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THE ECONOMICS OF REPRODUCTION-RELATED HEALTH CARE

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ABSTRACT

This paper presents the first systematic estimates of the direct money costs of reproduction-related health services. In 1982 Americans spent approximately $17.7 billion for contraception, abortion, treatment of infertility, obstetrical care, and infant care. This represented 5.5 percent of total health care spending and was equal to $327 per woman of reproductive age (15-44). Obstetrical care accounted for almost half of the reproduction-related expenditures and infant care accounted for more than one-third. The paper discusses the demographic, technologic, economic, and sociopolitical factors that determine these expenditures. It also considers related public policy issues regarding legal status, sources of funding, and allocation of resources.

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With increasing frequency and escalating rhetoric, discussions of reproduction-related issues have been moving from the science page to the front page and even into the headlines. The attempts to ban abortion, the debates about "high tech" obstetrical methods, and the concern over the cost of neonatal intensive care all call attention to this special sector of the health care system. Despite the furor, however, there is little solid information available about reproduction-related health services, especially from an economic perspective. What fraction of total health care spending is accounted for by this sector? What are the primary determinants of spending for contraception, infertility treatment, abortion, obstetrical, and infant care? What are the most important public policy issues, and how can economic analysis contribute to their resolution?

We do not suppose that individuals whose views about contraception, abortion, surrogate mothers, and the like are inalterably determined by religious convictions will find economic considerations to be relevant. But those who believe that the human predicament involves sacrificing some ultimate values to others may find our approach helpful. We emphasize the scarcity of resources relative to wants, the need to achieve a balance between incremental benefits and incremental costs, and the responsiveness of human behavior to changes in incentives and

constraints. We do not believe that economics can "solve" the problems associated with reproduction, but we suggest that the economic perspective can contribute to a fuller understanding of trends and issues.

In 1982 there were 54 million American women of childbearing age (15-44), of whom about 29 million used some form of contraception, including sterilization. Approximately ten percent had the opposite problem--difficulty in conceiving--and about one million of them received medical advice or treatment for infertility. In that same year, approximately six million women learned that they were pregnant. One-fourth of the pregnancies ended with an induced abortion and another 15 percent of these confirmed conceptions ended in miscarriage or stillbirth. Thus, 3,681,000 babies were delivered, of whom 42,000 died within the first year. Nearly all of the babies received some medical care and a small percentage received a great deal.

The paper begins with an estimate of total expenditures for reproduction-related services in the United States. The second section examines the factors which influence the supply of and demand for these services, and the final section discusses important policy issues concerning their legal status, funding, and resource allocation.

Estimates of Expenditures

This section presents estimates of total direct money expenditures for contraception, treatment of infertility, abortion, obstetrical care, and health care during the first year of life. No single source contains all the information of interest; therefore data on costs and utilization are drawn from a variety of sources ranging from national surveys to small clinical studies. All prices and quantities are for 1982 unless otherwise stated. Some estimates are based on data from other years, extrapolated to 1982 with the aid of related price and quantity series.

Contraception

Approximately 54 percent of American women ages 15-44 use some form of contraception. The cost in 1982 was about $2.4 billion, or $81 per contracepting woman and $44 per woman of childbearing age. Of those who are not contracepting, most are sexually inactive, noncontraceptively sterile, pregnant, postpartum, or seeking pregnancy. About 4 million women ages 15-44, however, are sexually active and not trying to conceive, but using no method of birth control (see Table 1). Among these women who are at greatest risk of unintended pregnancy, nearly two-thirds are not married.

The majority of contraceptors use one of the most effective forms of birth control: male or female sterilization (33 percent), birth control pills (28 percent), or IUDs (7 percent). Expenditures for these methods amount to over $1.9 billion, 80 percent of the total. Another 23 percent of contraceptors use

Table 1. Number of U.S. women ages 15-44, by contraceptive status, 1982.

	Married	Not married	All
	(millions)		
Total women ages 15-44	28.2	25.9	54.1
Contracepting	19.2	10.3	29.5
Sterilization	7.9	1.8	9.7
Pill or IUD	5.2	5.3	10.5
Diaphragm or condom	4.0	2.1	6.1
Other methods	2.1	1.1	3.2
Not contracepting	9.0	15.6	24.6
Noncontraceptively sterile	3.7	1.4	5.1
Pregnant or postpartum	2.0	.7	2.7
Seeking pregnancy	1.9	.4	2.3
Sexually active, not contracepting, and not seeking pregnancy	1.4	2.5	3.9
Not sexually active	0.0[a]	10.6	10.6

[a] Virtually all currently married women reported having intercourse within the previous three months.

Source: National Center for Health Statistics. 1984. "Use of Contraception in the United States, 1982," Advancedata 102 (4 December).

barrier methods: diaphragm, condom, or foam. Nine percent employ the least effective methods, mainly rhythm and withdrawal. Contraceptive sterilization has increased sharply in popularity during the last decade, replacing the pill as the most common method of birth control. Over half of contraceptors ages 30-44 rely on sterilization, but among younger women the pill is still preferred [National Center for Health Statistics, 1984b].

Expenditures for the different contraceptive methods vary in the size and timing of outlays. The one-time payment for surgical sterilization averages $1,180 for tubal ligation and $241 for vasectomy. Physician visits and the purchase of contraceptive devices contribute to high first-year expenditures for prescription methods--an average of $154 for pill, IUD, and diaphragm. In subsequent years, the IUD is costless, while expenditures for pill and diaphragm are substantially reduced, depending mainly on the cost of supplies [Torres and Forrest, 1983]. Whereas the costs of sterilization, pill, and IUD are fixed for all women who use these methods, the expense associated with barrier methods depends on the frequency of intercourse. Frequency, in turn, may be related to the cost of using the method.

Because of the unevenness in timing of expenditures, estimates of the annual cost of contraception vary depending on the technique of estimation. One technique is to count outlays in the year that they are incurred. Estimated in this manner, annual costs reflect actual cash flow. Consequently, the annual cost of using a method can fluctuate from year to year, and, during a

single year, can vary greatly among women using the same method.

Alternatively, outlays for contraception can be viewed as payments on a long-term investment in fertility control. Although the actual payments are uneven, the total cost can be regarded as spread smoothly over the entire period of protection against unintended pregnancy. Because one-time contraceptive expenses are paid at the beginning of the investment period rather than in annual installments, an implicit interest charge must be added to the total.[1/] The yearly cost becomes the imputed annual payment for interest and amortization on one-time expenses, plus the costs that are incurred year after year. When estimated in this way, all women using the same contraceptive method will have roughly the same yearly cost.

