Chapter 19

CHILD HEALTH IN DEVELOPED COUNTRIES*

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Contents

Abstract

This chapter provides an overview of the literature on child health in developed coun-
tries. I first lay out a simple economic model of the demand for child health inputs, and
discuss whether the evidence is consistent with that model. Next, two main causes of
market failure in the market for child health inputs – lack of information and external-
ities – are analyzed. These failures may provide an economic rationale for government
intervention in the market for health care. Much of the literature on child health has
focused on one such intervention, the provision of public health insurance. However,
the utilization of health care is only one input into the production of child health, and
it is far from the most important input for most children. Hence, the last section of this
chapter offers a brief review of what we know about the effects of government interven-
tions designed to address other threats to child health. The chapter concludes with some
opinions about useful direction for future research and data collection efforts.

Keywords

children, infants, health

JEL classification: I12, I18, I11

1. Introduction

What can economics bring to the study of child health? Some possible answers are: the recognition that people respond to economic incentives; the idea that expenditures on child health can be regarded as investments by families and societies; the concept of market failures and the resulting theoretical justification of government intervention in the market; and the idea that cost-effectiveness is a criterion for making social choices.

While the relevant economic theory can be applied in any setting, this review focuses on child health in developed countries. The primary reason is that there are several excellent recent surveys dealing with child health in developing countries [cf. Behrman and Deolalikar (1988) and Strauss and Thomas (1998)]. In contrast, recent changes in the health insurance coverage of low-income children in the United States have sparked renewed interest in research on children's health in rich countries, and this research has not yet been summarized. Much of this work relies on changes in US institutions to identify econometrically the effects of interest. While the institutions themselves may be of limited interest to non-Americans, the broader conclusions that can be drawn about the determinants of child health are of general interest, as are the identification strategies that have been employed. A second body of recent literature focusing on child health in developed countries deals with the relationship between child health and adult health and well-being, and with the overall relationship between inequalities in health and inequalities in economic status.

Although many of the relevant theoretical and empirical issues are the same, there are also important differences in the way child health has been examined in rich and poor countries. First, studies of children in developing countries often look at objective measures of child health such as nutrient intakes, height, weight, or arm circumference. In contrast, studies of children in richer countries often focus on the utilization of care and maternal reports of child health. Reliance on measures of this type creates special problems. For example, both utilization of care and maternal awareness of some conditions rise with maternal education, so that while objective health status can be expected to improve with maternal education, reported health may actually decline [cf. Dow et al. (1997)].

Second, the responsiveness of child health to changes in the level of various health "inputs" can be expected to be highly non-linear. For example, at very low levels, small increases in caloric intake will save lives and prevent disease, while at higher levels, small increases in the number of calories consumed might lead to weight gain but pose no immediate threat to health. Similarly, children without any doctor visits can be presumed to be going without preventive and palliative care, but it cannot be assumed that increasing the number of doctor visits from, for example, 3 to 4 per year will have any measurable effect on health. Since children in richer countries generally consume health care at a higher level than children in poorer countries, we might expect the size of any measured effects of changes in health inputs to be smaller.

This chapter first lays out a simple model of demand for child health inputs (in Section 2) and then discusses evidence consistent with that model (in Section 3). Section 4

discusses two main causes of market failure in the market for child health inputs – lack of information and externalities. These market failures provide an economic rationale for government intervention in the market for health care. Section 5 discusses one of the most common forms of intervention in the health care market, the provision of public health insurance.

However, the utilization of health care is only one input into the production of child health, and there is overwhelming evidence that in most cases it is far from the most important input. Improvements in standards of living, advances in knowledge about disease and hygiene, and public health measures such as improved sanitation and the provision of clean drinking water have done more to improve child health in the past 150 years than even the most spectacular advances in personal medical care [Preston (1977), Mokyr (1998)].

Accidents and violence are the major killers of young children in wealthy countries after the first year of life [MacArthur and Pless (1990)]. Accidents are often viewed as unavoidable and violence is seen as a problem for the criminal justice system rather than a public health problem [cf. Rosenberg et al. (1990)]. Yet variation in rates of death from these causes across countries suggest that many deaths could be prevented. For example, in the US there are approximately 10 deaths per 100,000 per year from external causes compared to 4.3 deaths per 100,000 in the Netherlands [Williams and Miller (1992)].[1] Moreover, substance abuse and poor eating habits threaten children from conception and beyond.

Hence, Section 6 moves beyond the narrow focus on insurance coverage and the utilization of care that has occupied so much of the literature and offers a brief review of what we know about government interventions designed to address other threats to child health. One of the main conclusions of this review is that economists interested in child health should pay more attention to these public health issues. Overall conclusions are presented in Section 7.

2. A simple economic model of the demand for child health inputs[2]

In the standard economic model of the determinants of child health, parents are assumed to maximize an intertemporal utility function such as:

$$\sum_{t=1}^{T} E_t (1/1 + \sigma)^t U_t + B(A_{T+1}), \tag{1}$$

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[1] Some of the difference is accounted for by a much higher rate of deaths in motor vehicle accidents in the US (5 per 100,000 in the US compared to 2.5 per 100,000 in the Netherlands). Some of this difference in turn may be due to differences in patterns of motor vehicle use, rather than to differences in required safety equipment or driver education for example.

[2] The model in this section is drawn with small alterations from Blau (1996).

where σ is the discount rate, B is a bequest function, A denotes assets, and U_t is given by:

$$U_t = U(Q_t, C_t, L_t; X_t, u_1, \varepsilon_{1t}),\tag{2}$$

where Q is the stock of child health, C is consumption of other goods, L is leisure, X is a vector of exogenous taste shifters, u_1 is a vector of permanent individual specific taste shifters, and ε denotes a shock to preferences. Utility is maximized subject to the following set of constraints:

$$Q_t = Q(Q_{t-1}, G_t, V_t; Z_t, u_2, \varepsilon_{2t}),\tag{3}$$
$$C_t = Y_t - P_{gt}G_t - (A_{t+1} - A_t),\tag{4}$$
$$Y_t = I_t + w_t H_t + r A_t,\tag{5}$$
$$L_t + V_t + H_t = 1,\tag{6}$$

where G and V are material and time inputs into health production, Z is a vector of exogenous productivity shifters, u_2 are permanent individual specific productivity shifters, ε_{2t} is a productivity shock, Y is total income, P represents prices, I is unearned income, w is the wage, H is hours of paid work, r is the interest rate, and endowments of health and assets, Q_0 and A_0 are assumed to be given. Equation (3) can be interpreted as a "production function" for child health which describes the way that inputs are can be converted into health.

Health inputs are valued by consumers not for their own sake, but because they affect child health, which in turn has a direct effect on parental utility. Non-market time is an input into both health production and the production of other valued non-market goods (i.e. leisure activities). This model is dynamic in the sense that the stock of child health today depends on past investments in health, and on the rate of depreciation of health capital (which is one of the elements of u_2).

The model can be solved to yield Frisch demand functions for C_t, H_t, G_t, and V_t of the following form:

$$C_t, H_t, G_t, \text{ and } V_t = F(\lambda_t, X_t, Z_t, w_t, P_t, M_t, r, \sigma, u_1, u_2, \varepsilon_{1t}, \varepsilon_{2t}),\tag{7}$$

where λ_t is the marginal utility of wealth and M_t is a vector of moments of the distribution of $\{X_k, Z_k, w_k, P_k, \varepsilon_{1k}, \varepsilon_{2k}\}$, and $k = t + 1, \ldots, T$.

Substituting the solutions for G and V into (3) yields a Frisch demand function for Q_t that is conditional on Q_{t-1}:

$$Q_t = Q^*(Q_{t-1}, \lambda_t, X_t, Z_t, w_t, P_t, M_t, r, \sigma, u_1, u_2, \varepsilon_{1t}, \varepsilon_{2t}).\tag{8}$$

Repeated substitution of lagged versions of (8) into (9), yields a Frisch demand for Q_t that is not conditional on Q_{t-1}:

$$Q_t = Q^{**}(Q_0, \lambda_t, J_t, X_t, Z_t, w_t, P_t, M_t, r, \sigma, u_1, u_2, \varepsilon_{1t}, \varepsilon_{2t}),\tag{9}$$

where $J_t = \{X_k, Z_k, w_k, P_k, \varepsilon_{1k}, \varepsilon_{2k}\}$, and $k = 1, \ldots, t-1$.

Finally, substituting in the determinants of λ_t yields a Marshallian demand function for Q_t:

$$Q_t = Q^{***}\left(Q_0, A_0, J_t^*, X_t, Z_t, w_t, I_t, P_t, M_t^*, r, \sigma, u_1, u_2, \varepsilon_{1t}, \varepsilon_{2t}\right), \tag{10}$$

where M_t^* is a vector of moments of the distribution of $\{X_k, Z_k, w_k, I_k, P_k, \varepsilon_{1k}, \varepsilon_{2k}\}$, and $k = t+1, \ldots, T$ and $J_t^* = \{X_k, Z_k, w_k, I_k, P_k, \varepsilon_{1k}, \varepsilon_{2k}\}$, and $k = 1, \ldots, t-1$.

