3.95	147	89.8	2.51	144	88.9	2.63	69	85.5	4.27	465	87.7	1.52
BREECH	PAY SRCE																		
	MEDI_CAL	7	57.1	20.20	9	100.0	0.00	11	72.7	14.08	7	57.1	20.20	3	100.0	0.00	37	75.7	7.15
	BL CROSS	1	100.0	.	1	100.0	.	3	100.0	0.00	2	100.0	0.00	1	100.0	.	8	100.0	0.00
	OTH INSR	.	.	.	9	100.0	0.00	29	93.1	4.79	15	86.7	9.09	8	62.5	18.30	61	88.5	4.11
	NKP HMO	2	100.0	0.00	3	66.7	33.33	10	90.0	10.00	3	66.7	33.33	2	50.0	50.00	20	80.0	9.18
	SELF PAY	.	.	.	7	71.4	18.44	7	85.7	14.29	1	0.0	.	2	100.0	0.00	17	76.5	10.60
	INDIGENT	.	.	.	.	.	.	.	.	.	2	50.0	50.00	.	.	.	2	50.0	50.00
	KP NCR	2	100.0	0.00	.	.	.	3	100.0	0.00	2	50.0	50.00	1	100.0	.	8	87.5	12.50
	KP SCR	.	.	.	1	100.0	.	6	100.0	0.00	2	100.0	0.00	3	66.7	33.33	12	91.7	8.33
	OTHERS	2	100.0	0.00	2	100.0	0.00	3	100.0	0.00	1	100.0	.	.	.	.	8	100.0	0.00
	TOTAL	14	78.6	11.38	32	90.6	5.24	72	90.3	3.52	35	74.3	7.50	20	75.0	9.93	173	84.4	2.77

(CONTINUED)

RACE/ETHNICITY OTH_UNKN

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
DYSTOC	MEDI_CAL	26	69.2	9.23	48	62.5	7.06	32	59.4	8.82	17	47.1	12.48	10	50.0	16.67	133	60.2	4.26
	BL CROSS	1	100.0	.	6	83.3	16.67	29	55.2	9.40	13	53.8	14.39	11	54.5	15.75	60	58.3	6.42
	OTH INSR	7	71.4	18.44	41	80.5	6.27	88	61.4	5.22	60	76.7	5.51	24	66.7	9.83	220	70.0	3.10
	NKP HMO	7	57.1	20.20	25	64.0	9.80	39	66.7	7.65	23	60.9	10.41	4	100.0	0.00	98	65.3	4.83
	SELF PAY	7	28.6	18.44	20	75.0	9.93	28	53.6	9.60	20	70.0	10.51	9	55.6	17.57	84	60.7	5.36
	INDIGENT	.	.	.	1	100.0	.	3	33.3	33.33	1	0.0	.	.	.	.	5	40.0	24.49
	KP NCR	.	.	.	3	0.0	0.00	3	100.0	0.00	7	71.4	18.44	4	75.0	25.00	17	64.7	11.95
	KP SCR	4	100.0	0.00	8	87.5	12.50	21	61.9	10.86	5	100.0	0.00	6	50.0	22.36	44	72.7	6.79
	OTHERS	6	50.0	22.36	9	77.8	14.70	10	50.0	16.67	4	75.0	25.00	1	100.0	.	30	63.3	8.95
	TOTAL	58	63.8	6.37	161	70.8	3.59	253	60.1	3.09	150	68.0	3.82	69	62.3	5.88	691	64.8	1.82
FET DIS	PAY SRCE																		
	MEDI_CAL	27	18.5	7.62	51	21.6	5.82	31	19.4	7.21	27	14.8	6.97	14	7.1	7.14	150	18.0	3.15
	BL CROSS	3	33.3	33.33	10	10.0	10.00	8	25.0	16.37	3	33.3	33.33	3	33.3	33.33	27	22.2	8.15
	OTH INSR	3	0.0	0.00	31	32.3	8.53	41	17.1	5.95	36	25.0	7.32	12	25.0	13.06	123	23.6	3.84
	NKP HMO	2	50.0	50.00	13	38.5	14.04	28	21.4	7.90	16	25.0	11.18	9	33.3	16.67	68	27.9	5.48
	SELF PAY	2	50.0	50.00	11	0.0	0.00	14	7.1	7.14	8	25.0	16.37	8	25.0	16.37	43	14.0	5.35
	INDIGENT	.	.	.	2	50.0	50.00	3	0.0	0.00	1	100.0	.	2	100.0	0.00	8	50.0	18.90
	KP NCR	.	.	.	5	20.0	20.00	5	20.0	20.00	1	100.0	.	2	100.0	0.00	13	38.5	14.04
	KP SCR	3	33.3	33.33	7	14.3	14.29	5	0.0	0.00	15	13.3	9.09	3	33.3	33.33	33	15.2	6.34
	OTHERS	6	0.0	0.00	5	40.0	24.49	9	11.1	11.11	3	66.7	33.33	.	.	.	23	21.7	8.79
	TOTAL	46	19.6	5.91	135	23.7	3.67	144	16.7	3.12	110	23.6	4.07	53	28.3	6.25	488	21.7	1.87

(CONTINUED)