In Table 2, contraceptive expenditures are calculated using the interest and amortization technique. Conceptually it makes more sense to spread the costs of contraception evenly over the period of protection because the benefits of fertility control accrue throughout this period. In 1979-1980 women obtaining tubal sterilizations were, on average, 30 years old [Centers for Disease Control, 1983b]. Thus, the cost of sterilization is amortized over the approximately 15 remaining years of reproductive life. One-time costs of the pill, IUD, and diaphragm are spread over a three-year period. This assumes that each year one-third of these contraceptors are first-time users or are incurring equivalent costs for checkups, replacement devices, etc.[2/] A real interest rate of 4 percent per annum is applied to unamortized balances of one-time costs. Recurring costs are then added to arrive at a total annual cost.

Table 2. Direct costs of contraception, 1982.

Type of contraception	Annualized one-time cost[a] ($)	Recurring cost ($)	Total annual cost ($)	Number (thousands)	Total cost (millions $)
Female sterilization[b]	106	-	106	6,486	688
Male sterilization[b]	22	-	22	3,189	70
Pill[c]	23	107	130	8,377	1,089
IUD[c]	47	-	47	2,108	99
Diaphragm[c,d]	27	84	111	2,432	270
Condom[d]	-	30	30	3,621	109
Spermicides[d]	-	50	50	1,135	57
Other	-	-	-	2,108	0
All types			81	29,455	2,382

[a] Unamortized cost incurs interest at 4 percent per annum, assuming the following initial costs: female sterilization $1,180, male sterilization $241, pill $65, IUD $131, and diaphragm $76.

[b] Amortized over 15 years.

[c] Amortized over 3 years.

[d] Assumes coital frequency of 100 per year.

Sources: National Center for Health Statistics. 1984. "Use of Contraception in the United States, 1982," Advancedata 102 (4 December).

Torres, A. T., and J. D. Forrest. 1982. "The Costs of Contraception," Family Planning Perspectives 15 (March/April):70-72.

Using this technique of calculation, the pill is the most expensive form of birth control, costing $130 per year. Female sterilization costs $106 per year, while condom and male sterilization are the lowest cost alternatives at $30[3/] and $22 respectively (see Table 2). Applying these estimates to the distribution of women by method yields a total expenditure for contraception of $2.4 billion in 1982.

Infertility Services

At the same time that millions of women spend almost two and one-half billion dollars to prevent births through contraception, many other millions of women find it difficult or impossible to conceive, and some of them seek medical advice and treatment. The National Survey of Family Growth (1982) reports that 4.4 million women (8.2 percent of women 15-44) have impaired fecundity[4/] and 4.2 million are surgically sterile for noncontraceptive reasons. More than half of these 8.6 million women say they would like to become pregnant. In addition, about one-fourth of women who have been sterilized for contraceptive reasons (or whose partners are contraceptively sterile) indicate a desire for children [National Center for Health Statistics, 1985b; Mosher, 1984]. Thus the potential demand for infertility treatments, surrogate mothers, and related services is probably very large. Among ever married women 15-44 in 1982, 6.3 million had sought medical attention for infertility at some time in the past and approximately one million reported at least one infertility visit during the previous twelve months [National Center for Health Statistics, 1984a].

The amount spent by those seeking medical assistance for infertility varies enormously from a few dollars for a single physician visit to thousands of dollars for repeated attempts at in vitro fertilization. There are no published estimates of average or total expenditures for infertility services; in our judgment they were still quite small in 1982, but probably growing rapidly.

About half of infertility is partly or entirely due to a problem of the male. A low sperm count or poor sperm motility, the most common causes of male infertility, are easily diagnosed through semen analysis. Some of these men can be helped by surgery or other therapy; some couples eventually conceive without treatment. An estimated 10,000 couples per year turn to artificial insemination by donor. Usually two or three inseminations are performed each cycle at a cost of approximately $75 per insemination [Menning, 1982]. About 80 percent of the women receiving artificial insemination conceive within three to six months [Feldschuh and Feldschuh, 1982].

Diagnostic workups to detect female infertility are usually more extensive than for males. The two most common causes of female infertility are failure to ovulate due to hormone deficiency and blockage of the fallopian tubes. Failure to ovulate can be detected by charting body temperature and blood hormone levels or by biopsy of the uterine lining. Tubal blockages can be viewed indirectly with X-rays or directly by inserting a fiberoptic scope through an incision in the abdomen. With new drugs and improved surgical techniques 50-60 percent of infertility can be successfully treated; these treatments,

however, are often expensive. Drugs such as Clomid and Pergonal can induce egg production in women who don't ovulate naturally, but one cycle of Pergonal can cost between $250 and $750 [Glass and Ericsson, 1982]. For women with blocked tubes, tubal surgery provides the best chance for successful pregnancy.

The birth of the world's first "test tube" baby in 1978 gave new hope to infertile women with severely damaged or missing fallopian tubes, but widespread use of this experimental technique is still far in the future. In the United States in 1982 there were probably fewer than 100 births resulting from in vitro fertilization. These births were achieved at considerable expense. Each attempt at fertilization costs about $3,000 for medical expenses alone and only 15 percent of couples using this technique succeed in having a live birth.

Data on utilization and expenditures for infertility services are almost entirely nonexistent. Presumably some couples spend little or nothing for infertility problems; a few spend an extraordinary amount. As a rough estimate we assume an average expenditure of $200 per couple seeking help, yielding a total of $200 million for 1982.[5/]

Abortion

According to the Alan Guttmacher Institute, nearly 3 percent of all women between the ages of 15 and 44 had an abortion in 1982. We estimate the money cost of these 1.5 million abortions at $484 million. This is approximately $307 per abortion, or about $9 per woman of childbearing age (see Table 3).

Table 3. Direct costs of abortion, 1982.

	Number (thousands)	Average Cost ($)	Total cost (millions $)
Clinic[a/]	1,291		
First trimester	1,202	195	234
Second trimester	89	370	33
Hospital	283		
First trimester	230	775	178
Second trimester	53	740	39
All abortions	1,574	307	484

[a/] Includes abortions performed in physicians' offices.

Sources: Henshaw, S. K. 1982. "Freestanding Abortion Clinics: Services, Structure, Fees," Family Planning Perspectives 14 (September/October):248-256.