This model can be considerably simplified by assuming that the elements of M_t^* are functions of current and past realizations of the exogenous variables. In panel data, we can also control for $Q_0, A_0, r, \sigma, u_1, u_2$ by including a child-specific fixed effect, η to yield the following reduced form demand for health:

$$Q_t = Q'\left(J_t^*, X_t, Z_t, w_t, I_t, P_t, \eta, \varepsilon_{1t}, \varepsilon_{2t}\right). \tag{11}$$

Alternatively, we could start with (8), allow the elements of M_t to be functions of current and past realizations of the exogenous variable, and capture $\lambda_t, r, \sigma, u_1, u_2$, with either a child-specific or family specific fixed effect to arrive at:

$$Q_t = Q''\left(Q_{t-1}, J_t^*, X_t, Z_t, w_t, P_t, \eta, \varepsilon_{1t}, \varepsilon_{2t}\right). \tag{12}$$

This simple model yields several insights. First, consumption of child health inputs will fall as the price of these inputs rises. This observation can be used to lend structure to discussions of "access" problems, for example. Large distances to providers, waiting times, transportation problems and so on, can all be interpreted as things that raise the "price" of health inputs and thus lower their utilization. Second, child health this period depends on child health last period, which in turn reflects past health inputs. Thus, the choice of inputs today will affect health not only today, but also in future. It is this feature of the model that leads us to view health as an investment. Third, in this model health care is not itself an outcome that provides utility. It is merely one of many inputs into the production of healthy children. This perspective suggests that the literature should place more focus on health outcomes, and on the relationship between inputs and outputs rather than viewing the provision of health inputs as an end in itself.

Drawing out the relationship between health inputs and outcomes is however, easier said than done. The fact that we do not know the form of the health production function is one reason that it is so difficult to estimate a structural model of the type laid out above. A second problem is that even if we knew all of the inputs, we would be hard pressed to come up with adequate measures of most of them. Other problematic issues include the endogeneity of some of the factors that affect household budget constraints (such as marital status and number of children), and the correct modeling of bargaining within the households (since mothers and fathers may place different weights on child health).

3. Evidence regarding the utility of the simple model

3.1. The Law of Demand

There is a great deal of evidence that the "Law of Demand" holds when it comes to the health care utilization of children: Higher consumer prices mean less care. Perhaps the most compelling evidence regarding the relationship between utilization of care and the price of medical care *per se* comes from the Rand Health Insurance Experiment.[3] This experiment, conducted from the mid 1970s to the early 1980s, covered approximately 2,000 non-elderly families. Families were assigned to one of 14 insurance plans which varied the prices of available services: Some families had access to free care, while others faced varying degrees of cost sharing.[4]

The results of the experiment suggested that the price elasticity is non-linear in income: There was no significant response to cost sharing among non-poor children, while for poor children, there were significantly fewer claims for several diagnoses under cost sharing. The reduction in claims for preventive services (vision examinations and general medical exams) and for illnesses that may have deleterious long-term effects if untreated (ear infections, acute upper respiratory infection, acute bronchitis, and various injuries) was particularly noteworthy. Cost sharing was also found to reduce the probability of immunization: 59% of children in the free care program were fully immunized by 18 months, compared to 49% in the cost-sharing program. What may be most remarkable about these immunization figures however, is how low they are even for the free care group. They provide strong evidence that monetary costs are not the only barrier to obtaining recommended preventive care.

In a further exploration of these results, the experimenters divided diagnoses into categories ranging from those for which care was "rarely effective" to those for which care was "highly effective". They found that cost sharing reduced the propensity to seek "rarely effective" care for all children. However, among poor children, the probability of making at least one claim for "highly effective" outpatient care was 56% of the probability among those with free care. The equivalent figure was 85% for non-poor children.

Additional evidence on the relationship between the consumer price of care and utilization comes from non-experimental comparisons of the Medicaid and non-Medicaid populations. Since 1965, Medicaid has been the main system of public health insurance for low income women and children in the United States. It differs from many sources

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[3] Some of the results of the RAND Health Insurance Experiment have recently been replicated in a non-experimental setting by Matthew Eichner (1997). Eichner takes advantage of the fact that in families where one member has an accident that results in the insurance deductible being reached, other family members face much lower costs of medical care for the rest of the year. He finds an estimated elasticity of demand of -0.32, somewhat larger than those obtained from the RAND experiment.

[4] For further information about the design of the experiment, see Newhouse and the Insurance Experiment Group (1993).

of private insurance in that there are no copayments or deductibles, and all preventive services are covered. Thus, the model would lead one to predict that children on Medicaid were at least as likely to receive care as those with private insurance. The evidence on this point is somewhat mixed however. Himmelstein et al. (1995) find that children on Medicaid are similar to the uninsured in terms of their probability of being inadequately immunized. On the other hand, St. Peter et al. (1992) report that poor children on Medicaid were more likely than other poor children to have a usual source of care and to receive routine care within appropriate time intervals.

These mixed results may be due in part to the fact that children on Medicaid are likely to differ from other children in unobserved ways. Currie and Thomas (1995) use data from the National Longitudinal Survey of Youth (NLSY) to follow the same children over time. They show that becoming covered by Medicaid increases the probability of receiving sick visits to the doctor as much as private health insurance, but that it has a *greater* effect on well visits. This is consistent with the theory since many private health insurance plans pay for sick visits but not for well-child visits.

A second complication is that the fees that providers receive for treating Medicaid patients are often as much as 50% lower than those they would charge privately insured patients. Thus, Medicaid patients may experience significant difficulties finding physicians who are willing to treat them [cf. Currie, Gruber, and Fischer (1995)]. One quarter of US doctors report that they do not accept Medicaid patients in their practice [Rowland and Salganicoff (1994)]. Among pediatricians, 23% do not participate in Medicaid and 40% limit the number of Medicaid patients in their practices [Yudkowsky, Cartland, and Flint (1990)]. Perhaps as a result, children on Medicaid are less likely to be seen by private physicians, and more likely to be seen in hospital emergency rooms and outpatient clinics. Decker (1992) finds that private doctors who do treat Medicaid patients typically spend less time per patient than other doctors. Zambrana et al. (1994), Riportella-Muller et al. (1996), and Brown (1989) all cite unfriendly or unsympathetic providers as a barrier to care. These differences suggest that measurement of the effects of price changes may be complicated by the fact that poor parents may "purchase" health care of different quality than wealthier parents.

Barriers to care such as transportation problems, long waiting times, language or cultural problems, and lack of child care for other children, are often cited as particularly salient for low income parents [cf. Zambrana et al. (1994), Riportella-Muller et al. (1996)]. As discussed above, these barriers can be regarded as increasing the effective "price" of medical care, and they may obscure the relationship between measured price and quantity demanded if they are ignored. We observe large differences in the utilization of care by socio-economic status even in countries with universal health insurance coverage. This suggests that non-monetary barriers to care may be extremely important. Yet virtually no research has been conducted examining the relevance of these factors in a multivariate context. Currie and Reagan (1998) provides one exception. They show that among central-city black children, the probability of having had a routine doctor's checkup in the past year decreases with distance to hospital, suggesting that this group is particularly reliant on hospitals for primary care.

In principle, further information about the effects of price of care on utilization could be obtained by studying the growth of "managed care" in the United States. Both the privately and publicly insured are increasingly enrolled in some form of managed care. Much of the growth in managed care among Medicaid patients has resulted from the liberalization of federal rules governing the Medicaid program in 1993. These changes permitted state governments to conduct trials in which some federal regulations covering Medicaid (such as regulations that ensure freedom of choice of providers) are waived, in return for expansions in the proportion of the population that is covered. Between 1993 and 1994, the fraction of the Medicaid population enrolled in managed care grew from 14 to 23% of the caseload. Currently, over half of the Medicaid enrollees in California and New York are in some form of managed care, and most of those enrolled in managed care are low income women and children, rather than elderly or disabled Medicaid recipients.

In many managed care systems, services are only paid for if they are approved by a "gatekeeper" physician. But since all approved services are paid for in full (or with only minimal co-payments), the plan has an incentive to promote the utilization of preventive care while limiting or eliminating unnecessary use of more specialized care. However, the evidence to date is mixed. A 1995 review of over 130 studies of Medicaid managed care by the Kaiser Foundation [Rowland et al. (1995)] found that it reduced utilization of emergency room and specialist care, but did not lead to any consistent changes in the overall number of doctor visits. Similarly, access to preventive care did not seem to consistently rise or fall, and remained lower for the Medicaid population than for the non-poor population.

Several US General Accounting Office reports (1990a, 1995b) have criticized quality control standards in Medicaid managed care plans. For example, the 1995 study found that California had no way of verifying whether children in these programs had actually received necessary preventive services or not. Problems with quality control may be particularly acute in the Medicaid population for several reasons. First, it is possible that "churning" of the Medicaid caseload reduces a provider's incentive to control long-term costs by promoting preventive care. In the past Medicaid coverage was related to receipt of cash welfare. Since most welfare spells are short, most new Medicaid enrollees could be expected to be on the program for relatively short periods. Short, Cantor, and Monheit (1988) found that fewer than half of Medicaid enrollees were covered for a continuous 32 month period. I am not aware of comparable figures for privately insured children, but since the average worker spends more than 20 years at his or her longest job, there is reason to believe that children with private, employer-provided coverage might enjoy a more stable source of insurance coverage. Nor is it clear how recent expansions of Medicaid to persons of higher income and welfare reform may have affected stability of coverage among the Medicaid-eligible. However, there is reason to suspect that these changes may have increased churning since women on welfare may find it easier to document their eligibility than women who are not. The evidence from states that have started to enforce time limits suggests that many women who remain eligible for Medicaid have lost their benefits due to such administrative problems [Rubin (1997)].

