3 Principles of Risk and Insurance for the Medical Leader

—by Howard J. Bolnick, FSA

In an ideal world, public or private insurance to cover the cost of medical care would be available to everyone at a fair price. Many industrialized countries have chosen to use public means to implement something close to this ideal for their citizens. The United States has taken a different tact: risk associated with financing medical care is borne by a complex patchwork of public programs and private insurance, with private managed care increasingly serving both public and private markets.

The shortcomings of our mixed public-private health care financing system have been widely debated. In the private sector, access to health insurance is sometimes limited, premiums are often higher for the sick than for the well, insurance policies may be canceled, and continuity of coverage in job changes is not ensured. The public sector may not share all of the private sector maladies, but difficulties with benefit limitations and severe constraints on providers' abilities to charge for their services are common complaints. Even managed care is increasingly being criticized. "Drive-by deliveries" and "gag clauses" are touted as indications that managed care, like other health care financing vehicles, suffers from serious shortcoming.

Public and private health care financing programs share common characteristics; They are all insurance vehicles subject to a common insurance market behavior and the same fundamental insurance problems. This chapter explores insurance market behavior as a framework to understand the basic principles of risk and insurance. This framework links characteristics of insurance market structures, consumers' insurance purchasing behavior, and insurance company risk management tools. These links are a powerful way to understand how insurance markets work, why they consistently fall short of our ideal expectations, and how these dynamics apply to managed care.

Insurance Market Behavior Dynamic

Insurance Market Structure shapes...
Consumer Behavior, which, turn, leads insurers to develop...
Risk Management Tools to provide market stability

Insurance market behavior is a causative dynamic that starts with insurance market structure. Risk-bearing markets exist as either public markets (e.g., Medicare and Medicaid) or as familiar private markets (e.g., health

insurance for small businesses and individuals). Each market has its own characteristics, described by economic and legal behavior on the part of both consumers and insurers.

Consumers buy insurance because they are risk adverse; that is, they are willing to trade an uncertain loss for a known premium. Consumer behavior can be predicted from the market structure. If the insurance purchase is voluntary, fundamental risk-bearing problems of adverse selection and moral hazard need to be coped with by insurers. These problems arise from the nature of human decision making under uncertainty.

In response to fundamental insurance problems, insurers develop risk management tools. Risk selection, risk rating, preexisting condition limitations, and policy cancellation options are all tools that traditional indemnity health insurers have developed to compensate for problems caused by consumer behavior. Managed care does not obviate the need for risk management tools. However, managed care organizations have largely replaced traditional risk management tools with new ones more consistent with their business strategies and tactics.

In the absence of effective risk management tools, insurance markets have a strong tendency to attract higher cost risks than expected in premiums. This creates losses for insurers, who respond by raising premiums. Higher premiums, in turn, chase off some better risks, which sets off a new round of insurer losses followed by premium increases. If left unchecked, this dynamic results in the withdrawal of all insurers and customers from the market. This extreme reaction is a market failure.

Market Structure

Insurance markets exist in both the public and the private sector. Each market has its own characteristics.

Government Rules

State and/or federal laws and regulations govern the conduct of customers and insurers in insurance markets. These might include federal legislation such as ERISA and the Health Insurance Portability and Accountability Act of 1996 (HIPAA), or legislation at the state level such as variations on the National Association of Insurance Commissioners' Small Employer and Individual Health Availability Model Act. Government rules and regulations generally:

- Create insurance structures, such as reinsurance pools, that would not naturally form in a competitive market environment.

- Prescribe consumer behavior (e.g., mandate the purchase of insurance).

- Proscribe insurer behavior (e.g., limit the use of preexisting condition limitations in health insurance contracts).

Consumer Choice

An important characteristic of a market is whether consumers have a choice of becoming eligible and participating in insurance. Most private markets feature choice. In various individual insurance markets, customers have free choice of joining and maintaining their insurance participation. Employer-purchased coverages offer employees these same rights. Some private markets have government-mandated insurance (e.g., worker's compensation). Most public markets cover (almost) all categorically eligible citizens (e.g., Medicare), thereby limiting choice. As will be discussed under fundamental insurance problems, consumers' freedom of choice leads to the potential problem of adverse selection.

