PUBLIC HEALTH OPTOMETRY ECONOMICS

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Chapter Overview

This chapter on public health optometry economics describes the positive and normative uses of economic science. The terms positive and normative while standard are not necessarily clear. Positive uses imply the use of economic theories of responses to incentives to formulate and test hypotheses about individual patient and provider behavior. Normative uses imply analyses including cost of illness, cost-benefit, and cost-effectiveness analyses to assess policies to provide documentation for advocacy, encourage use that is consistent with guidelines, or otherwise change incentives in the market. In addition to describing the positive and normative uses of economic science, the chapter will describe how these interact in the process of making policy, the many varieties of normative studies, and certainty of normative studies, and the reasons that economic analyses alone should not be the basis for policy. Examples from eye care will be used to illustrate points throughout.

Objectives

The objectives of this chapter follow:

1. The reader should be able to describe and distinguish between the positive and normative uses of economic science and describe the feedback loop that includes the two uses.
2. The reader should be able to differentiate between the concepts of the demand for medical care and the need for medical care.
3. The reader should be able to describe the differences among cost-of-illness, cost-benefit, and cost-effectiveness studies and their potential use in the policy making process.
4. The reader should be able to describe different perspectives for economic analysis.
5. The reader should be able to describe methods of sensitivity analyses that are used to describe the degree of certainty about normative economic analysis conclusions.
6. The reader should be able to describe the reasons that economic data should be the exclusive determinant of policy making.

Public Health Principles

The principles of economics suggest that consumers will maximize their well being (often referred to as utility) and for profit firms will maximize profits. In the process of maximizing profits, firms have to produce their output at minimum costs. This suggests a measure of efficiency. The general assumption is that as long as buyers and sellers of goods and services experience the full cost and benefit of the production and consumption process the private market will yield an outcome in which it is impossible to make anyone better off without making someone else worse off. Public health economics begins to focus on situations involving health care and the health of the population in which these assumptions do not apply. Specific issues in public health economics include externalities, health disparities, and the use of tools that aggregate or average preferences within a population for the purposes of making policy recommendations.

Externalities are the effects of a production or consumption process on individuals other than the buyers and sellers of the good or services. In general economics, there are obvious examples. For instance, smoking affects not only the smoker but those who suffer environmental tobacco exposure. Industrial production results in pollution that results in costs for those who are not involved in the production. Obtaining an influenza vaccination protects the recipient as well as those around her. Driving a car creates a level of pollution that affects individuals other than the car drivers. In vision care, treating an individual with visual impairment who is still trying to drive results in greater safety for the individual and for those who are placed at risk by the poor driving that is related to vision. As neither individual buyers not individual sellers have an incentive to consider the external costs and benefits, the existence of externalities is one of the few arguments that economists accept as a legitimate reason for government action in society. The amount of a good or service that emerges in the private market will not be the socially optimal amount of the good or service. While it is beyond the scope of this chapter to describe the exact way to use data on externalities to make policy, economic logic provides ways of using the data to make policy that is consistent with socially optimal outcomes. Identifying and measuring externalities are key aspects of public health economics. Policy makers must be aware of the interventions and either determine ways to change incentives for people to act as if they were aware of the external costs or size the program to provide an economically optimal amount of the service in question.

Economists recognize the difference between the health services that individuals are “supposed” to have (as recommended by professionals) and the amount they actually use. The latter is referred to the amount demanded. There is an entire section of this chapter dedicated to the discussion of the distinction between these concepts. However, one key is that there are much different levels of utilization and much different levels of health for subgroups within the population. For example, the rate of screening for glaucoma may vary substantially by race. Economic science can help us to understand the reasons for different levels of utilization, and, ultimately, disparities between different groups within the population. In particular, economic science can help to identify whether the primary reasons for differences are differences in income and prices (either monetary or time) or whether the differences are because of differences in information, beliefs, or preferences. Knowing the root cause of differences is critical for developing a policy to minimize

differences while otherwise minimizing the ways in which incentives are modified and the remainder of the economy is made inefficient. If there are disparities without externalities, an economic argument in favor of changes will need to focus on the tradeoffs that will be made.