3.2. Health as an investment

There is growing evidence that child health affects adult health, although the extent to which children can recover from some insults to their health (for example, those caused by under-nutrition) early in life is controversial. Indeed, some researchers believe that health in the womb affects adult health. David Barker and his colleagues have linked a number of adult disorders, including heart disease, to under-nutrition of the mother during critical gestational periods [cf. Barker and Martyn (1992)]. Animal studies suggest that stressful events or positive stimulation during "critical periods" can have long-term effects on brain chemistry and on the endocrine system with resulting effects on health [Hertzman and Wiens (1996)]. Since health affects wages and labor force participation [cf. Currie and Madrian (1999)], poor health in childhood can lower future utility directly by affecting future health, and indirectly by lowering future wages and participation.

Child health may also be linked to adult labor market success, through its effects on schooling [cf. Grossman (1975), Perri (1984), Wolfe (1985), Wadsworth (1986) and Grossman (2000)]. Some of this effect may be direct, through lost school days, while some of it may be indirect, through effects on cognition.

Many studies find positive effects of anthropometric measures of health such as birthweight, weight, height, head circumference, and absence of abnormalities on the cognitive development (measured using test scores) of children of various ages.[5] For example, Broman, Nichols and Kennedy (1975) look at 4 year olds; Edwards and Grossman (1979) examine white children 6 to 11 years old, Shakotko et al. (1981) look at teenagers, while Wilson et al. (1986) examine children over 12 years old. Chaikind and Corman (1991) and Rosenzweig and Wolpin (1994) look at the effects of birth weight on later cognitive achievement. Outside of economics, the volume of literature on this subject is even greater [cf. Brooks-Gunn et al. (1993), McCormick (1992)].

Kaestner and Corman (1995) examine tests of cognition and find positive effects of birthweight, and negative effects of stunted growth (e.g., weight or height less than the 10th or 25th percentiles) in models estimated using cross-sectional data. These effects largely disappear when child fixed effects are added to the model; however, given the large amounts of measurement error in the test scores this result is perhaps to be expected. Alternatively, Kaestner and Corman suggest that their results may be weaker than those of Rosenzweig and Wolpin (who use the same NLSY data) because Rosenzweig and Wolpin focus on a subsample of more disadvantaged children. That is, the

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[5] Birthweight is the single most important indicator of infant health since children of low birthweight (birth weight less than 2500 grams) experience post-neonatal mortality rates 10 to 15 times those found among infants of normal birthweight [US Office of Technology Assessment (1987)]. Weight can respond quickly to changes in child health, and so is often regarded as a shorter-term measure of well-being than height, which responds more slowly. Anthropometric measures like these reflect not only the effects of under-nutrition, but also the effects of illness, since frequent illness interferes with growth. See Martorell and Habicht (1986) for more discussion of the interpretation of various anthropometric measures.

ill effects of poor health on cognition may be greater for more disadvantaged children than for children who are better off. All of these studies focus on US children. Korenman, Miller, and Sjaastad (1995) also find positive relationships between anthropometric measures and various measures of cognition in the NLSY data, and note that the effects are particularly large for short-term memory.

The Kaestner and Corman paper also examines the effects of several maternally reported measures of child health including the presence of a serious illness and the number of illnesses requiring medical attention. The former has a negative effect on cognitive outcome measures in cross-sectional models, whereas the latter has no consistent effect. Maternal reports are subject to a number of sources of bias. First, more educated and higher income mothers are likely to take their children to the doctor more frequently, even though we would expect their children to be in better health. Second, greater contact with health care providers may result in a higher probability of some diagnoses (such as asthma). Third, mothers who report themselves to be in poor health, may be more likely to report poor health in their children, whether or not the children are actually sick [cf. Strauss and Thomas (1996)]. It is possible though that a dichotomous measure of whether or not there is a serious illness is more accurately reported than the objective number of illnesses.

This discussion suggests that investments in child health do pay off in the form of better adult health, and superior educational outcomes. It also highlights important measurement issues that are ubiquitous in this literature. Results may depend on whether maternal reports of health status (e.g., good, fair, poor) or more intrinsically objective measures such as height and weight are used. And even when more objective measures are chosen, it is important to determine whether or not they are directly observed or based on maternal reports. Strauss and Thomas (1996) give an interesting example from the NLSY. In some cases, maternal reports of heights and weights were used rather than direct measures. Maternal reports were more likely to be used for more educated mothers. But since children grow, maternal reports tend to understate child height. Thus, there is a spurious negative relationship between maternal education and child height and weight in these data.

4. The importance of failures in the market for child health

While the simple economic model of household decision making is useful for understanding many aspects of the demand for health care, the health care market is a great deal more complex than the market for oranges, for example. Important differences arise because of market failures, especially imperfect information and the presence of externalities.

4.1. Imperfect information

There is a strong presumption in the medical literature that many parents lack appropriate information about the care their children need. It has been shown, for example,

that the advice received during prenatal care visits can have a significant impact on the incidence of low birth weight [Kogan et al. (1994)]. And home visiting programs, which generally stress parent education as well as the monitoring of at-risk children, have been shown to improve child health along a number of dimensions including reductions in the risk of injury and improvements in cognition [cf. Gomby et al. (1993)]. The evidence regarding under-immunization of preschool children in the United States is also suggestive of a lack of information: Most under-immunized children visited their health care providers 6 to 8 times during a given year [US General Accounting Office (1995a)] but did not receive recommended shots, perhaps because parents did not realize that they should receive them. Miller et al. (1994) present more direct evidence that children of parents who did not know the recommended age for Measles–Mumps–Rubella vaccination were more likely to have delayed immunizations, although the direction of causality is not clear. Finally, there is a good deal of evidence that the probability that a child receives recommended preventive medical and dental care increases with maternal education, regardless of family income and family structure [Zill (1996)]. Thus, lack of knowledge on the part of parents is one explanation for under-utilization of preventive care.

A key insight of models of physician-induced demand such as those of Pauly (1980) and Dranove (1988) is that asymmetric information can also lead to excessive consumption of medical services if physicians take advantage of their superior information to "sell" services that patients do not need. In Dranove's (1988) model, this capacity to sell services is limited by the fact that patients will not always buy them – doctors who over-prescribe treatments may develop a reputation that causes patients to view their recommendations with skepticism. In the model, the extent of demand inducement is shown to be higher for services that have high clinical value when they do happen to be warranted. For example, antibiotic treatments are very effective for bacterial infections but not at all effective against viruses, and so the model might predict that antibiotics would be over-prescribed. Demand inducement also rises with the supply of physicians. Inducement falls with the price of the service and with increases in the patient's diagnostic skills, which in turn may be correlated with the patient's level of education and income.

This model suggests that there may be considerable scope for inducement in the market for children's health care: Most services required by children are inexpensive, and services such as antibiotic treatments for ear infection may have high clinical value when they are warranted. Moreover new parents, in particular, may lack diagnostic skill. There is evidence that medically inappropriate pediatric hospitalizations are sensitive to insurance status – one study found that among the uninsured, 14% of pediatric hospital days were inappropriate compared to 22% of hospital days among children with insurance [Kemper (1988)]. The results of the RAND Health Insurance Experiment are also broadly consistent with some of these predictions: Cost sharing reduced demand more among the poor than among the rich, and the demand for less effective services fell by more than the demand for highly effective services. However, these differences were not statistically significant among children.

Models of induced demand are premised on the idea that doctors have better information than parents. But the fact that it is difficult for doctors to assess adequately the risk status of patients without agreeing to see them is a form of asymmetric information that may also contribute to inadequate health care for children. One possible reason is that doctors may use public insurance as a marker for "high risk". Patients with public insurance are generally poor and more likely to suffer from other factors that place them at risk. If doctors use insurance status to screen out potential patients, then they are in effect practicing a form of statistical discrimination because they cannot observe actual risk status without treating the patient.

This observation suggests that even if there were no difference in fees between public and private insurers, higher costs of treating high-risk patients might still lead to a "two-tier" system in which some doctors opted out of the public program, or otherwise acted to limit their involvement with low-income patients. Physicians have been found to spend more time with patients who are "well-groomed" [Hooper et al. (1982)], and poverty and minority status have been found to have effects on children's access to care that are independent of insurance status [Newacheck et al. (1996)]. Travis (1996) finds that increases in Medicaid fees paid to physicians in Washington state increased utilization of prenatal care for whites and Hispanics but not for blacks. While discrimination is not the only explanation for this pattern of results, it is certainly consistent with them.