Henshaw, S. K., J. D. Forrest, and E. Blaine. 1984. "Abortion Services in the United States, 1981 and 1982," Family Planning Perspectives 16 (May/June):119-127.

The Centers for Disease Control's estimate of the number of abortions is about 20 percent lower. Their figure, however, is based on summary reports from individual states and is probably incomplete [Centers for Disease Control, 1983a].

Approximately 82 percent of abortions are performed in clinics and doctors' offices; the remaining 18 percent in hospitals. About 90 percent are performed in the first trimester and 10 percent in the second trimester [Henshaw et al., 1984]. Over one-third of second trimester procedures take place in hospitals, while only 16 percent of earlier abortions are hospital procedures [Henshaw, 1985].

The estimates of the cost per abortion by site and trimester are based on samples. A 1981 survey of 240 clinics reported charges of $190 and $358 for first- and second-trimester abortions, respectively [Henshaw, 1982]. We inflated these charges slightly to bring them to 1982 levels because the price of an abortion has been rising slowly in recent years [Henshaw et al., 1984]. Charges for in-hospital abortions are based on very small samples and are probably less reliable. One anomaly is that the reported cost of a second-trimester abortion is less than that of a first-trimester abortion in hospital. Perhaps hospitals performing many abortions have relatively low charges and are more likely to perform second-trimester procedures.

Estimates of government expenditures for abortion lend support to our overall figure. During fiscal year 1982 state and federal agencies paid $68 million for 210,000 abortions, that is, an average of $322 per publicly funded abortion [Nestor and Gold,

1984]. This is similar to our estimate of an average cost of $307 for all abortions.

Obstetrical Care

A large portion of reproduction-related expenditures are accounted for by hospital charges and professional fees for obstetrical care, including prenatal, delivery, and postnatal services. We estimate total charges for these services at 8.2 billion dollars, approximately $2,230 per live birth. Hospital charges account for nearly 60 percent of the total. Another 35 percent represent fees charged by obstetricians and anesthetists, while laboratory tests, X-rays, and ultrasound cost an additional $600 million (see Table 4).

Of the 3.7 million babies born in 1982, 99 percent were delivered by physicians in hospitals or other medical facilities. These admissions accounted for 10.5 percent of all hospital admissions in that year, but because maternity stays are relatively short--an average of 3.4 days compared to 7.1 days for all admissions--only 4.6 percent of total hospital days are for women having babies [National Center for Health Statistics, 1985a]. The average hospital charge for a normal birth with labor and delivery rooms was $1,130 (birthing rooms were $30 less). Caesarean births--17.6 percent of all births in 1982--cost $1,930, 70 percent more than a normal birth [Health Insurance Association of America, 1982]. At an average cost of $1,270 per birth, total obstetrical hospital charges were $4.7 billion. A rough estimate of obstetrical hospital costs based on average hospital costs supports this figure. The average expense per

Table 4. Direct costs of obstetrical care, 1982.

	Number (thousands)	Average cost ($)	Total cost (millions $)
Live births			
Hospital charges			
Normal	3,033	1,130	3,427
Caesarean section	648	1,930	1,251
Nonhospital charges			
Attending physician			
Normal	3,033	600	1,820
Caesarean section	648	785	509
Anesthetist			
Normal[a/]	1,520	150	228
Caesarean section	648	250	162
Tests, lab, and other[b/]	3,681	150	552
Total: live births	3,681	2,160	7,949
Miscarriages and stillbirths	966	260	252
Total: all obstetrical care	4,647	1,765	8,201

a/ Assumes anesthesia is used in half of normal births.

b/ Estimated as 17 percent of nonhospital charges

Source: Health Insurance Association of America. 1982. The Cost of Having a Baby.

patient day was $380 for nonfederal short-stay hospitals in 1982 [American Hospital Association, 1984]. If maternity hospital admissions are of average expense, then the 3.7 million admissions with an average length of 3.4 days cost $4.8 billion.

According to the Health Insurance Association of America, the average physician fee for complete obstetrical care was $600 for a normal delivery and $785 for a Caesarean delivery [Health Insurance Association of America, 1982]. We use these estimates although they are somewhat lower than those found in a survey of physicians by Medical Economics. They reported a median charge for normal obstetrical care of $700 for obstetricians, $500 for family practitioners, and $450 for general practitioners [Kirchner, 1982]. If 80 percent of babies are delivered by obstetricians [National Center for Health Statistics, 1984c] and the remaining births are spread equally between family and general practitioners, the average charge is $655.

The average anesthetist's fee for a normal delivery was $150 [Health Insurance Association of America, 1982] and approximately $250 for a Caesarean delivery. If all Caesarean deliveries and half of normal deliveries require the services of an anesthetist, the total bill for their services is $400 million.

In recent years the use of high technology diagnostic techniques in obstetrical care has grown rapidly. Of women having live births in 1980, 29 percent of those ages 35 and over and 4 percent of younger mothers received amniocentesis. Thirty percent of all mothers received at least one ultrasound examination and 13 percent received at least one medical X-ray [Kleinman et al.,

1983; Hamilton et al., 1984]. These procedures and other tests not covered by the obstetrician's basic fee accounted for 17 percent of all nonhospital costs in a 1981 study of maternity costs at the Palo Alto Medical Clinic [Scitovsky, 1984]. They add another $600 million to the cost of having a baby.

In addition to the cost of live births, there were undoubtedly charges incurred for miscarriages and stillbirths. We estimate that stillbirths occurring after 28 weeks of pregnancy incurred charges similar to those for live births. The proportion of these stillbirths delivered by Caesarean section is as high as among live births and electronic fetal monitoring is used almost as frequently [Placek et al., 1984]. For those stillbirths occurring between 20 and 28 weeks, we estimate the average charge at three-quarters of the cost of a live birth, and for miscarriages prior to 20 weeks we estimate a physician's fee equal to one-third of the fee for a normal delivery.

Pediatric Care

Babies in their first year of life used medical care costing approximately $6.5 billion in 1982. Sixty percent of the total was spent on newborn care. Another 30 percent was paid for medical care for infants requiring subsequent hospitalization during the first year. Only 10 percent was spent on well baby care, preventive care, and medical care for problems not requiring hospitalization (see Table 5).

The majority of infants are normal and healthy, leaving the hospital after a routine nursery stay. Pediatric care for a normal newborn is $64 and the average hospital charge is $100 per

Table 5. Direct costs of infant care, 1982.