Economists are interested in market failures other than just externalities and questions that extend beyond disparities. Economists are interested in many market failures. Market failure is a term that is used to refer to a variety of situations in which a perfectly competitive market is prevented from operating. In eye care, prescription drugs that are under patent is one example of a restriction on competitive market operation. Licensing requirements are also an example of a regulation that prevents a market from operating fully competitively. There are reasons for both types of market arrangements. Patents provide a greater rate of return for firms that develop new prescription drugs for some amount of time. This provides an incentive to spend money on research to develop new pharmaceutical products. Licensing provides for patient safety. The key is that economists have tools by which they can assess the welfare effects of different market arrangements. These include tools like cost-benefit and cost-effectiveness analyses. These provide structured information to add to the decision making process.

The Positive and Normative Uses of Economic Science

Economics is a term for which many people do not have a full appreciation. Those interested in the use of economics in public health need to understand that it is both a science that can be used in a positive sense (i.e. to explain observed behavior and predict future behavior) and in a normative sense (i.e. to generate recommendations of what public policy option should be taken). In public health, the normative use of economics most often refers to a cost-effectiveness or cost-benefit analysis that is conducted to make recommendations on a policy that should be adopted based on the average of preferences for outcomes at a population level. However, even when the science is used in a normative sense, the measures that are used are derived from methods that are based on the positive science.

The Feedback Between the Positive and Normative uses of Economic Science

In the case of public health, there is often an iterative interaction between the normative and positive uses of the science. Figure 1 shows this process. The positive steps are shown on the left hand side of the figure. Starting in the lower left corner of the figure, an observation will be made of a public health problem or an unexpected result of policy. For example, we might observe that an unexpectedly low number of individuals are taking some type of positive health behavior. In the case of optometry, it could be proper screening for glaucoma in a high risk population. Moving clockwise around the figure, the next normative step is that an analysis will be done to study what factors (including price or insurance coverage) are influencing the unexpected behavior. After the reasons for an unexpected behavior have been

analyzed, alternative interventions are developed. At this stage, those developing the interventions should be informed by the economic data, and the intervention developers will likely consider other factors as well. After one or more interventions are developed, they will be analyzed using the economic science in a normative sense. This is said to be in a normative sense as there is some form of aggregation of preferences and a conclusion is drawn as to what is in some sense "best" for society. Based on this analysis, a recommendation as to the best policy option will be made. After the policy is changed there will be further study of why the policy change did (or did not) bring about the intended behavior change. The process occurs repeatedly and this is shown by the circular nature of the figure.