Seminal papers in the asymmetric information literature focus on lack of information among insurers [cf. Akerlof (1970)]. If insurers cannot distinguish high-risk from low-risk individuals, then at any given price it will be the higher risk individuals who purchase insurance. Insurers will be forced to keep raising the price of insurance until the market fails and insurance becomes unavailable. The health insurance market seems to function in such a manner in the United States – families that do not receive public insurance, and are unable to purchase insurance in large pools created by employers, often remain uninsured because the price of insurance is unaffordably high.

A final possibility is that appropriate information about medical care is simply lacking on all sides. For example, a recent survey of US pediatricians found that one quarter did not understand that breast milk is the best food for infants, and 40 to 50% did not know that supplementary feedings in the first weeks of life can lead to breast-feeding failure [Freed et al. (1995)].

4.2. Externalities

The most obvious externalities are related to the transmission of disease – children who receive inadequate care and become ill may pose a serious threat to others. Parents who do not take account of costs imposed by these externalities may not provide the optimal level of care for their children [cf. Philipson (1996)]. It is also possible that parents, who must trade off child welfare against other goods, will not choose the level of investment in health care that the child would choose if he or she were able to make his or her own decision. This too can be regarded as an externality. Finally, as long as society feels an obligation to provide emergency care for children as well as services for children with

special needs, then inadequate prenatal care or primary care of children will impose fiscal externalities on all taxpayers.

There is a good deal of evidence that children in the United States have not been receiving optimal levels of at least some forms of preventive care. During 1989 and 1990 the United States experienced a measles epidemic among preschoolers that led to 43,000 cases and more than 100 preventable deaths. Since measles is the most contagious of the vaccine-preventable diseases, this increase may signal that many children are also vulnerable to pertussis, polio, mumps and rubella [The National Vaccine Advisory Committee (1991)]. Indeed, the incidence of pertussis (whooping cough) also rose in the late 1980s and early 1990s [US Centers for Disease Control and Prevention (1992)].

Low birthweight, smoking while pregnant, drug-exposure *in utero*, lead poisoning, and anemia are all preventable, and can lead to cognitive deficits that impair children's school performance, increasing costs for special education and possibly for social programs down the road [Chaikind and Corman (1991), Olds et al. (1994), Hoyme et al. (1990), Parker (1989), Needleman et al. (1996)]. For example, Chaikind and Corman find that in addition to any extra medical costs incurred by children of low birthweight, these children are 50% more likely to be enrolled in special education classes. They calculate that these extra enrollments raised special education costs by $371 million dollars in 1989. The risk of abnormal neurodevelopmental handicaps is 3 times higher among low birthweight infants (those less than 2,500 grams) and 10 times higher among infants of very low birthweight (those less than 1,500 grams). The rate of impairment approaches 25% among very low birthweight infants, and includes survivors with mental retardation, cerebral palsy, blindness, and deafness.

Low birthweight and exposure to illicit drugs are also linked to higher neonatal medical costs. One hospital reported a median cost of $5,500 1990 dollars per drug-exposed infant compared to $1,400 for an infant who had not been exposed. These infants have longer hospital stays, are more likely to end up in intensive care, and between 25 and 60% of them will require foster care [US General Accounting Office (1990b)]. Lead poisoning has been linked to delinquency in children and teenagers and to adult criminality, which clearly imposes externalities on those outside the affected individual's family [Needleman et al. (1996)].

Preventable hospitalizations and inappropriate use of expensive emergency room care also impose high costs on society. Casanova and Starfield (1995) find that the rate of pediatric hospitalizations for ambulatory care sensitive conditions is lower in Spain, a country with universal health insurance, than in the United States. They attribute this finding to greater utilization of primary preventive care and to the availability of outpatient alternatives to hospitalization in Spain. Lower socio-economic status (SES), reliance on neighborhood clinics for well-child care, and living in an area with relatively few primary care physicians are all correlated with a reliance on emergency rooms for routine sick care [Halfon et al. (1996)]. To the extent that parents are unable to pay for care in hospitals and emergency rooms, hospitals will pass on the costs to governments and to the privately insured. Uncompensated care is a significant expense for Ameri-

can hospitals: For example, Long, Marquis, and Harrison (1994) found that in 1989, bad debt and charity care accounted for about 9% of the costs incurred by hospitals for maternal and infant care.

5. The role of government in the market for child health: the provision of insurance coverage

These market failures create a case for government intervention to assure that all children get necessary preventive care. A good deal of research has been devoted to evaluating the sometimes unintended consequences of these interventions. Much of this research focuses on recent changes to Medicaid, the main US program providing insurance to low-income children. Because health insurance coverage for low-income children has been phased in gradually in the US, it is possible to use differences across states and over time to analyze the effects of providing insurance. In contrast, most European countries offer the analyst a single before/after comparison so that it is difficult to control for other confounding factors. Moreover, attempts to measure the effects of health insurance by comparing countries with different systems are suspect because of the great differences in other factors across countries.

While there are also differences between American states, it seems reasonable to assume that these differences are smaller than those that exist between countries. Thus, one can view the recent changes in the United States as a unique opportunity to address some general questions about the effects of extending public health insurance to low-income children. This "experiment" can be used to address several questions. First, can it be shown that public insurance has a positive effect on the utilization of care and on children's health? Second, how efficiently is care provided under a means-tested public health insurance system? And third, to what extent do differences in access to care by socio-economic status stem from differences in the availability of health insurance?

5.1. Institutional background

The United States does not have universal health insurance coverage, but does have public insurance programs which cover the elderly, the disabled, and some women and children in poor families. Medicaid is the government program that covers the latter group. Medicaid was implemented in the late 1960s and early 1970s and was phased in at different rates across the states. From its inception until the mid-1980s, Medicaid coverage was tied to the receipt of cash welfare benefits. Income thresholds for welfare varied widely across states, but in general only female-headed households were eligible for benefits. Hence, as many as 30% of poor children lacked health insurance coverage [Bloom (1990)]. A good deal of research has established that uninsured children have lower utilization rates, a less efficient distribution of utilization across sites of care, and worse health outcomes [cf. Kasper (1986), Short and Lefkowitz (1992)].

   In response to this lack of coverage and to rates of mortality and morbidity among US children that were higher than in many other developed countries, the US government began expanding Medicaid eligibility to previously uncovered groups of pregnant women and children in the mid-1980s. By July 1, 1991, states were required to cover all children born after Sept. 30, 1983 whose family incomes were below the poverty line. Currie and Gruber (1996a) estimate that these Medicaid expansions roughly doubled eligibility for Medicaid coverage among women of child bearing age from 15 to 35%, while Currie and Gruber (1996b) find that eligibility among children increased from 15 to 30%. It may surprise readers who think of the US medical insurance system as primarily private to learn that approximately 40% of births were paid for by Medicaid in 1995 [National Governor's Association (1997a)].

   Typically, states were first given the option of extending coverage to specific groups, and then required to do so. The important point is that since states took up these options at different rates, and programs varied tremendously in terms of generosity to begin with, there has been a great deal of variation across states in both the income thresholds and the age limits governing Medicaid eligibility.[6] This variation in eligibility across states, years, and child age groups, can be used to identify the effects of eligibility for public insurance among the poor and near-poor children who became eligible.

5.2. Insurance and children's health

The least controversial measure of health is mortality. Mortality is affected both by underlying health status and by medical care received, and it is not possible to separate out these factors using mortality data alone. In the case of infants, it is possible to proxy underlying health status using birth weight. For example, Horbar et al. (1993) found that in a sample of very low birth weight children weighing between 601 and 1300 grams at birth, each increase in birth weight of 100 grams was associated with a decrease of approximately 10% in the probability of death, other things being equal. In contrast, infant mortality rates reflect not only the health of the fetus but also the effect of any interventions that occur during or after birth. New technologies have had dramatic effects on the survival rate of low birth weight infants. Buehler et al. (1985) report that improvements in birth weight-specific mortality rates accounted for 91% of the overall decline in neonatal mortality in the US between 1960 and 1980.

   Though it is effective in saving lives, high-tech neo-natal care is very expensive[7] and surviving low birth weight babies are at increased risk of handicaps such as cerebral

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[6] This point can be illustrated with reference to 11 of the largest states. As of January 1988, 8 of these states had taken advantage of the option to extend Medicaid coverage to previously ineligible children. By December 1989, all 11 of them had done so. However there was still a great deal of variation across states in the generosity of the program. For example, Pennsylvania had extended coverage to children up to 6 years old in families with incomes below 100% of the poverty line, while New York only covered children up to one year old, but extended coverage to infants in families with incomes up to 185% of the poverty line.

[7] For example, in 1984, the cost of caring for a surviving baby less than 2500 grams in the US was $9,712 compared to $678 for a heavier infant [Office of Technology Assessment (1987)].

palsy of significant degree, major seizure disorders, blindness, deafness, and learning disabilities [McCormick et al. (1992)]. Hence, for both humanitarian and economic reasons, the best way to reduce infant mortality is to reduce the incidence of low birth weight and pre-term delivery through appropriate use of preventive prenatal care.