Competition among Insurers

Insurers' competition for customers is driven by the economic profit motive. This creates both positive and negative results. A positive result is the development of a rich choice of products and features reflecting consumers' different tastes and values. A negative result can often be that competition based on price leads to the development and widespread use of risk management tools that lower price through risk selection, risk rating, etc. Competition among insurers occurs in both private markets and public markets. Medicare risk contracts are a recent example of competition among managed care organizations in a public market.

There are four distinctly different markets that arise from combining key consumer and insurer characteristics:

- ***Private, Open Markets.*** These are familiar private sector insurance markets. Consumers have a choice of buying or not buying insurance. Numerous insurers compete to attract consumers. Health insurance for individuals is a pure form of a private, open market. This brief introduction to the principles of risk and insurance is concerned only with private, open markets.

- ***Private, Closed Markets.*** These markets are structured to limit both consumer choice of participating and competition among insurers. Large self-insured employers are a good example. Consumers can only enter the market by working for the self-insured business. By self-insuring, the employer eliminates the effects of insurer competition for its employees.

- ***Public, Open Markets.*** These markets are served by public-operated insurance mechanisms, usually with some sort of public or insurance industry subsidy to lower premiums. The public insurer is usually the only source of insurance in its market. Consumers are allowed their choice to buy or not buy from the public insurer. An example of this market is state-sponsored Comprehensive Health Insurance Plans (CHIPs), which operate health insurance programs for individuals who are unable to obtain insurance in the private sector.

- ***Public, Closed Markets.*** These markets are served by public-operated insurers that provide insurance to virtually everyone in well-defined categories of consumers. Examples of this market structure are Medicare and Medicaid.

Risk Aversion

Consumer insurance buying behavior is driven by risk aversion. Risk-averse buyers are willing to trade a certain relatively small loss, a periodic premium payment, for the uncertain alternative of either incurring what could be a large loss or, at the other extreme, of incurring no loss at all.

Economists and psychologists have studied the strength of human risk-averse behavior. Studies consistently find consumers willing to pay a premium greater than their expectation of loss. For example, psychological and economic studies demonstrate that, given a choice between a risky alternative of a 1 percent chance of a loss of $1,000 or a 99 percent chance of no loss at all and a riskless alternative of a certain loss (i.e., a premium payment) equal to the expected loss of the risky alternative of $10 (the expected loss equals the 1 percent chance of loss times the $1,000 loss), people choose the $10 premium payment. The studies go on to demonstrate that risk aversion is strong enough that people will actually choose a riskless alternative with a premium greater than their $10 expected loss. At some point, however, the premium becomes large enough that people choose the risky alternative of losing $1,000 rather than pay too large a premium.

Over the years since the concept of risk aversion was first discussed in economic literature, economists and, more recently, psychologists have attempted to measure risk aversion. Humans, being as diverse and complicated as we are, do not have risk-aversion algorithms embedded in our minds that can be retrieved and duplicated on computer worksheets. We do, however, make decisions under uncertainty by acting in a manner consistent with findings from these studies.

Buying insurance is a pure example of decision making under uncertainty. Paying a premium equal to the insurer's average expected loss plus a loading

for administrative expenses and profits fits exactly with economic and psychological models. Understanding risk aversion as a basic characteristic of human decision making under uncertainty, we can draw important conclusions about consumers' insurance buying behavior.

- An individual will buy insurance at a premium equal to his or her expectation of loss plus some loading for the insurer's administrative costs and profit.
- If loading is too high, individuals will choose not to buy insurance.
- If average expected losses incorporated by the insurer into premiums are too high in relation to an individual's own assessment of his or her risk, the individual will not buy insurance.

These characteristics of individuals' insurance buying behavior are the source of fundamental insurance problems.

Consumer Behavior

Private sector insurance markets are characterized by consumers' having a choice of buying from a variety of insurers competing in the market. This private, open market structure has two fundamental insurance problems caused by consumer behavior: adverse selection, driven by risk-averse buying behavior, and moral hazard, driven by the economic consequences of insurance on consumers' purchasing behavior.

Adverse Selection

Consumer choice to buy insurance or not and competition among insurers ensure that, for an entire population that might buy insurance:

- The insured population is smaller than the total population.
- The population choosing to become insured with one insurer is smaller than the insured population.