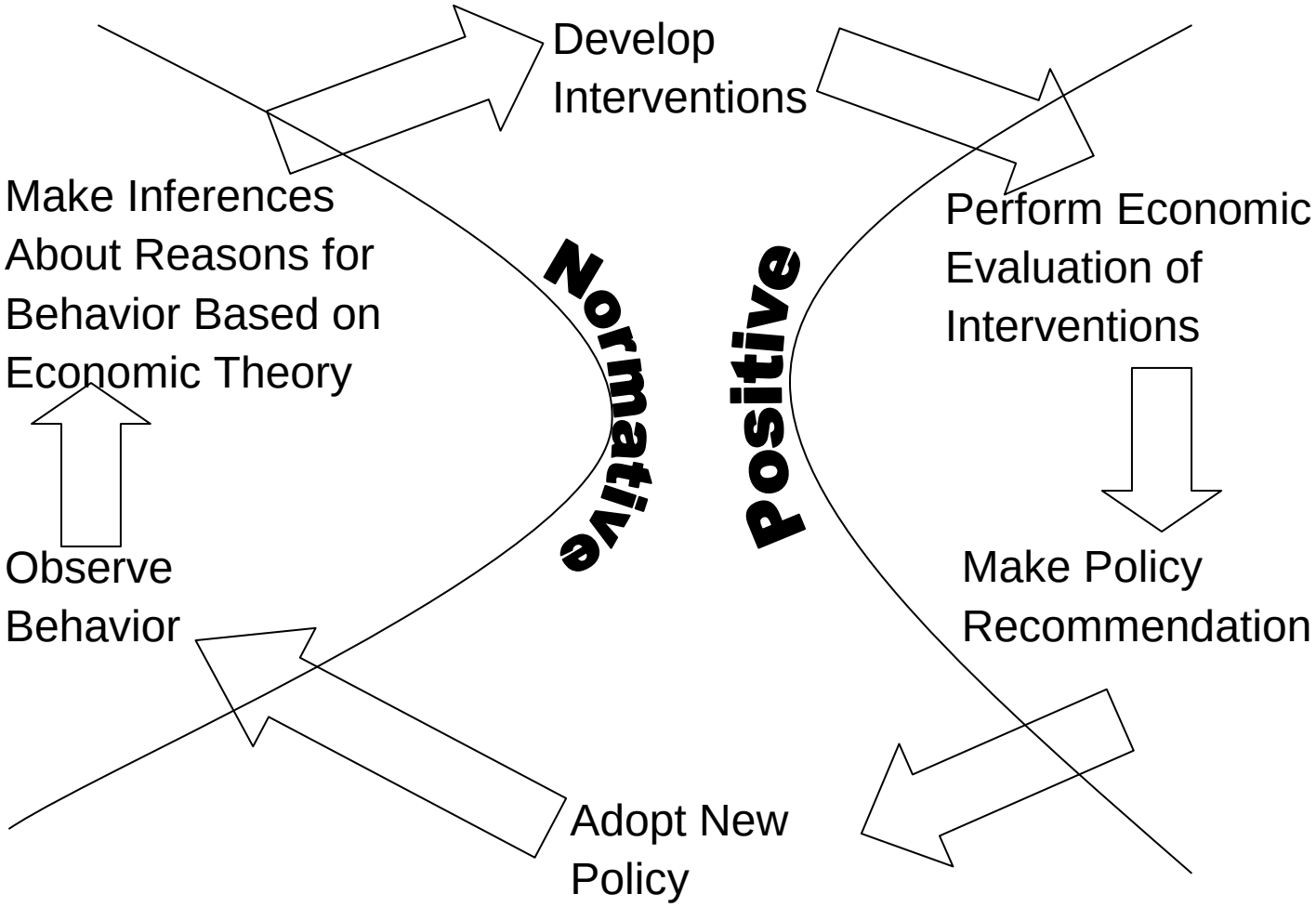

Figure 1. The Interaction of Positive and Normative Economics

The Demand for and the Need for Medical Care

The need for medical care is defined professionally. The need can be thought of as a function of Healthy People recommendations or professional society preferred practice guidelines. Economists are not in favor of planning based on need since the number of individuals who will use a service is not determined by what professionals define as appropriate levels of utilization but by what individuals decide to use as a function of their preferences, beliefs, information, income, and prices they face. This level of utilization is referred to as the demand for care. The measurement of the demand for care is a positive function of economic science.

Demand varies within a population based on differences in all the characteristics that were described above. The demand is determined by individual behavior that is aimed at maximizing their well being or utility. The distinction between supply and demand can be made clear by considering an example in eye care. An eye exam every year is recommended. However, not everyone receives an eye exam every year. Some individuals may be so far from an eye care provider that they find the time cost (or gasoline cost) of a trip to an eye care provider onerous. There are others who simply do not believe that they need an annual eye exam. Others may not have the annual eye exam covered by their health insurance policy. This demonstrates not only different constraints but also other variations that affect the demand for care.

Economists would generally prefer to observe behavior than to ask people about behavior, as economists always are concerned about incentives to reveal honest answers. Regardless of how economists obtain data on the demand for care, the information about demand can be used to make inferences about the value of the goods and services that are being demanded. The value of goods and services is critical for cost-benefit analyses of changes in policy that will affect the utilization of eye care services.