	Number (thousands)	Average cost ($)	Total cost (millions $)
Newborn care			
Normal care			
Hospital	3,496	350	1,223
Physician	3,496	85	299
Intensive care	185	12,000	2,220
Other infant care			
Hospitalization			
Hospital	340	5,140	1,748
Physician	340	675	230
Physician office visits	3,681	165	607
Lab, immunizations, etc.	3,681	35	129
Total infant care	3,681	1,755	6,456

Sources: Health Insurance Association of America. 1982. The Cost of Having a Baby.

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Kirchner, Merian. 1982. "Fee Increases: Restraint Takes Over," Medical Economics (11 October):218-249.

day, or $340 total [Health Insurance Association of America, 1982]. Approximately 5 percent of the newborns, however, require intensive neonatal care. Many are normal weight infants born with congenital defects; a substantial portion are low birth weight babies--that is, born weighing 2,500 grams or less. Nearly 7 percent of all babies are low weight at birth. These births account for over half of all infant deaths and three-fourths of all neonatal deaths (deaths within the first 28 days).

There are no national data on the utilization of neonatal intensive care. Expenditures must be estimated from clinical studies, often based on atypical populations and small samples. Total physician and hospital costs for the first year of life averaged $8,000 per infant in one study of 1,185 infants weighing at least 500 grams at birth. The infants were treated in the intensive care nursery at the University of California, San Francisco Moffitt Hospital during a 30-month period in 1976-78. Average total cost was $19,000 for babies weighing 501-1,000 grams at birth. For infants weighing at least 2,500 grams, the average total cost was $5,600 [Phibbs, Williams, and Phibbs, 1981]. Another study of 75 babies weighing less than 1,000 grams reported average hospital costs (1976 $) of $14,000 for the 45 infants who died and $40,000 for the 30 survivors [Pomerance et al., 1978].

Peter Budetti et al. [1981] conducted a study of the costs and effectiveness of neonatal intensive care for the Congressional Office of Technology Assessment. The researchers estimated that average expenditures per patient in 1978 were

about $8,000. Adjusting their estimate by the CPI for medical care, the average cost per admission was $12,000 in 1982. By this estimate, the total cost of neonatal care for the approximately 185,000 infants admitted to intensive care nurseries was $2.2 billion.

In addition to lengthy hospital stays at birth, a substantial portion of low weight infants are rehospitalized during the first year of life. McCormick et al. [1980] estimate that 19.0 percent of these infants have at least one additional hospital episode, with an average of 12.5 hospital days during the year. Normal weight infants have a rehospitalization rate of 8.4 percent with an average stay of 7.8 days. These figures imply that infants used 2.9 million hospital days in 1982.

The National Hospital Discharge Survey (NHDS) conducted by the National Center for Health Statistics reports much higher figures--1,702 hospital days per 1,000 infants in 1982, or a total of 6.3 million days [National Center for Health Statistics, 1984d]. Some possible reasons for the huge disparity are that NHDS estimates may include neonates who are transferred to another hospital or to an intensive care unit within the same hospital. Since McCormick's study excluded all hospitalizations before the infant went home for the first time, her estimate would be lower. In addition, McCormick's estimates relied on interviews with parents of infants alive at one year. Actual utilization would be underestimated if the infants who died required more hospital care or if parents forgot to report some of the hospital days. This paper uses an average of the two estimates--4.6 million hospital days. At $380 per day (the

average expense per day for all admissions), hospital costs are estimated at $1.7 billion. Physician fees for these hospitalizations add another $230 million, assuming an average charge of $50 per day.

According to unpublished data from The Robert Wood Johnson Foundation National Perinatal Regionalization Program, normal weight infants have an average of 10 physician visits during the first year [McCormick, 1985]. On the other hand, the National Ambulatory Medical Survey (NAMS) reported only 4.4 office visits to pediatricians per infant per year in 1980-81. If 70 percent of all physician office visits by babies under age 2 were to pediatricians [National Center for Health Statistics, 1983], the NAMS estimate implies an average of 6.3 visits per infant per year. We split the difference between the sources and estimate eight visits per year. Physician charges are estimated as $25 for an initial office visit and $20 for a follow-up visit [Kirchner, 1982; American Medical Association, 1981]. Thus physician care during the first year amounted to $600 million. Immunizations and other services not included in the physician's fees added another $130 million, assuming average charges of $35 per infant.

Summary

The total medical costs of reproduction amounted to approximately $17.7 billion in 1982, about 5.5 percent of the total health care expenditures. Table 6 shows that reproduction-related expenditures came to $76 per person, $327 per woman of childbearing age and $4,810 per live birth. The bulk of

expenditures was for obstetrical care and care of infants in the first year of life. Hospital and physician charges for obstetrical care cost $8.2 billion and accounted for 45 percent of the total. Pediatric care for infants, especially those needing intensive care or rehospitalization, amounted to $6.5 billion and made up 35 percent of the total. Infertility treatment, contraception, and abortion cost an additional $3.1 billion.

Table 6. Summary of direct costs of reproduction-related activities, 1982.

	Number (thousands)	Average cost ($)	Total cost (millions $)	Total cost (percent)
Contraception	29,455	81	2.4	13.6
Infertility services	1,000	200	.2	1.1
Abortion	1,574	302	.5	2.8
Obstetrical care[a/]				
Hospital	4,647	1,015	4.7	26.6
Physician	4,647	630	2.9	16.4
Other	4,657	120	.6	3.4
Infant care[a/]				
Hospital	3,681	1,410	5.2	29.4
Physician	3,681	310	1.1	6.2
Other	3,681	35	.1	.6
Total reproduction-related expenditures			17.7	100.0
Per capita		76		
Per woman ages 15-44		327		
Per live birth		4,810		
Per infant alive at one year		4,865		
Total health expenditures			322.4	
Reproduction-related as a percent of total health expenditures			5.5%	

[a/] The distribution between hospital, physician, and other charges is sometimes based on arbitrary distinctions.

Sources: See Tables 2-6.

The Determinants of Expenditures

Reproduction-related services account for about 5 percent of the total health care bill. What determines this level of spending? Why not 8 percent? Or 3 percent? As shown in Figure 1, expenditures are identically equal to the quantity of services multiplied by the price per unit of service. This is an accounting definition. In a behavioral sense, quantity and price are determined by demand and supply. Thus, analysis of expenditures must consider the factors determining the demand for, and supply of, reproduction-related services.