An insurer, driven by the profit motive, is concerned with predicting the expected losses of the risk pool, which is composed of consumers choosing to buy from it. In an ideal world, the fact that an insurer's risk pool is much smaller than that of the insured population and of the total eligible population is of no consequences for its pricing. This ideal state is represented in

Figure 1. Private-Open Markets: choice

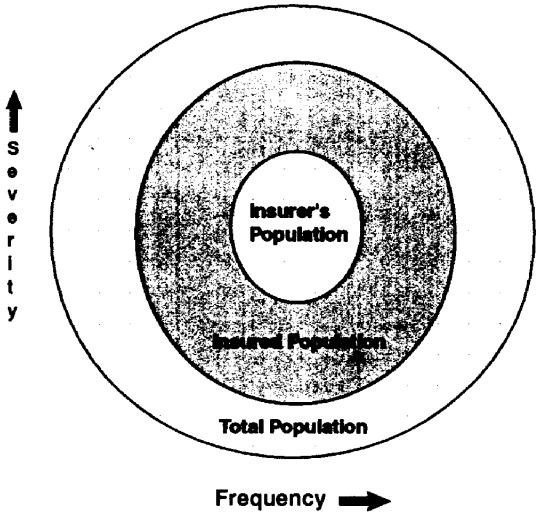
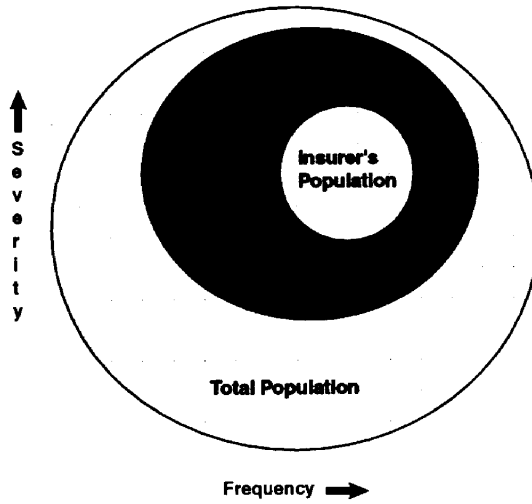


figure 1, page 34. Three circles of decreasing size represent the total population, the insured population, and an insurer's population. As long as the three populations have the same average loss frequency (probability that a loss occurs) and the same average loss severity (size of a loss once it happens), the average loss (loss frequency times loss severity) will be identical for all populations.

In the real world, choice and competition introduce a high probability of adverse selection. Adverse selection occurs when the insured population exhibits higher losses than the total population or when an insurer's risk pool exhibits higher losses that the insured population. Adverse selection occurs for three reasons:

- Individuals do not all have the same risk characteristics. Some are prone to a higher frequency and/or severity of loss, and others are prone to a lower frequency and/or severity of loss. The health characteristics of a population clearly follow this pattern. Studies have shown that a small percentage of the population accounts for the majority of health care costs in any given period.

Figure 2. Adverse Selection

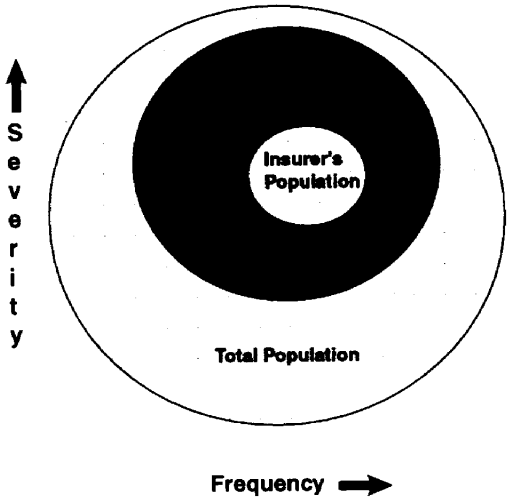


- Consumers know a great deal more about their risk characteristics than do potential insurers. Insurers have information about average risks, but they have no specific information about the risk characteristics of individuals interested in buying from them. This is know as an information asymmetry; one party has important information that is not available to a second party with whom a contract is formed.