Types of Cost Studies

There are multiple types of cost studies that require different methods and that provide different amounts of information for the policy making process. The types of cost studies include: cost, cost of illness, cost minimization, cost consequence, cost effectiveness, cost utility, and cost benefit. We most commonly hear about whether particular interventions or treatments are cost-effective and we hear about cost-effectiveness studies. One key take away message from the discussion here is that cost-effectiveness studies are only one type of study in a wide range of studies that have the potential to inform policy.

Cost studies are just that—studies that identify and measure costs. Economists studying costs are often not interested only in accounting costs but in what are called “opportunity costs”. The key distinction between the two is that accounting costs represent what is actually being paid or following accounting rules. Opportunity costs represent the

value of the good as captured by what other purpose the good could be used for. A key distinction between these two costs is when looking at prescription drugs that are under patent. After the research is done, the price that is charged for a drug that is under patent will be much higher than the cost of producing the drug. After the drug comes off patent, the price of the generic is substantially lower than the price of the patented drug despite the fact that most of the same materials and a similar process are used. An economist is interested in the true cost of the drug which is much closer to the price of the generic drug than to the price of the brand name pharmaceutical product. There are not necessarily easy ways of determining the price when the drug is still under patent. However, this captures the essence of understanding the difference between accounting costs and economic costs.

Cost of illness studies are intended to document the costs of a condition. These are most commonly conducted as "incident cost studies," meaning a summary of the lifetime costs from the onset of a condition. This type of study can be most useful when prevention of the condition is an option. The data that are captured in this type of study include the medical costs of treatment, the medical costs of preventing additional disease progression, and the productivity losses associated with patients' inability to be as productive after the onset or progression of the condition and the patients' families' inability to be as productive as they would otherwise. An interesting question is where to begin the analysis. For a population at risk of glaucoma, one could begin at the stage of screening for glaucoma. Even if one did not want to include screening (although this is arguably part of the cost of an illness) is the question of where to begin with glaucoma is key. At the stage of elevated intraocular pressure? At the stage of glaucomatous damage? Even contact lenses have costs that go beyond the cost of obtaining and replacing the lenses themselves. A cost of illness measure for contact lenses would include the costs of treatment of infections.

A cost minimization analysis assesses which of two or more alternatives that lead to the same clinical or quality of life outcome costs the least. The cost can be construed only as the cost of medical care or as the entire cost as described above for a cost of illness study. In eye care, screenings might be performed by nurses or by trained lay individuals. If the screenings performed by the two groups had similar levels of sensitivity and specificity, then the key question would be which costs less. Clearly, if the patients being screened were screened in exactly the same location, unless the lay screeners take considerably longer to conduct the screening than do the nurses, it would be obvious that the minimum cost would be achieved by using lay screeners. However, the screening may be performed in fundamentally different locations or with different technologies available, and even a cost minimization analysis can be complicated in some cases.

Cost consequence analysis essentially provides a description of the costs and consequences. A key distinction between this type of analysis and cost minimization is that the alternatives do not bring about identical outcomes. A key difference between this type of analysis and the other analyses discussed below is that the consequences in a cost consequence analysis are multiple outcomes associated with a clinical or public health change. When this type of analysis is conducted there is no attempt to develop a single summary outcome measure for the effect of the clinical or

public health intervention. A cost consequence analysis in public health optometry might focus on driving safety. While there are many ways of summarizing the effect of automobile accidents in either monetary or health terms, screening for visual impairments that affect driving has an effect on the treatment and rehabilitation of patients, on patients' driving, and on the safety of others on the roadways.