The primary forces affecting supply and demand are demographic, technologic, economic, and sociopolitical. Within each of these categories some factors may <u>independently</u> affect expenditures, e.g., a breakthrough in basic science that creates new possibilities for medical diagnosis or treatment. Many factors, however, are <u>interdependent</u>, e.g., the development of a new technology increases the demand for health insurance to pay for the new service, while the spread of insurance increases the demand for new technologies. The distinction between independent and interdependent factors is not always clear cut. For instance, in the short run the number of women of childbearing age may be regarded as independent, but over a long time horizon this number depends on technologic, economic, and sociopolitical factors.

The following discussion identifies a few of the most important factors and their interdependencies within the domain of reproduction-related services. One other interdependency deserves mention, but will not be discussed in detail. That is,

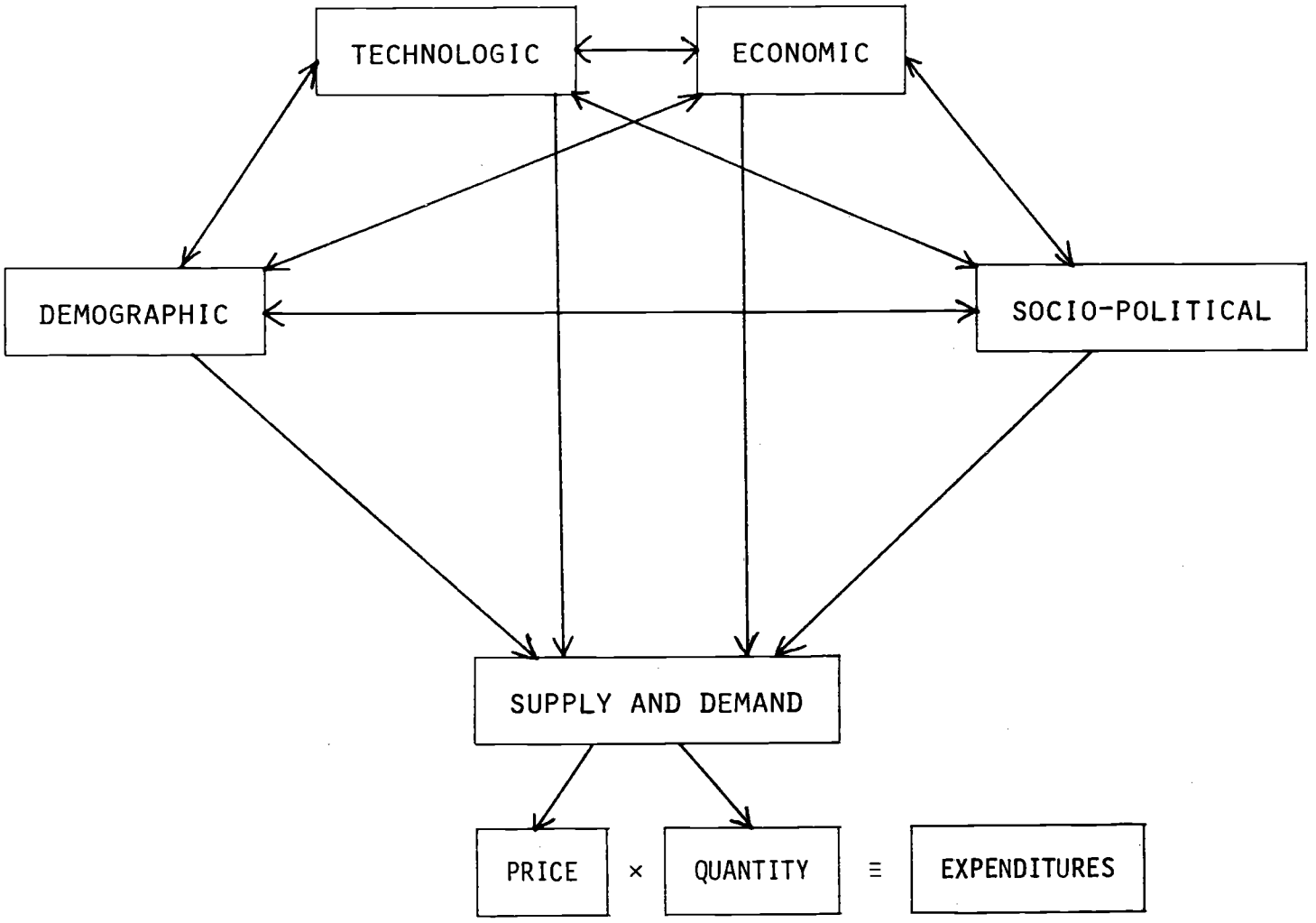

Figure 1. The determinants of expenditures.

the interdependency between reproduction-related expenditures and other health care spending. For example, neonatal intensive care may improve the health status of surviving infants, thereby reducing their need for medical care in subsequent years. Conversely, excellent medical care for female children and teenagers may reduce the incidence of high-risk pregnancies and low weight births.

Demographic Factors

The most obvious factor affecting expenditure for reproduction-related services is the number of women of childbearing age. In 1982 this group represented 23.6 percent of the total U.S. population, up sharply from 20.1 percent in 1960. This rise reflects the post-World War II "baby boom," which followed a period of low fertility rates during the Great Depression and World War II. The Bureau of the Census projects that women of childbearing age will be 23.3 percent of the population in 1990, but will fall to 21.5 percent by the year 2000 [U.S. Bureau of the Census, 1984].

The distribution within the 15-44 age group also matters, because reproduction-related expenditures tend to peak between 20 and 30 and are substantially lower at younger and older ages (see Figure 2 and Table 7). In 1982 only 39 percent of women of childbearing age were in their twenties, but they accounted for two-thirds of all births, 55 percent of abortions, and 45 percent of current expenditures for contraception. Older women spend much less per capita because they have few births, few abortions, and