- Consumers have a choice to buy insurance or not. Risk aversion drives their decisions. A buying decision is made by a psychological comparison of insurers' premiums to consumers' assessments of their risk characteristics. Consumers who judge their risk to be about equal to or higher than the risk upon which premiums are based are quite likely to buy insurance. Consumers with lower risk characteristics are less likely to buy.

Clearly, in a market with consumer choice, difference in risk characteristics, and no compensating behavior by insurers, adverse selection will occur. This deviation from the ideal situation is represented in figure 2, page 35. The insured population and insurers will exhibit average losses greater than those of the total population. In addition, each insurer drawing customers from among these higher risk potential customers runs the risk of attracting an even worse risk pool than that of the insured population.

Figure 3. Moral Hazard



Adverse selection results in insurers' increasing their premiums. Every premium increase causes customers to reassess their buying decisions. With each premium increase, lower risks within the insured population become more prone to drop their insurance. Those remaining are higher risks. This process is known as an assessment spiral. At an extreme, an assessment spiral can cause a market to fail as insurers find it increasingly unprofitable and withdraw from competing for the increasingly expensive insured population.

Markets with asymmetrical information and their consequences have been of great interest to economists. Insurance markets are often the ones studied. Their studies give ample reason for concern that assessment spirals and market failures are real world consequences. Insurers have had to consider this inherent market instability as they plan their strategies to compete and make profits.

Moral Hazard

Despite the implication of its name, moral hazard is not caused by human moral failure. It results from the economic consequences of insurance on consumers' purchasing behavior.

Without insurance to cover losses, consumers would have to pay the full cost of any goods or services needed as consequence of a loss. Their

post-loss buying behavior would take into account cost as well as their needs and desires for various good and services.

With full insurance coverage, consumers substitute a relatively small premium for the risk of loss. Once losses occur, insurers pay for all needed goods or services. Consumers post-loss buying behavior no longer needs to take cost into account. Purchasing decisions are driven only by consumers' needs and desires for insured goods or services.

Economists describe the differences in buying behavior with and without insurance in terms of the economic tradeoff between cost and quantity (demand for goods and services). As price increases, the quantity of goods and services bought by consumers decreases; vice versa, as price decreases, quantity increases. Moral hazard is simply a recognition that insurance reduces the post-loss price of goods and services. Because the prices they pay are reduced under insurance coverage, economically rational consumers demand more insured goods and services. Figure 3, page 36, represents how moral hazard affects the cost of insurance by increasing both loss frequency and loss severity.

The effect of moral hazard in health insurance has been vividly demonstrated in the RAND Health Insurance Experiments. In their study, RAND investigators randomly assigned members of the same health plan to different health insurance policies. The utilization differences between full reimbursement policies and partial reimbursement policies were measured. As predicted by moral hazard, members with full reimbursement policies used significantly more medical care resources than did those with partial reimbursement policies.

Risk Management Tools

Private, open markets in which consumers have choice and insurers compete to attract them can be characterized as follows:

- Consumer choice causes uncertainty about the level of risk borne by all insurers.
- Consumer choice causes uncertainty about the level of risk borne by each insurer.
- Insurance causes consumers to increase their demand for insured goods and services.
- Competition among insurers and consumers' risk-averse buying behavior shapes insurers' market behavior.

These problems of choice and competition can add to the cost of insurance and, at an extreme, cause a market to fail, leaving everyone, high risk or low risk, without an option to insure.

We know, however, that private, open insurance markets exist in abundance. Somehow, the problems inherent in market structure and consumer behavior are controlled. The reason is the risk management tools developed by insurers. Risk management tools are universal; they are used in public markets and private markets and in markets with and without consumer choice. Specific tools reflect not only market structure and consumer behavior, but also the strategic approach that insurers take to a market.

To understand insurer behavior, we will look briefly at the traditional health insurance business and managed care organizations and contrast their business strategies and resultant risk management tools.

Business Strategies

Traditional health insurers and managed care organizations are fundamentally different businesses. Traditional insurers are designed to manage their risk pools' health financial risks. Effective managed care organizations manage their members medical care. Differences in business strategies result in the development of very different risk management tools.