Cost effectiveness analyses focus on a single outcome. The most relevant in eye care would be cases (or person years) of blindness prevented. In a cost-effectiveness analysis, we can compare multiple interventions with the same outcome. In theory, we could compare any two interventions with the same outcome. In other words, we can ask whether we have to spend more to prevent a case of blindness if we are focusing on diabetic retinopathy rather than glaucoma or age-related macular degeneration. A similar type of study is a cost utility study. This is a cost effectiveness study with an outcome called quality adjusted life years. To measure a quality adjusted life year, the quality of life and length of life are combined in a single metric. This allows for a more informed comparison among eye care conditions as different causes of blindness have different effects on vision.

Cost benefit studies place a monetary value on the outcomes of an intervention. There are many ways to place a dollar value on the outcome. One way is to place a value on medical care or productivity losses that are avoided. Additionally, we can place a dollar value on having sight in general. While productivity is an important part of the value of sight, there is a value of having sight in general. While this type of analysis can be useful for finding a simple answer to the question, "Are the benefits bigger than the costs?" those conducting the studies may find it difficult to place a monetary value on all outcomes and those using the study results to set policy may find it difficult to accept the ways in which the health outcomes are valued.

Thus, cost-effectiveness is an important tool on the normative side of economic science. It is placed on the normative side because we usually conduct such analyses at an aggregate population level. When aggregating preferences, we are making the assumption that policies that are made for a population should be made when an analysis based on the average measures suggests a positive economic outcome. This is only one of many possible social decision rules. Cost-effectiveness itself is limited because it only allows a comparison of interventions that have the same outcome metric. Cost analyses in general are limited because there are aspects of the cost or the distribution of the costs that are not captured in the way that the measures of cost or cost-effectiveness are created.

Perspectives for Cost Studies

The perspective of a study indicates whose costs and whose benefits are part of the decision making process. In eye care, it is important to recognize the perspective of a study because it will indicate whether we will consider all possible cost and benefits (in which case we would consider an insurer, a patient, the patients' family, the providers, etc.) or

whether we are only considering an insurer or a provider or a health care organization. When using an insurer perspective, the result is closer to a business case analysis. When using a societal perspective, the result takes into consideration all possible costs and benefits and is intended to offer a more complete picture. The latter perspective is generally recommended in theory. However, it is unclear how many decision makers take into consideration all cost and all benefits when they are making policy recommendations.

The Certainty of Cost Studies

Cost studies of all sorts suffer from uncertainties that are similar to statistical uncertainty in any study. However, cost studies also are subject to a variety of other uncertainties. Cost studies are rarely conducted as clinical trials with no further information added to the process. Many cost studies involve modeling exercises in which mathematical models are developed that show the potential relationships between different interventions and different events over time. The combination of uncertainty in estimates across numerous studies can result in complex uncertainties about whether a new intervention is cost-effective in comparison with an old intervention, in other words, whether the clinical gains are worth what is being spent.

There are many ways of assessing the certainty of the economic evaluation conclusions. One way is referred to as a univariate sensitivity analysis. If we can identify a reasonable range in which the value of a parameter might be found, we can experiment by using multiple values from within that range and reporting on whether the qualitative conclusions of the analysis change. We can also perform a probabilistic sensitivity analysis. In the simplest case, assume that we have a confidence interval for an estimate of the sensitivity and specificity of a screening procedures and that we are simply comparing a screening option to no screening, e.g. for early signs of glaucomatous damage to the optic nerve. In this case, we could use a computer program to draw a series of random numbers from a distribution defined to match (as closely as possible) what was measured for the sensitivity and specificity of the procedure. Each time a new number is drawn, we repeat the entire economic evaluation. After drawing a random number 10,000 times, we can report what proportion of those times the screening program is found to be a good buy.

There are potentially other steps in a probabilistic sensitivity analysis. While the example focused on a single variable, sometimes random values are drawn for dozens of variables in each repetition. The number of repetitions is not necessarily 10,000. The minimum is generally 1,000 but the maximum can be in the millions. There are also different ways of reporting the results, including some useful graphic interpretations. However, the most important take away message is that these assess the probability of a new intervention being relatively cost-effective.