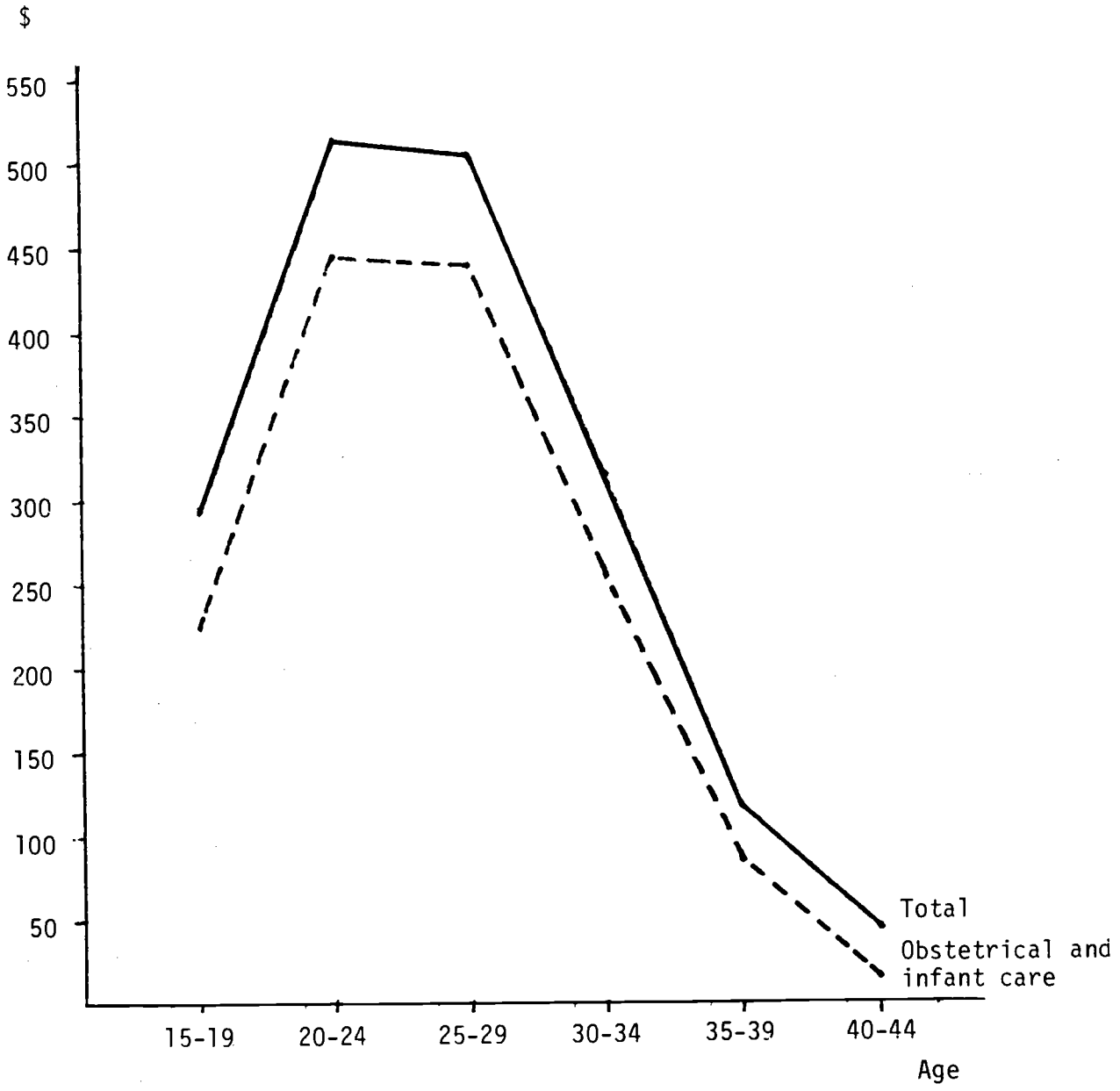

Figure 2. Reproduction-related expenditures per woman, by age, 1982.

Table 7. Reproduction-related expenditures by age,[a/] 1982 (in dollars).

	15-19	20-24	25-29	30-34	35-39	40-44	Total
Per woman							
Total	295	516	505	313	119	46	327
Contraception	55	51	52	46	24	22	44
Infertility services	-	3	4	5	6	6	4
Abortion	15	16	9	5	2	1	9
Obstetrical care	119	248	251	147	49	9	152
Infant care	105	198	189	110	38	7	119
Per live birth							
Obstetrical care	2,197	2,203	2,242	2,263	2,268	2,269	2,228
Infant care	1,939	1,760	1,689	1,698	1,780	1,808	1,754
Addendum:							
Live births/1000 women	52.9	111.3	111.0	64.2	21.1	3.9	67.3

[a/] Expenditures are counted in the year they are made.

Source: Calculated by authors.

many are already contraceptively or noncontraceptively sterile. Other things equal, shifts in the distribution within the 15-44 year age group increased expenditures by 13 percent between 1960 and 1980 as the baby boomers moved into their 20s. These shifts will decrease expenditures by 15 percent between 1980 and 2000 as the baby boom cohorts get older and the smaller cohorts of the 1990s enter the peak childbearing ages.

Given the number of women of childbearing age, their fertility is the major determinant of expenditures because obstetrical and infant care dominate the total. To be sure, the fertility rate is not completely independent; it is affected by technologic, economic, and sociopolitical factors. The general fertility rate dropped by 43 percent between 1960 and 1982, from 118.0 to 67.3 births per thousand women ages 15-44. If the 54 million women in 1982 were having babies at the 1960 fertility rate, 75 percent more babies would have been born, and reproduction-related expenditures would have been over $28 billion. The offsets of lower expenditures for contraception and abortion would have been small; even if desired family size rises from two to four, a couple will have to contracept most of the time.

Given the fertility rate, cost is affected by the age and marital status of the mothers. Unmarried women are twice as likely as married women to deliver a low birth weight baby, and teenagers are at higher risk regardless of marital status. Low birth weight babies are more likely to be delivered by Caesarean section [Placek et al., 1983], are more likely to need expensive

special care after birth, and are more likely to require rehospitalization during the first year. Thus, obstetrical and infant care expenditures per birth vary with the age of the mother, as shown in Table 7. The cost for older women rises because they are also at greater risk of having a low birth weight baby and they have the highest Caesarean section rates. The proportion of births delivered by older women is declining: women 35 and over accounted for 11 percent of births in 1960 but only 5 percent in 1982. The proportion delivered to unmarried mothers (of all ages), however, increased sharply in the late 1960s and 1970s.

Technological Factors

Technologic advances have a strong effect on expenditures because they change the set of feasible alternatives and/or change the cost of producing existing services. In some industries technologic advances result in lower total expenditures, and this occasionally happens in health care as well. For instance, the discovery of anti-infectious drugs and vaccines resulted in lower total expenditures for treatment of infectious diseases. Usually, however, new medical technology adds to expenditures. For instance, advances in neonatal intensive care allow physicians and nurses to treat and save infants who would have died in the past. New fertility drugs and improved surgical techniques allow many infertile couples to have children of their own.