Traditional Health Insurers

Traditional health insurers design risk management tools to control their risk pools' financial risks. Traditional insurers are mainly concerned with tactics:

- To control the level of health risk of consumers attracted to their risk pool to compensate for potential adverse selection.
- To charge premiums consistent with their customers' self-assessed level of risk to compensate for potential adverse selection.
- To share the cost of medical care with insureds to control moral hazard.
- To protect against losses associated with the worst consequences of an assessment spiral caused by unchecked adverse selection and moral hazard.

Insurers' risk management tools are consistent with these tactics. They usually adopt a mix from among the following examples of risk management tools.

Control the Level of Health Risk

- Insurers ask for health information about customers who apply to them. Risk selection directly compensates for information asymmetries. Decisions to accept the application, deny it, or modify premiums or benefits flow directly from this equality of health information.

- Pre-existing conditions can be limited or denied to avoid situations where consumers become interest in buying insurance only upon becoming ill.

- Sales may be targeted at healthy consumer or away from unhealthy populations.

- Insurance is terminated after an employee or a dependent is no longer a member of an eligible group.

Premium Equity

- At the issuance of a new contract, health information may be used to charge premiums related to applicants' health risks. Better risks are charged lower premiums; worse risks are charged higher premiums.
- In subsequent years, claims experience may be used to discriminate between better risks and worse risks. Better risks can be offered lower premiums than worse risks in order to forestall the better risks' accepting more favorable offers from other insurers. Renewal rating processes can become quite complicated.

Cost Sharing

- Deductibles and coinsurances may be added to benefit formulas to provide an incentive for insureds to consider cost in their choice of medical care.

- Limitation, exclusions and maximums may be written into insurance contract to control the use of costly or ineffective services.

Protection from Extreme Losses

- Insurers may purchase reinsurance coverage to protect themselves from large losses on an individual or for excessive losses on their entire pool.

- A right to terminate the entire risk pool may be written into insurance contracts.

By using these types of risk management tools, traditional insurers have developed stable and profitable insurance markets that otherwise might not exist.

Managed Care Organizations

Effective managed care organizations design their risk management tools to control their members' medical care. Managed care organizations are mainly concerned with tactics:

- To organize and manage high-quality, cost-effective provider networks.
- To gather, analyze, and use information needed for providers to deliver high-quality, cost-effective medical care to members.
- To target and attract a large enough population of members in well-defined service areas.

Effective managed care organizations' risk management tools are consistent with these tactics. Organizations usually adopt a mix from the following examples.

Network Organization

- Profile users to identify the best providers for a health care network. Adding high-quality providers to a network helps to control the medical care consequences of any adverse selection and moral hazard.
- Negotiate provider contracts with savings over fee-for-service relationships. Lower provider charges also help to control the cost of adverse selection and moral hazard.

High-Quality, Cost-Effective Medical Care

- Develop medical care practice guidelines that help to control the medical care consequences of any adverse selection and moral hazard.

Market Share in Service Area

- Build market share in local service areas to provide patients to contracted providers. A large market share also provides a spread of risk so that average losses for plan members do not differ significantly from average losses for the insured population in a service area.

- Target sales to larger employers to build market share quickly. This sales tactic also spreads risk and avoids adverse selection from more volatile and unstable small businesses and individuals.

Comparison and Consequences of Risk Management Tools

Traditional insurers, with their strategy of managing financial risk, concentrate their risk management tools on the health profile of their insureds and on developing sophisticated risk classification systems to properly rate risks within their pools. Managed care organizations, on the other hand, focus their risk management tools on building and managing networks of providers in order to manage the delivery of high-quality, cost-effective medical care. Despite differences in strategies, both insurers and managed care organizations need risk management tools as solutions to the fundamental insurance problems of controlling adverse selection and moral hazard.

Even with the need for risk management tools, their existence sometimes conflicts with the public's idealized opinions about how insurance should operate. It is helpful to compare the risk management tools used by traditional insurers and managed care organizations to the list of complaints about insurance companies and managed care plans at the beginning of this chapter.

Capital Needs

Insurance has a solid mathematical heritage based on probability and statistics. Two mathematical laws and a classic probability problem describe how insurance pools can be expected to behave: the Central Limit Theorem, the Law of Large Numbers, and the Gambler's Ruin Problem.