Why Economics should not be the Exclusive Determinant of Policy

Economics should not be the only determinant of policy as the positive methods described so far have the potential to measure variation in outcomes (e.g. the variation in demand, followed by variation in utilization and outcomes as described above), the normative methods have very little capacity to include distributional aspects in the valuation of outcomes. Distributional aspects are an important part of social decision making. Further, there are many decision rules other than using average outcomes and there is great debate over the most appropriate way to value quality and quantity of life in either a summary measure of health or in monetary terms.

Case Study

Consider the example of different methods of screening children for vision disorders. Several studies over time have documented a variety of methods of screening children that do not require all children to be seen by an eye care professional. What would an economist be interested in studying in this type of situation?

First, an economist would want to analyze the demand for different types of services. The economist would begin by finding out what type of information and regulations exist at present. Is having a child screened before kindergarten a strong recommendation? Is it a requirement? If is it only a recommendation, then who takes advantage of the service? How many parents take their preschooler to a pediatric ophthalmologist or optometrist? How many parents rely on their pediatricians' office? How many people rely on screenings at school? How many people find other community-based screenings? In addition to knowing the number of people who obtain each type of service, the economist would be interested in knowing the characteristics of those who use each type of service. What are their incomes? What type of insurance coverage do they have available? How far are they from the different types of providers? This is a positive use of economic tools.

If there were apparently a substantial underutilization of screening services, new interventions could be developed. The interventions could include different types of personnel. They could include different types of technology. They could include different types of community outreach. The costs of each would be assessed. The effectiveness of each would also be assessed. The effectiveness would be measured in terms of the number of cases identified properly. Among those who are identified properly, only some would seek care. There will also be false positives and these will be costly if the parents of these cases take them for care only to find out that they have no problems. Further, efforts could be made to measure the costs and effects of failure to achieve early treatment.

If the initial analysis indicates that a single method of screening is clearly the most cost-effective, then the next step would be to assess the certainty about this conclusion. This could be done through a repeated simulation process like the one described above. If the one that appeared to be most cost-effective in a single point analysis was also highly likely to be the most cost-effective under any circumstances, then this would be a clear policy recommendation. In reality, an intervention that is highly cost effective in a point estimate setting is not always highly likely to be the most cost-effective under all circumstances. In some cases, analysts will identify which criterion might be most important for adding certainty to a cost-effectiveness estimate.

Clinical Pearl

Prevention is not always cost-effective. Certainly, the care for a patient who does not suffer from an adverse condition with her vision will cost less than the care for a patient who does have an adverse eye condition. Additionally, we would never want someone to suffer from a condition that can be prevented. However, there are cases in which prevention (particularly if it includes broad-based screening) costs a lot of money. Prevention tends to be cost effective when the risk is high, the population at high risk is either the entire population or can be clearly identified, the cost of prevention is low, and the consequences of failure to prevent are very negative. If any of these conditions does not hold, then prevention is less likely to be cost-effective. There may also be non-economic reasons to consider implementing prevention. However, it must be recognized that there are many ways in which the apparent cost-effectiveness of prevention can be compromised.

Principles Applied to Other Populations, Cases, or Problems

The role of optometry in primary eye care is similar to the role of primary care in general. There are many examples in which screening can bring about clear clinical benefits but there are different options for screening and an economic evaluation can focus on which method of screening is least costly or achieves the clinical goal of prevention a condition or deaths from a condition at a reasonable cost. Demand analysis and cost-effectiveness analysis can be used throughout health care and public health.

Study Questions

1. Why do we have a problem with uncorrected refractive error in the United States?
2. What is the most cost-effective way to treat convergence insufficiency?
3. What is the most cost-effective approach for screening for glaucoma patients?
4. What is the most cost-effective combination of lens material and cleaning solution for contact lenses?

Take Home Conclusions

Economics provides an important set of tools for predicting and understanding how people will respond to incentives and for prioritizing resource allocation. Prevention may not be justifiable based on economics. Economics is useful but has limitations in its use for policy making.