Increasingly in obstetrics, electronic devices and ultrasound supplement the less expensive stethescope and clinical

examination when monitoring fetal status. In 1980 one-third of expectant mothers received at least one ultrasound examination during pregnancy, and one-half received electronic fetal monitoring during labor [Placek et al, 1984]. Increased monitoring has probably contributed to a rise in the proportion of babies delivered by Caesarean section from 7 percent of live births in 1972 to 17 percent in 1980. The standard practice of repeating Caesarean section delivery in all subsequent births has also increased use of this procedure.

The pace and character of technologic change in medicine depends in part on exogenous advances in science (e.g., the discovery of DNA) and on the funding provided by NIH and other sources. Innovation and diffusion of more applied technologies are also heavily influenced by the willingness and ability of society to pay for medical care. Thus, during the 1960s and 1970s, open-ended, retrospective reimbursement by private and public health insurers provided a strong stimulus to technologic change. New methods of financing health care in the 1980s, including Medicare's prospective payment system, health maintenance organizations, and preferred provider organizations, are likely to dampen the growth of expensive new technologies and shift the emphasis toward innovations that reduce costs.

Economic Factors

The demand for reproduction-related services, like the demand for any good or service, depends on price, income, and the

prices of substitute and complementary commodities, as well as numerous physiological, psychological, and social variables. The basic law of demand states that, other things equal, the lower the price the greater the quantity demanded. The validity of this law with respect to medical care in general has been demonstrated [Newhouse et al., 1981; Leibowitz et al., 1985] and there can be little doubt that it applies to reproduction-related services as well. The growth of third-party payment has undoubtedly contributed to increased expenditures. Even when the decisions about utilization are made by the physician rather than the patient, third-party payment, which lowers the price to the consumer, results in greater demand if the physician acts in the interests of the individual patient.

Neonatal intensive care is an area where third-party payment makes a big difference. The cost of care for some low birth weight babies and some normal weight babies born with severe problems is far beyond the reach of the average parent. Without private insurance or public support, this care would not be delivered and infant mortality would be somewhat above its present level.

One aspect of reproduction that is still poorly covered by third-party payment is the treatment of infertility. Given the large number of Americans who might benefit from such services, and given the high cost of some interventions such as in vitro fertilization, expenditures in this area might increase greatly from their present low level if such services were covered by private or public insurance.

A change in the price of one service can affect not only the

demand for that service, but also the demand for related services. For example, a drop in the price of effective contraception could lower the demand for abortions by reducing the number of unwanted pregnancies. Similarly, if prenatal care can increase birthweight, a lower price for prenatal care might reduce the demand for neonatal intensive care. These price changes will not affect behavior unless the consumer can benefit from a decision to use less expensive care. For example, childbearing centers and midwives provide obstetrical care to low risk women at only 50 to 60 percent of the cost of traditional care. Some women may favor this alternative because of its emphasis on low-intervention childbirth. With full insurance, however, there is no financial incentive to choose the low cost care.

The full price of a service includes not only its money price but also the value of the time spent on the service. An increase in the value of time (because of the growth of real wages) affects the demand for reproduction-related services directly and indirectly. All time-intensive activities such as staying in the hospital after delivery or taking the infant to the physician for a well-baby checkup become relatively more expensive. An important indirect effect on demand occurs through fertility, because, other things equal, an increase in the value of women's time tends to lower the birth rate.

Other than price, the principal economic factor affecting expenditures is the growth of real income per capita. As income rises, demand for most goods and services rises, and again

reproduction-related services are no exception. All other things equal, a wealthier society can better afford to treat an infertile couple or try to keep a low birth weight baby alive.

Socio-political Factors

Sociopolitical considerations affect the utilization of reproduction-related services in many ways and at many levels. Expenditures are influenced by laws that prohibit, permit, or encourage various behaviors. National policy toward abortion, for instance, as established by federal legislation and Supreme Court decisions, affects the willingness and ability of women to have abortions. Abortion policy, in turn, affects other types of expenditures such as obstetrical and infant care. If abortion were illegal, the fertility rate and number of low birth weight babies would increase. The proportion of babies needing neonatal intensive care would also probably increase because so many of the abortions are performed on teenagers and unmarried women.

Expenditures for reproduction-related services are significantly influenced by prevailing norms regarding socially acceptable behavior. For example, attitudes toward premarital and extramarital sex clearly affect expenditures for contraception and abortion. These attitudes may change as a result of fundamental shifts in philosophy and religion, or in reaction to advances in technology (e.g., female-controlled contraceptive techniques) and changes in the economy (e.g., growing opportunities for women in paid employment). Prenatal screening for genetic disorders is an area with a large potential for growth. How extensively these services are utilized will depend

on laws and attitudes concerning selective abortion and the care of infants born with chromosomal abnormalities.

Public commitment to equality of health care will also affect expenditures, but the direction of the effect can vary. In the United States, the push for equality in the 1960s and 1970s tended to increase total expenditures by making more care available to the poor. By contrast, the British National Health Service in England has attempted to equalize access to some kinds of care by limiting available services to all.

Public Policy Issues

Public policy issues concerning reproduction-related services are as hotly debated as any in our society. This is not surprising, given the subjects involved: sexual behavior, the creation of life, the responsibilities of parents, and the rights of helpless infants. We cannot hope to do full justice to the moral, legal, and political dimensions of these issues, nor can we discuss in detail the issues that arise in each of the five areas of expenditures. Instead, we present a general discussion with a few specific examples of public policy issues in three broad categories: legal status, sources of funding, and allocation of resources.

Legal Status

The most basic policy question that arises with respect to several reproduction-related services is their legal status. Should service "X" be permitted or should it be banned? Currently this debate focuses on abortion, but in the past similar battles were waged over contraception, and in the future infertility services such as surrogate mothering may receive increased scrutiny. The economic approach suggests that human welfare is maximized when individuals are free to act in their own interests, provided their actions do not harm others who are not part of the decisionmaking process. Controversies arise over the identification of the "others" and the degree of harm that they experience.

Economics cannot do much to resolve these controversies, but it can suggest how people would respond to a change in the legality of an activity. A ban on abortion, for instance, would have the following effects. First, there would be fewer pregnancies because of the greater incentive to contracept or to reduce sexual activity. Second, the number of abortions would decrease because the total cost (including the cost of breaking the law) would increase. Third, the birth rate would probably increase because the decrease in abortions would likely outweigh the decrease in pregnancies. Fourth, infant mortality and the proportion of babies born at low birth weight would probably rise because of the decrease in abortions [Grossman and Jacobowitz, 1981]. Fifth, the proportion of babies with congenital abnormalities would probably rise. Sixth, the number of illegal and self-induced abortions would increase, with attendant increases in mortality and morbidity.