Accordingly, Currie and Gruber (1996a) focus on the recent extensions of Medicaid eligibility in the US to pregnant women and infants and ask whether these extensions reduced the incidence of low birth weight in addition to reducing the infant mortality rate. They use state rules to calculate the fraction of 15 to 44 year old women in the March Current Population Survey (CPS)[8] who would be eligible for Medicaid coverage in the event of pregnancy in each state and year from 1979 to 1990. They then estimate models in which the fraction of low birth weight infants in the state, and the state infant mortality rates are functions of the fraction of women who are potentially eligible. State and year dummies are included in the models in order to control for any state or year specific determinants of mortality.

A possible drawback to this strategy, is that the since Medicaid is means-tested, the actual fraction eligible for Medicaid may depend on business cycle effects, or on omitted variables specific to states and years. It is possible to construct an eligibility measure that reflects only variations in state rules by using a nationally representative sample and calculating the fraction of women in this sample who would be eligible for Medicaid in each state and year. This "simulated eligibility" measure will be exogenous as long as state rules can themselves be treated as exogenous variables. The plausibility of this assumption is bolstered in this case by the fact that much of the change in legislation (though not all) was in response to federal mandates, and thus not directly under the control of state legislators. An additional advantage of this procedure is that sampling variation due to the fact that there are small cell sizes in some states and years is eliminated.

Use of this simulated measure suggests that the estimated effect of Medicaid eligibility is indeed biased towards zero when actual eligibility is used. Hence, the fraction eligible is positively correlated with omitted characteristics of states (such as poverty) that are themselves correlated with poor birth outcomes. Estimates using the simulated eligibility measure suggest that the observed 20 percentage point increase in eligibility over the 1980s reduced the incidence of low birth weight by 2% and the incidence of infant mortality by 8.5%. Cole (1994) reports similar results regarding the incidence of low birthweight using county-level data.

This finding supports an earlier study by Hanratty (1996) which showed that the introduction of universal health insurance in Canada was associated with a decrease in the infant mortality rate.[9] As in the US, health insurance was adopted by the Canadian

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[8] The CPS is used to generate unemployment rate figures and many other government statistics. About 100,000 individuals are surveyed each month, but the nature of the questionnaire changes from month to month and the most detailed demographic information is asked in March.

[9] In 1966, the federal government passed the Medical Care Act which offered federal funding to all provinces that introduced comprehensive universal coverage. Between July 1, 1968 and April 1, 1972, all the Canadian provinces took up this offer.

provinces at different rates. She also asked whether the introduction of national health insurance increased birthweights, with ambiguous results.

It is more difficult to document a relationship between public insurance coverage and health among older children. Currie and Gruber (1996b) explore this issue using data about children less than 15 years of age from the pooled 1984 to 1992 waves of the US National Health Interview Surveys (NHIS).[10] By combining household information with information about state laws and the child's age, it is possible impute Medicaid eligibility for each child. Perhaps the most useful measure of utilization available is whether or not the child has been to the doctor in the past 12 months. Since every child should receive at least one visit a year, this measure is a relatively clean indicator of utilization that is not confounded by morbidity.[11] On the other hand, it is not clear that the productivity of most visits (in terms of improvements in child health) is very high.

Perhaps surprisingly, Medicaid-eligible children are as likely to have at least some visits in the year as other children. However, they are much more likely to be reported by their parents to be in poor health. Hence, conditional on need, it appears that Medicaid eligible children may be less likely to receive care. The Medicaid children are also younger on average, which is to be expected given the way the expansions have been phased in covering younger children first – and one might expect younger children to have more doctor visits, other things being equal. Medicaid-eligible children are disadvantaged in most observable respects and it is also likely that they differ from other children in ways that are not observed, and that may be correlated with utilization of care and health status. Hence, simple comparisons of the effects of Medicaid eligibility on the variables of interest are likely to be subject to omitted variable bias.

In order to address this problem, Currie and Gruber (1996b) instrument individual eligibility using the simulated fraction of children in the same state, year, and age group who are eligible for Medicaid. Dummy variables for state, year, and each year of age, as well as interactions between age and state and age and year are included in both the first and second stage regressions. These variables control for characteristics of states, years, and ages that could be correlated with the outcome variables, as well as for omitted variables such as nation-wide technology changes or state programs affecting specific age groups. Using this instrumental variables procedure they find that Medicaid eligibility increases the utilization of care – the probability that a child did not receive a doctor's visit in the past year falls 10 percentage points from a baseline level of 19 percent. That is, becoming eligible for Medicaid is estimated to reduce the probability of going without a doctor's visit by more than half. In contrast, the OLS estimate is only 2.5 percentage points suggesting that these estimates are indeed biased towards zero by omitted variables.

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[10] The sample is limited to children less than 15 years of age to avoid complications due to "children having children" – under the Medicaid expansions teenage girls could become eligible for Medicaid coverage in the event of pregnancy, even if they were not previously eligible.

[11] On the other hand, number of doctor visits would not be a good measure of health, since conditional on measures of medical need, lower SES individuals get fewer visits [Aday (1975)].

Currie and Gruber (1996b) also estimate models in which aggregate state-level child mortality rates depend on the fraction of children eligible in each state, year, and age group.[12] Using this objective measure of child health they find that the 15% increase in the fraction of children eligible for public insurance between 1984 and 1992 was associated with 0.2 percentage point decline in child mortality, which translates into a 5.1% decrease in child mortality. Moreover, this difference is statistically significant for deaths from internal causes such as disease (which one might expect to be affected by medical intervention), but not for external causes such as accidents, homicides, etc.

In summary, the evidence in this section suggests that extending public insurance to pregnant women and children is associated with significant decreases in infant and child mortality, and with increases in the use of preventive care among children.

5.3. The efficiency of utilization of care

A second set of questions that can be posed is whether these improvements in health were "purchased" in the most efficient way possible? If it is true that "an ounce of prevention is worth a pound of cure" then we would hope that public insurance increased the use of preventive care as well as care for sick children. More generally, one might want to step back a bit further and ask whether spending money on providing medical care (of whatever variety) for children is the most cost-effective way to improve their health?

Cole (1994) tackles the question of whether insurance promotes preventive or palliative care directly by examining the effect of the Medicaid expansions on the use of prenatal care. She follows a two-step procedure. First, she regresses individual-level information about birth weight and prenatal care from American *Vital Statistics* records (1983 to 1990) on maternal characteristics. Then, she aggregates the residuals up to the county level, and regresses these measures on the fraction of Medicaid eligibles in the county and on other county characteristics. This procedure "nets out" variations between counties in the characteristics of their residents. In a sample of high poverty counties, she finds that an increase in the fraction eligible increased the use of prenatal care: The 20% increase in eligibility that took place over the 1980s is estimated to have reduced the fraction of women who delayed obtaining prenatal care beyond the first trimester from 22% to 17%.

She also aggregates the individual-level data by state, race, age group, and marital status, and alternatively by state, race, age group, and education group. These regressions show that among teenaged mothers and unmarried mothers the Medicaid expansions significantly increased the utilization of prenatal care and reduced the incidence of low birth weight and preterm births. Among these "at-risk" populations, a 20 percentage point increase in Medicaid eligibility was associated with a 25% decline in the number of women delaying prenatal care, and decreases in the incidence of low birth weight and preterm births of approximately 4% and 8%, respectively.

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[12] Data are available for two age groups: children 1 to 4 and children 5 to 14.

On the other hand, Currie and Gruber (1996a) find evidence that some groups of newly eligible pregnant women were not drawn into prenatal care. In particular, they distinguish between expansions that were targeted to very low income women who had been ineligible for Medicaid because of family structure (e.g., because they were married), and broader expansions that made women eligible by raising income thresholds. They find that only the more narrowly targeted expansions improved child outcomes although both types of expansions raised Medicaid costs. The targeted expansions raised expenditures for both outpatient and inpatient hospital services, while the broad expansions increased only expenditures on hospitals.

Why were the broader expansions to women of higher income less effective and what conclusions can be drawn from this about the efficacy of means-tested public health insurance programs? It appears that the broader expansions failed to increase Medicaid *coverage*.[13] That is, women who became eligible for Medicaid as a result of higher income thresholds did not take up their new benefits. On the other hand, poorer women did take up their benefits at about the expected rate.[14] These results hold even when the sample is restricted to women without private insurance coverage.

The problem may be due to the fact that women who became eligible as a result of higher income thresholds were unfamiliar with the social insurance system, and did not realize that they were eligible for Medicaid coverage. This interpretation is supported by case studies. For example, Piper et al. (1990) found that a 1985 expansion of eligibility in Tennessee increased Medicaid enrollments, but that most of the increase took place within thirty days prior to delivery.

Clearly, this represents a very inefficient pattern of usage. The women did not take advantage of the insurance to obtain prenatal care, but appear to have been enrolled when they arrived at the hospital to deliver. This pattern is consistent with increases in costs only for hospital services. The fact that coverage of pregnant women went up at all probably reflects the incentives that hospitals have to recoup the costs of treating otherwise uninsured women from the Medicaid program.[15]

Note that this example suggests that eligibility may have very different effects than coverage. Eligibility may affect the provider's incentives to provide certain services to women in labor or to children seeking attention in hospital clinics and emergency rooms.

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[13] Individuals were asked whether they were covered by Medicaid at any point in the past year. Currie and Gruber use each woman's socio-economic characteristics to calculate whether or not she would have been eligible for Medicaid in the event of pregnancy, under either the targeted or the broad expansions. Coverage is then regressed on eligibility. The models control for demographic characteristics and income as well as for state and year. There are approximately 456,000 observations. Their results regarding low take-up of means tested social insurance programs are consistent with those of Blank and Ruggles (1996) and Blank and Card (1991).