RACE/ETHNICITY OTH_UNKN

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																TOTAL		
		< 20			20-24			25-29			30-34			35+					
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
PRM IND	PAY SRCE																		
OTH COM	MEDI_CAL	71	5.6	2.76	117	9.4	2.71	103	8.7	2.80	59	11.9	4.25	28	17.9	7.37	378	9.5	1.51
	BL CROSS	5	0.0	0.00	10	10.0	10.00	27	3.7	3.70	32	6.3	4.35	10	20.0	13.33	84	7.1	2.83
	OTH INSR	14	14.3	9.71	91	6.6	2.62	151	11.9	2.65	120	13.3	3.12	34	23.5	7.38	410	12.2	1.62
	NKP HMO	6	0.0	0.00	21	14.3	7.82	66	12.1	4.05	42	23.8	6.65	22	18.2	8.42	157	15.9	2.93
	SELF PAY	16	0.0	0.00	59	13.6	4.50	49	6.1	3.46	35	22.9	7.20	20	10.0	6.88	179	11.7	2.41
	INDIGENT	.	.	.	7	14.3	14.29	8	0.0	0.00	5	0.0	0.00	3	33.3	33.33	23	8.7	6.01
	KP NCR	2	0.0	0.00	15	6.7	6.67	10	10.0	10.00	7	28.6	18.44	6	16.7	16.67	40	12.5	5.30
	KP SCR	7	0.0	0.00	15	13.3	9.09	29	13.8	6.52	24	20.8	8.47	6	0.0	0.00	81	13.6	3.83
	OTHERS	12	8.3	8.33	26	7.7	5.33	25	16.0	7.48	8	0.0	0.00	3	0.0	0.00	74	9.5	3.43
	TOTAL	133	5.3	1.94	361	9.7	1.56	468	10.3	1.40	332	15.1	1.97	132	17.4	3.31	1426	11.4	0.84
NO COMP	PAY SRCE																		
	MEDI_CAL	106	0.0	0.00	200	0.5	0.50	155	0.0	0.00	79	0.0	0.00	33	0.0	0.00	573	0.2	0.17
	BL CROSS	5	0.0	0.00	23	0.0	0.00	67	0.0	0.00	44	0.0	0.00	15	0.0	0.00	154	0.0	0.00
	OTH INSR	22	0.0	0.00	142	0.0	0.00	270	0.4	0.37	170	0.0	0.00	58	0.0	0.00	662	0.2	0.15
	NKP HMO	14	0.0	0.00	67	0.0	0.00	126	0.0	0.00	63	0.0	0.00	16	0.0	0.00	286	0.0	0.00
	SELF PAY	27	0.0	0.00	84	0.0	0.00	98	1.0	1.02	45	2.2	2.22	17	0.0	0.00	271	0.7	0.52
	INDIGENT	4	0.0	0.00	9	0.0	0.00	10	0.0	0.00	2	0.0	0.00	3	33.3	33.33	28	3.6	3.57
	KP NCR	7	0.0	0.00	22	0.0	0.00	28	0.0	0.00	20	0.0	0.00	9	0.0	0.00	86	0.0	0.00
	KP SCR	15	0.0	0.00	55	1.8	1.82	57	0.0	0.00	46	0.0	0.00	21	0.0	0.00	194	0.5	0.52
	OTHERS	10	0.0	0.00	39	0.0	0.00	29	0.0	0.00	15	0.0	0.00	8	12.5	12.50	101	1.0	0.99
	TOTAL	210	0.0	0.00	641	0.3	0.22	840	0.2	0.17	484	0.2	0.21	180	1.1	0.78	2355	0.3	0.11

(CONTINUED)

RACE/ETHNICITY OTH_UNKN

12:10 THURSDAY, DECEMBER 15, 1988

OSHPD JAN-JUN 86 CS RATES AND SE R S STAFFORD		AGE GROUP																	
		< 20			20-24			25-29			30-34			35+			TOTAL		
		C SECTION			C SECTION			C SECTION			C SECTION			C SECTION			C SECTION		
		DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE	DELI	RATE	SE
TOTAL	PAY SRCE																		
	MEDI_CAL	248	16.9	2.39	463	21.0	1.89	362	19.6	2.09	210	20.0	2.77	94	21.3	4.24	1377	19.8	1.07
	BL CROSS	15	20.0	10.69	53	18.9	5.43	147	22.4	3.45	108	22.2	4.02	45	33.3	7.11	368	23.1	2.20
	OTH INSR	46	15.2	5.35	327	20.2	2.22	623	23.4	1.70	468	30.6	2.13	163	33.1	3.70	1627	25.6	1.08
	NKP HMO	31	22.6	7.63	141	26.2	3.72	294	24.5	2.51	168	29.2	3.52	60	31.7	6.06	694	26.5	1.68
	SELF PAY	54	7.4	3.60	188	18.6	2.85	205	15.6	2.54	115	26.1	4.11	63	27.0	5.64	625	18.9	1.57
	INDIGENT	4	0.0	0.00	22	18.2	8.42	25	8.0	5.54	11	18.2	12.20	9	55.6	17.57	71	18.3	4.62
	KP NCR	11	18.2	12.20	47	8.5	4.11	56	26.8	5.97	40	30.0	7.34	24	37.5	10.09	178	23.6	3.19
	KP SCR	29	17.2	7.14	88	15.9	3.92	130	26.2	3.87	103	23.3	4.19	50	28.0	6.41	400	22.8	2.10
	OTHERS	38	21.1	6.70	91	22.0	4.36	82	22.0	4.60	32	21.9	7.42	15	26.7	11.82	258	22.1	2.59
	TOTAL	476	16.4	1.70	1420	20.2	1.07	1924	22.0	0.94	1255	26.5	1.25	523	30.0	2.01	5598	22.8	0.56