Some effects are more difficult to predict. For instance, the proportion of babies born to unmarried women might rise or fall, depending on the differential responses of married and unmarried women with respect to contraceptive behavior, sexual activity, and illegal abortions and on changes in marital status resulting from the ban.

The magnitude of all these behavioral responses would depend on how vigorously the ban was enforced; weak enforcement produces weak effects. Prostitution, for instance, is illegal in most jurisdictions, but the ban is largely symbolic and only weakly and sporadically enforced. Weak enforcement was also the norm when several states had laws against the sale of contraceptives.

Two arguments in favor of a symbolic ban are that society's values are made explicit and that the law may have some deterrent effect. Arguments against a weakly enforced ban are that it invites corruption, leads to disrespect for the law in general, is likely to be evaded more easily by some individuals than by others, and precludes the possibility of regulations to protect health and safety.

Short of banning an activity, society may decide to regulate it through licensure laws and other means. Some activities are regulated by requiring licenses of the users (drivers' licenses, for example). More often, the providers of services must obtain licenses and are subject to government regulation. Thus, many reproduction-related services are controlled through the licensing of health professionals and medical facilities. The case for regulation and licensure of providers usually rests on economies of scale in the provision of information. In the absence of licensure, consumers presumably would have great difficulty determining the qualifications and standards of those offering the services. The danger lies in providers using licensure and regulation to restrict competition.

If an activity such as abortion or surrogate mothering is to be banned or regulated, which level of government should exercise control? One argument in favor of federal standards is that they would eliminate the possibility of border crossing to take advantage of differences in laws. On the other hand, with respect to the emotional issues related to reproduction, there may be a case for controls at the state or local level where the values of the local population can find expression.

Sources of Funding

Once legal status is determined, the most important public policy issues usually concern sources of funding. In our society most goods and services are paid for by individuals out of their own income and accumulated wealth, that is, according to their ability to pay. This is true of some reproduction-related services, but as with other medical care, many expenditures are funded through private insurance or public programs.

Private insurance works best if the probability of using a service is known for the population as a whole, but not known for individuals. With respect to reproduction-related services, however, individuals frequently have much more information than do the insurance companies about their desired family size, attitudes toward contraception and abortion, and the like. If companies base insurance premiums on the average cost of care for the population as a whole, above-average users will be eager to purchase insurance, but those with low probability of use will not (adverse selection). The companies must then raise premiums (making insurance even less attractive) and the private market for insurance may not be viable. Given the high potential for adverse selection, it is not surprising that reproduction-related services have not been as comprehensively covered by health insurance as other kinds of medical care. Mandatory insurance coverage can alleviate the adverse selection problem, but this approach will also increase the tendency toward overutilization.

Alternative sources of funds include philanthropy and government subsidy. Such private and public subsidies are often

only available to the poor, and may be accompanied by restrictions that are not applicable to those who can pay from their own funds. An alternative approach is to treat the service as a public service (such as fire and police protection) and have the government pay for all. The choice of an appropriate funding method requires a balancing of the desire of individuals to avoid risk, the propensity to overutilize if a third party is paying the bill, and social judgments concerning distributional equity.

Allocation of Resources

With legal status determined and a method (or methods) of funding in place, a key public policy issue concerns the method of allocating resources. The standard method in our economic system is to allow buyers and sellers to compete and to let the price be determined at the level where the quantity demanded equals the quantity supplied. If the price is held below this level (as with price controls), shortages will develop. If the price is held above this level (as with many farm products), surpluses will appear. Whenever there are shortages or surpluses some additional rationing mechanism must be introduced to apportion the resources.

Consider, for instance, the allocation of resources with respect to neonatal intensive care. The market will not produce an equal distribution--babies from wealthy families will receive better treatment. But if the market is not allowed to allocate resources, who will do so? Clearly, a policy of providing all possible care to all infants--regardless of cost and the likelihood of survival--is not feasible. Every society must

decide on a standard of appropriate care. In Britain and Sweden, intensive treatment is seldom given for infants weighing less than 750 grams, while in the United States aggressive treatment for infants weighing 500-750 grams is common [Young, 1984]. The challenge is to define "appropriate" care without specifying rigid cutoffs or formulas.

In vitro fertilization, surrogate mothering, and other unusual ways of obtaining a baby also raise ethical questions concerning the allocation of resources. Should access to these services be determined in the market? If not, who will decide which individuals receive which services? And what criteria will be employed? Should personal characteristics such as age, education, income, and marital status be considered? Should the service be available only in cases of infertility, and if so, how is infertility to be defined? What about cases where normal pregnancy might pose a health risk for the mother or the child? How much of a risk would justify an alternative such as surrogate mothering? Are there other circumstances that would warrant surrogate mothering or artificial insemination, such as inability to find a mate or a preference not to mate? If nonmarket rationing is used in these areas, how will it be possible to keep "black markets" from developing? Alternatively, will society be willing to have different sets of eligibility criteria, depending on whether the funding comes from government, philanthropy, insurance, or direct payment?

As this brief discussion suggests, policy problems concerning reproduction-related services are diverse and complex.

They are not different in kind from those that are faced in many other areas of the economy, but they concern activities that are charged with emotion and that are undergoing rapid technologic change. Scientific advances that increase the ability to create life, to sustain life, and to alter life open new possibilities for the fulfillment of human desires; they also create substantial dilemmas for public policy. We hope that health professionals, philosophers, legal scholars, and social scientists will work together toward their resolution.

FOOTNOTES

1. Money available now is worth more than an equal amount available in the future because it can be invested to earn more money. Thus, prepaying a lump sum is more costly than paying an equal amount in installments.

2. The cost estimate is particularly sensitive to the number of years a method is assumed to provide protection.

3. Assuming coital frequency of 100 per year [Torres and Forrest, 1983].

4. They are nonsurgically sterile, it is difficult or dangerous for them to have a baby, or they have experienced no pregnancy during three or more years of sexual activity without contraception in a stable relationship.

5. Assuming an average expenditure of $500 per couple instead of $200 would increase our estimate of total reproduction-related health expenditures by less than two percent.

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