[14] They estimate that for every 100 women made potentially eligible under the targeted expansions, 9.6 took up their benefits, which represents almost full takeup given current fertility rates.

[15] Hospitals that accept any federal funds are not permitted to turn away a woman who is already in labor [US Office of Technology Assessment (1987)] and maternity care is the single largest component of uncompensated care for US hospitals [Saywell et al. (1989)].

Coverage also reflects the parent's decision to seek care. This distinction between the effects of eligibility and coverage does not arise in a system with universal health insurance coverage. But it is an important feature of the US system, and one that has been largely ignored to date.

In a related study using *Vital Statistics* data on every birth in the US over the 1987 to 1992 period, Currie and Gruber (1997) find that women who became eligible for insurance coverage of their pregnancies were more likely to receive a number of obstetrical procedures. There was however, little evidence of associated changes in the health of newborns except among women whose closest hospital had a Neonatal Intensive Care Unit. These results suggest that a considerable amount of the procedure use that is induced by increases in the generosity of public insurance coverage (e.g., increases in the use of Cesarean sections) may have only marginal health benefits.

While the studies discussed above focus on infants, Baker and Royalty (1996) use data from a longitudinal survey of California physicians observed in 1987 and 1991 and find that expansions of Medicaid eligibility to previously uninsured women and children increased the utilization of care provided by public clinics and hospitals but had little effect on visits to office based physicians. On the other hand, using the methods described above, Currie and Gruber (1996b) find some evidence that the eligibility expansions increased the number of visits to doctor's offices but did not affect the number of visits to other sites of care. In principle, one would like to shift visits from emergency rooms and hospital clinics to office-based physicians because in addition to possibly reducing program costs, such a shift would likely improve the continuity of care. But the question of whether or not such a shift has occurred remains open given the conflicting evidence and the limited amount of research to date.

Taken together, these studies suggest that while the expansion of insurance coverage to the low income population in the United States did improve infant and child health, it may not have done so in the most efficient way possible. They point to one important benefit of universal programs – if everyone is covered, people will not fail to seek care solely because they are unaware of their entitlements. In a system in which only some children are eligible, outreach may be very important. Several states have accompanied changes to their Medicaid programs with such programs. To the extent that people are aware of their eligibility but still fail to seek care, the elimination of other administrative barriers to becoming covered may also be warranted. In the same way that evaluations of the Medicaid eligibility expansions have contributed to our knowledge of the benefits and limitations of insurance coverage, evaluations of outreach programs and efforts to simplify administrative procedures could shed more light on the importance of other non-price barriers to care.[16]

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[16] See US General Accounting Office (1994) for a description of some of the problems facing people wishing to establish Medicaid eligibility.

5.4. Crowdout

In 1993, 67% of US children were covered by private health insurance provided primarily by their parent's employers, 20% were covered by Medicaid, and 13.5% were uninsured [US General Accounting Office (1995c)]. A good deal of recent research focuses on the issue of whether public insurance tends to "crowd out" private insurance. The figures on insurance coverage for children are extremely suggestive: Despite the dramatic increases in public insurance coverage discussed above, the fraction of children without insurance coverage has stayed remarkably constant in recent years because private health insurance coverage has fallen by the same amount that public insurance coverage has risen [US General Accounting Office (1995c)]. However, private health insurance coverage has also been falling among groups that one would not expect to be affected by the Medicaid expansions, such as single men. Thus, it is not obvious to what extent the relationship between increases in public insurance and decreases in private insurance is causal.

Estimates of the extent of crowdout are sensitive to the methods used to control for possibly pre-existing trends in the provision of private health insurance coverage. At the high end of the spectrum of estimates, Cutler and Gruber (1996, 1997) estimate that for every two people covered by the Medicaid expansions, one person lost private health insurance. However, some of these people (such as household heads who decided they would no longer purchase health insurance once their children became eligible) were not themselves eligible for Medicaid – so not all of the people crowded out ended up getting insurance at public expense. They calculate that in fact about 40% of those crowded out ended up on Medicaid. Other observers have posed the question somewhat differently, and come up with correspondingly different estimates. For example, Dubay and Kenney (1997) find that about 22% of the increase in Medicaid coverage came from people who used to be privately insured. Since not everyone who became eligible for Medicaid did so as a result of the expansions, this number is necessarily smaller than Cutler and Gruber's estimate. Finally, one might ask what share of the overall decline in private insurance coverage is a result of the Medicaid expansions. The answer to this question is about 15%, which suggests that a great deal of research remains to be done on the causes of this decline.

One issue obscured by the focus on crowdout is the fact that Medicaid insurance coverage may be better than what is privately available to many families. For example, as discussed above, many private policies do not cover routine pediatric preventive care such as immunizations. Hence, the substitution of Medicaid for private insurance coverage may improve children's health care, and this improvement should be valued when the costs and benefits of the expansions are weighed.

From a societal point of view, it does not matter whether private or public insurers pay for health care, except in so far as taxation creates a dead-weight loss, but policy makers reluctant to raise (or eager to cut) taxes are deeply concerned about this issue. If public insurance does consistently crowd out private insurance to a significant extent, then it may prove impossible to have the two systems side by side in equilibrium.

5.5. Insurance coverage and inequities in children's utilization of care

The third question posed above was the extent to which disparities in the utilization of care can be attributed to lack of insurance coverage. In the United States, race is often used as a proxy for socio-economic status. For example, Pui et al. (1995) reports that higher mortality rates among black pediatric cancer patients reflect inferior care, but it is not clear to what extent this is due to differential insurance coverage. It is possible that insured children from low SES families will receive less care than other children because their parents are not informed about the value of medical care, or because they face other barriers such as transportation or child care costs.

In addition, children insured by the Medicaid program may lack access to care because many providers do not accept Medicaid payments, or limit the amount of time that they spend with Medicaid patients [Sloan, Mitchell, and Cromwell (1978), Decker (1992)]. Doctors have many reasons for refusing to participate in the Medicaid program, ranging from low reimbursement rates relative to those paid by private insurance, to red tape, to fears that high-risk patients may sue. As discussed above, some providers may prefer to avoid poor, high-risk patients even in countries with universal health insurance. It has been argued that in the US, problems of access are particularly acute among black children because of residential segregation [Fossett and Peterson (1989)]. On the other hand, urban teaching hospitals tend to be located in inner-city areas with high concentrations of African-American residents – hence children in these locations may have access to the best quality hospital care even if they find it difficult to gain access to office-based physicians for primary care.

Currie and Thomas (1995) ask whether Medicaid coverage has differential effects on whites and blacks. As discussed above, they use data from the National Longitudinal Survey of Youth (NLSY), which has followed children of the initial respondents since 1986. The longitudinal nature of the data allows them to include a fixed effect for each child which controls for any unobserved, constant, characteristics of the home environment and of the child that might be correlated with Medicaid status. Their estimates indicate that both private insurance coverage and Medicaid coverage are associated with a higher number of visits for illness among white children, while for black children, insurance coverage has no significant effect on the number of sick child visits. A possible explanation for this result is lack of power due to a relatively small sample of black children. However, as discussed above, the study did find a significant effect of insurance coverage on the utilization of preventive care. Thus, it is unlikely that low power accounts for the lack of a significant impact on sick visits among blacks.

The study does not resolve the question of whether these racial disparities can be attributed to a shortage of providers, other barriers to care, or differing attitudes towards care. The influential Black report in Great Britain concluded that class-based disparities in mortality actually increased following the introduction of national health insurance and that other policies might be more effective in promoting equality in health outcomes [Townsend, Davidson, and Whithead (1988)]. As discussed below, many European countries have acted to remove other potential barriers by sending public health

nurses directly to children's homes, requiring parents to bring children to designated centers for care, or rewarding parents who bring their children in for care and penalizing those who do not. It would be interesting to conduct rigorous evaluations of these programs.

5.6. Summary

The American example suggests that means-tested public insurance programs improve the utilization of preventive care and child health, but that when introduced alone, they may not result in a very efficient allocation of medical resources. In particular, there is some evidence that the eligible under-utilize preventive care which may lead in some cases to over-utilization of sick care. Similarly, there is a great deal of evidence that the poor are more likely to seek care from expensive sources such as emergency rooms and hospitals rather than from doctors in private practice.

To the extent that universal eligibility and aggressive public health programs address these problems, they may result in a more efficient allocation of medical resources. A second conclusion is that minority children appear to benefit less from public insurance coverage than other children. It is possible that research in Europe could shed light on whether this finding is peculiar to the American system or reflects a more widespread form of "discrimination" against lower SES individuals.

6. The role of government in the market for child health: other types of interventions

Despite the increasing availability of sophisticated sick care for children, child mortality rates are higher in the US than in Europe, Japan, or Canada for all age groups, and especially among 1 to 4 year olds and 15 to 19 year olds. Some of this difference may reflect under-utilization of basic preventive care: Immunization rates for US preschoolers have been lower than in many European countries (though they are improving), and US children are less likely than their counterparts in these other countries to have a regular source of medical care [Williams and Miller (1992)]. But since, for example, very few American children die of communicable diseases, we must look to other differences between the US and other countries if we wish to explain American "excess child mortality".

Some of the mortality gap may reflect the effects of a broad array of public health measures that are in place in other countries. However, even their advocates admit that the health policies in place in most developed countries have not been subjected to any systematic evaluation. For example, Williams and Miller (1992, p. 991) state that "One of the most impressive aspects of health policy implementation among the European study countries is the realization that the programs were put in place not because of extensive documentation on cost effectiveness, but out of a value system that cherishes equity in health care". Thus evaluating the costs and benefits (or even the efficacy!) of

the various aspects of the policy environment in other countries remains an important focus for future research.

Once the question of child health is framed as a public health issue, it becomes an extremely broad topic indeed. The following discussion provides only the briefest possible overview of some of the many policies that fall under this rubric.[17]

6.1. Direct provision of services

Economic theory suggests that the direct provision of in-kind benefits is generally inefficient unless services are limited to those that are deemed to be strictly necessary for every child. Otherwise, some children will receive services that they do not really need at public expense. Yet, despite this caveat, most developed countries outside of the United States have chosen to engage in the direct provision of preventive services for children. For example, Japan has a network of public health centers that provide a wide range of pediatric preventive services. Sweden has a system of child health centers throughout the country that provide free immunizations and screenings, while in Germany, infants and preschool children are entitled to a pre-determined number of free comprehensive examinations [Chaulk (1994)]. In France, a health care team including a physician, nurse, child psychologist and social worker monitors children beginning in their preschool years [Bergmann (1996)]. These countries typically have much higher rates of compliance with recommended schedules of preventive care than are typical in the United States.

One of the keys to making direct provision work seems to be setting up a tracking system to ensure that eligible children are reached. In the United States, many children who regularly see health care providers are not immunized; in fact these "missed opportunities" are considered a major cause of under-immunization [cf. Holt et al. (1996)]. England, France, Germany, Japan, and the Netherlands all have tracking systems that notify health authorities of a birth and initiate computer tracking of preventive care [General Accounting Office (1993)]. In the Netherlands, for example, computerized punch cards indicate to a central office that a scheduled visit has been completed and that the appropriate care has been received [Williams and Miller (1992)]. Studies in the US have shown that tracking pregnant women and high risk newborns and assisting them in coordinating their care can be effective in improving birth outcomes among poor women [Buescher et al. (1991), Myerberg et al. (1995)]. Implementing a tracking system for high risk children has also improved immunization rates in Washington state [National Governor's Association (1997b)]. The effectiveness of tracking may reflect the importance of information failures in this market – parents who do not know the recommended schedules and doctors who do not know what care the patient has received may both contribute to having children "fall through the cracks" in the system.

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[17] These issues are discussed further in Currie (1998).

6.2. Public health programs

The discussion thus far has focused on the provision of medical services for children. Yet, as discussed in the introduction, many of the gravest threats to child health are not medical in nature. Even in rich countries, there may remain considerable scope for the improvement of child health through public health measures aimed at preventing accidents, curbing violence, reducing substance abuse, and encouraging healthy lifestyles.

Public health programs can take various forms ranging from the provision of information via educational campaigns, to mandating the use of safety equipment and sanctioning undesirable behaviors. To the extent that social ills are due to imperfect information about, for example, the importance of good nutrition or seatbelts, economic theory suggests that provision of the requisite information should be among the most efficient forms of government intervention in the market for child health. Hence, it would be especially interesting to evaluate the extent to which public education (broadly defined) can contribute to improved child health. The rest of this section discusses a variety of public health initiatives along with the available evidence regarding their effectiveness.

6.2.1. Education and informational campaigns

There is little doubt that some efforts to educate parents and children about good health practices pay off. For example, several states have implemented a program called "Baby Your Baby" which consists of a massive advertising campaign for prenatal care along with a toll free number people can call to get information about prenatal care available in their area. In Nevada, the infant mortality rate declined from 9 deaths per 1,000 before implementation of the program to 5.7 deaths per 1,000 after the introduction of this program – and it cost only $468,000 in fiscal year 1997 [National Governor's Association (1997b)].

Perhaps the most startling recent example of a successful public education campaign is the decline in the infant mortality rate from 8 deaths per thousand live births to 7 deaths per 1000 between 1994 and 1996. This improvement has been attributed to a concerted effort by hospitals and other health care providers to get people to put babies to sleep on their sides or backs rather than on their fronts. Recent research has shown that sleeping on the back reduces the risk of Sudden Infant Death Syndrome (SIDS), a leading baby killer. All of the two-year decline in the infant mortality rate came from a reduction in SIDS deaths. Given the approximately 4 million births per year that take place in the United States, this decline works out to 4000 fewer deaths per year [National Center for Health Statistics (1997)].

The extent to which smoking can be influenced by informational campaigns is an extremely important issue given the major public health threat posed by tobacco. It is estimated that 1 in 6 children may take up smoking and that one quarter of them will die as a result [US DHHS (1991)]. Moreover, 80% of smokers take up the habit before age 18 [US CDC (1998)]. Smoking during pregnancy has been identified as "the single most powerful determinant of poor fetal growth in the developed world" [National Center on

Addiction and Substance Abuse (1996, p. 1)]; it has been shown to double the risk that a baby will be born underweight.

Despite considerable controversy, it is clear that tobacco use is influenced by advertising in mass media. For example, in the early 1990s, the state of California conducted an unprecedented multi-million dollar campaign against smoking. Between April 1990 and June 1993 it spent 26 million dollars, more than any other state government had ever spent. Hu, Sung, and Keeler (1995) found that the program had a large negative effect on cigarette consumption – in fact, this program has been credited with reducing smoking in California up to 40%.

However, it has been countered by increased advertising by tobacco companies, which has had the predicted neutralizing effect. Tobacco companies spend 14 million dollars a day to advertise their products in the United States [Clary (1998)]. This problem was addressed in the recent tobacco settlement in Minnesota which severely restricted tobacco advertising by banning advertisements on billboards, bus shelters, taxis, and buses, and by prohibiting marketing or promotions aimed at children [Weinstein (1998)].

A cautionary note comes from Arizona's recent anti-tobacco education campaign, which apparently backfired. The theme that smoking was "not for kids" appears to have only made it more attractive to teens [Clary (1998)]. Similarly, programs that group deviant youths together for counselling can actually increase drug use, since peer effects may outweigh any positive effects of the programs [Botvin (1997)].

In fact, interventions that rely on individual counselling or education efforts often show disappointing results. For example, Kendrick et al. (1995) report that clinics that integrated smoking cessation advice into regular prenatal care achieved lower *reported* levels of smoking but that quit rates verified through urine tests were no different in treatment and control clinics. Perhaps unsurprisingly, a meta-analysis of controlled trials of smoking cessation interventions found that the intensity of the intervention (e.g., number of counselling sessions) was critical [Kottke et al. (1988)]. This finding suggests that it is not enough to tell people that smoking is harmful. They also need information about how to quit and reassurance that back-sliding can be overcome.

Interventions designed to prevent teen pregnancy or to reduce violent behavior have generally taken the form of providing either group or individual counselling and education. The birth rate for 15 to 19 year old girls in the United States was 54.7 per 1,000 in 1995. This rate can be compared to 6 per 1,000 in the Netherlands, 9 per 1,000 in Denmark, and 32 per 1,000 in Great Britain. Teen pregnancy is thought to have important negative social and health consequences both for mothers and their children [US DHHS (1991)]. In his review of the literature on teen pregnancy prevention programs, Douglas Kirby (1997) concludes that some educational programs may have been effective in persuading teens to delay intercourse and/or use condoms, especially in areas in which AIDS was perceived as a salient threat. But he finds no studies which have demonstrated effects on pregnancy rates. On the other hand, the teen birth rate has been declining since the early 1990s and this decline has been driven primarily by the increased use of contraception (especially condoms) rather than by decreases in sexual

activity or increases in abortion rates [Child Trends (1997)]. It is possible that this decline represents a cumulative effect of education gleaned from many sources.

Educational interventions aimed at reducing violent behavior typically seek to teach children to identify feelings and act on them in an appropriate way. Many of these programs also emphasize remedial education in an effort to alleviate frustration due to academic failure. While some programs of this type have shown promising results with very young children [cf. Tremblay et al. (1997)], there is little evidence that programs aimed at seriously aggressive adolescents are effective in modifying behavior [Tolan and Guerra (1994)].

Thus, the limited amount of information that is available suggests that as economic theory would suggest, education can be a potentially very cost effective method of improving public health in some cases. However, some educational strategies are more successful than others, and certain forms of "education" may actually do more harm than good!

6.2.2. Product safety and other government mandates

Tengs et al. (1995) review several government interventions aimed at protecting children. They estimate that child restraint systems in cars cost $73,000 per year of life saved, or almost $5.5 million for a child with a 75 year life expectancy. Comparable figures for flammability standards for children's sleepwear can be as high as $1 billion, while various school bus safety measures started at $10 million. In contrast, figures presented in Currie and Gruber (1996a) suggest that Medicaid expansions which were targeted to low income women cost approximately $1 million per life saved. While the exact cost figures are of course sensitive to the assumptions used to obtain them, this comparison suggests that safety mandates are not always particularly cost effective public health measures.

Viscusi (1995) argues that this is because mandates are often put into place without any cost/benefit analysis, and because they often incorporate a seemingly irrational "status-quo bias". The later refers to people's willingness to bear existing "natural" risks (e.g., consume naturally occurring chemicals in food) coupled with their unwillingness to bear additional smaller "synthetic" risks (e.g., consume chemical additives to food). On the other hand, it may not be irrational for people to be skeptical of pronouncements that synthetic chemicals are harmless given previous examples of "harmless" chemicals which turned out to be toxic, carcinogenic, and/or environmentally disastrous. Thus, the status-quo bias may be a reasonable response to imperfect information in the market for risk.

Williams and Kotch (1990, p. 108) examine "excess mortality" among children in the United States and note that deaths from motor vehicle accidents, firearms, fires, poisonings, and drownings are all greater in the US than in other developed countries. They call for the extensive use of government mandates to limit these risks, concluding that "limiting exposure [to risk] through regulation of handguns, greater use of public transportation, and affordable and accessible day care are among the measures that should

be implemented". Obviously, mandates in areas such as public transportation or gun control involve issues far beyond the scope of this survey. However, this argument does highlight the message that many public policies outside the health care arena affect child health, and that these effects ought to be included in the cost/benefit calculus when such policies are considered.

6.2.3. Home visiting

Canada, Germany, France, Sweden, Japan and Great Britain all have home visiting programs for high risk pregnant women, for post-partum care, and for "at risk" children. For example, Great Britain uses public health nurses to provide preventive health information and examinations in the homes of all families with newborns. All six countries also have lower child and infant mortality rates though it is not clear that these desirable results can be attributed only to home visiting programs [Chaulk (1994)]. Home visiting programs have had a long history in the US, beginning in the 1850s with volunteer "Friendly Visitors" programs in Philadelphia and other cities. There are now thousands of US programs which use home visitors to deliver a variety of services to families with young children.

Although few cost/benefit studies of home visiting have been conducted, there is some evidence that home visiting programs targeted to "at risk" families with young children can reduce the incidence of serious and costly problems such as low birthweight, child abuse and neglect, and educational failure. For example, pregnant teens in a rural South Carolina county with a "Resource Mothers" program for pregnant adolescents had half the number of low birthweight babies as similar teens had in a comparison county without such a program [Heins et al. (1987)]. Mayer (1988) found that low-income Michigan mothers who were visited had better birth outcomes both when compared to their previous pregnancies and when compared to a control group with similar demographic characteristics. Larson (1980) reports that children randomly assigned to a home visiting program had fewer accidents in their first year and higher immunization rates. In Florida, low birthweight children who were randomly assigned to receive home visits for 2 years were less likely to need additional developmental services later on [Resnick et al. (1987)]. Randomized trials have also shown that children who experience "failure to thrive", benefit from home visiting programs [Black et al. (1995)], and that home visited children "at risk" are less likely to be subjected to abuse or neglect [Olds et al. (1995)].

The Olds et al. study is notable because it did undertake a cost/benefit evaluation which was based on a randomized control/treatment design [Olds et al. (1993)]. The results suggested that government savings from welfare (Aid to Families with Dependent Children and Food Stamps), Medicaid, and Child Protective Services slightly outweighed the costs of providing the home visiting program. This study focused on rural women in upstate New York, but positive results have also been achieved in a similar intervention with a population of urban black women in Memphis Tennessee [Olds et al. (1997)].

However, many home visiting programs fail to reach their goals Olds and Kitz-man (1993)]. Success appears to depend on a number of elements such as clarity of goals, comprehensiveness of services, guidance and supervision of staff, and targeting to at-risk families – European-style programs that provide home visits to all children irrespective of risk have not been shown to be cost-effective, though of course this does not mean that they are not.

6.2.4. Incentives and/or sanctions

Germany and Japan offer financial incentives to seek early prenatal care, while France penalizes women who do not obtain care by reducing the child allowances they are enti-tled to [Bergmann (1996)]. In Britain, it is the physicians who get bonuses for achieving high immunization rates [Chaulk (1994)]. While these policies have not been subjected to rigorous evaluation, economists in any case would expect parental behavior to be sensitive to direct financial incentives.

6.2.5. Community-based programs

Community-based programs can take an almost infinite variety of forms. The distin-guishing characteristic is that they focus on the neighborhood or community rather than on changing individual behavior. For example, the "Safe Kids/Healthy Neighborhoods Injury Prevention Program" in central Harlem worked to renovate playgrounds, and to set up safe supervised activities. The project also had an educational component, as injury and violence prevention education was introduced in local schools. Targeted in-juries (vehicle injuries, outdoor falls, assaults, and handgun injuries) fell over the study period while non-targeted injuries (poisonings, ingestions, burns, etc.) did not. Similar community based approaches in Massachusetts and Sweden have also shown positive effects [Davidson (1994)].

Some public health professionals are also starting to look at crime as a health issue [cf. Earls and Reiss (1994)]. Their emphasis on uncovering risk factors for criminal behavior complements economic analyses of criminality in that it focuses on preference formation and constraints facing individuals, rather than on incentives to commit crime given the preferences and constraints that are in place at any given point in time.

6.2.6. Summary

There are many types of initiatives that have been proven to be effective in improving children's health, at least in some settings. What is lacking is any systematic evaluation of these initiatives that would rank programs in terms of cost effectiveness. One factor complicating such an evaluation is that programs aimed at improving child health are often implemented as part of a package of measures. Moreover, many policies which are not primarily aimed at improving child health may nevertheless have significant effects on health.

Indeed, many child advocates feel strongly that child health would be most effectively improved by a combination of measures that included attention to economic and social deprivation as well as health [cf. Kliegman (1995)]. It seems clear, for example, that the fact that black infants are twice as likely to die as white infants in the United States is to some extent socially determined, because this differential is observed even among college educated women, and because one does not observe the same divergence in countries such as Cuba [Schoendorf et al. (1992), Hogue and Hargraves (1993)].

7. Directions for future research

One of the most important factors limiting research on determinants of child health in more developed countries is a lack of objective health data. Much of the discussion above has focused on infant and child mortality, because it is virtually the only objective measure that is widely available. But mortality is an extreme outcome, and may not be closely related to other indicators of child health. Other relatively objective indicators that might be measurable in large scale surveys include whether or not children are anemic, stunted, over or under-weight, whether they have uncorrected vision or hearing impairments, and whether they are experiencing developmental delays.

Much of the research reviewed here focuses on the utilization of care. Unfortunately, it is usually difficult to link utilization with health outcomes, rendering it impossible to know whether utilization of care should be considered to be primarily a consumption good rather than an investment good. In addition, utilization data are generally self-reported which raises the possibility of systematic measurement error. For example, less educated parents may be less likely to report some conditions, such as asthma, if they know less about the symptoms of those conditions.

Another difficulty is that administrative data sets created to record information about such things as birthweight and the incidence of communicable diseases or accidents, are often lacking important information about children's income or family backgrounds. Moreover, it is often impossible to link individual-level data about utilization to "supply-side" data that measures access to care (since the geographic identifiers are either un-available, or available at only a very aggregate level).

Relatively simple improvements in data collection efforts which would have a poten-tially large payoff in terms of research include: the development of protocols allowing the release of geographical identifiers that would allow the merger of "demand" and "supply-side" data sets; the addition of measures of family income and background to administrative data sets; and the collection of more objective measures of child health.

Assume for the moment however, that we had data linking measures of child health, family background, utilization of care, and access to care. What are the most interesting outstanding questions that could be addressed? One of the most pressing questions for health policy is identifying interventions in child health that are good investments. For example, clinical studies have demonstrated that prenatal care for high-risk women can have a significant effect on birth outcomes [cf. Institute of Medicine (1985)]. On the

other hand, economic studies of the effects of prenatal care in large populations tend to find small or insignificant effects [cf. Rosenzweig and Schultz (1982, 1983, 1988), Frank et al. (1991), Corman et al. (1987), Grossman and Joyce (1990)]. These results are not necessarily inconsistent because the benefits could well be large for "at risk" women and small or non-existent for other women. Also, while it is likely to be important for all women to get some prenatal care (so that the high-risk women can be identified and treated), it may not be useful for all women to receive all of the visits currently recommended.

A second line of research would explore the links between socio-economic status and health. We know that higher incomes and education are associated with better health, but we know little about the reasons why. Also, we know that there is correlation in income across generations, and hence there must be correlation in health status, but we do not know what the causal linkages are, or what interventions might be effective in breaking these linkages among low-income people.

Third, the relationship between utilization of care and the supply of services could be examined. Lack of access to care is often cited as a problem when utilization of care is below recommended levels, but it is difficult to demonstrate a causal link between utilization and access when other factors, such as socio-economic status or lack of appropriate information, might be implicated.

Finally, this review has focused a good deal of attention on a range of public health measures aimed at improving child health. It would be extremely useful to have more systematic analysis of these programs, particularly studies aimed at identifying the components of successful programs and the costs and benefits of implementing them.

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