Central Limit Theorem

The Central Limit Theorem relates an individual's mathematical risk characteristics to the characteristics of a insurer's pool of individual risks. Individual risks, like health risks during a single year, are often unknown and are characterized by a relatively large chance of no loss and a small chance of large losses. However, by assembling a large number of individual risks in a pool, the loss characteristics of the entire pool take on a well-understood and mathematically well-behaved form. The Central Limit Theorem states that the probability distribution of a pool of N individual risks approaches a normal distribution as the pool becomes large. Knowing the probability distribution of pool losses is fundamental to insurance pricing.

Law of Large Numbers

The Law of Large Numbers gives insurers additional information about the stability of their risk pools. The Law of Large Numbers states that an insurer's pool mean will become quite close to the average loss of the entire insured population as the size of the insurer's pool grows larger. The law means that the risk of statistical fluctuation is reduced by increasing the number of policies or health plan members in an insurance pool.

Gambler's Ruin Problem

Even though large insurance pools can be mathematically described using a normal distribution with expected loses per risk quite close to those of the entire insured population, losses from an insurer's risk pool are not as well behaved as insurers would like. The nature of this fundamental insurance problem is captured in the Gambler's Ruin Problem. The Gambler's Ruin Problem considers a player who carries on a series of bets with a gambling house. A bet could be something as simple as the flip of a fair coin. Bets are continuously placed until either the player or the house are ruined (i.e., run out of money). The problem is to calculate the chances of winning for the player and the gambling house.

The solution to this simple version of the Gambler's Ruin Problem is that the players chance of winning is the ratio:

$$\frac{\text{Player's Initial Capital}}{\text{Total Capital (Players and House) in Game}}$$

A mathematically sound message to our hypothetical player is that even betting on a fair game in which he or she can expect to win 50 percent of the time, statistical fluctuations are large enough that capital is needed to ride out "runs of bad luck."

Insurers' Risk Based Capital Needs

This chapter has presented a number of fundamental risk-bearing problems that insurers, including managed care organizations, need to consider. Some of these problems are systematic risks: adverse selection and moral hazard. Other problems are random risks: the mathematical nature of insurance pools and their statistical fluctuations. Systematic and random risks both lead to a need for capital to assure consumers that promises made by insurers and managed care organizations will be kept.

Insurance regulators and actuaries have developed a method to assess the capital needs of risk-bearing organizations. Risk-based capital is determined

for each insurer on the basis of its risk characteristics in four categories:

- Risk of mispricing insurance products.
- Risk of asset default.
- Risk of mismatching between assets and liabilities.
- Risk arising from other business functions.

Although these categories obviously go well beyond the basic material presented in this chapter, they give an even more robust sense of why insurers and managed care organizations need to maintain capital to ensure fulfillment of their obligations.

Managed care organizations increasingly are negotiating provider contracts that shift risk from health plans to providers (e.g., capitation). Shifting risk does not forestall the need for capital; it shifts the need from health plan to provider and may alter the amount and the form of the capital.

Summary

This chapter is designed to provide physician executives with a framework to understand risk and insurance and its consequences for health insurance and managed care organizations. Points covered are necessarily short distillations of much more complicated material. The main points that the author intends to convey are:

- Insurance market behavior is driven by a dynamic in which market structure shapes consumer behavior, which, in turn, leads insurers to develop risk management tools to provide market stability.
- Market structures are characterized by: government rules, consumer choice, and competition among insurers.
- Consumer behavior is based on their risk aversion.
- Consumer risk aversion, consumer choice, competition among insurers, and insurance itself cause the fundamental risk-bearing problems of adverse selection and moral hazard.

Principles of Risk and Insurance for the Medical Leader

- Adverse selection and moral hazard have the potential to increase premiums or even to cause an insurance market to fail if not adequately control by insurers.

- Insurers control adverse selection and moral hazard by developing risk management tools consistent with their business strategies.

- Risk management tools for managed care organizations differ significantly from those of traditional insurers.

- The mathematical basis for insurance, described by the Central Limit Theorem, the Law of Large Numbers, and the Gambler's Ruin Problem, form the basis for relatively well-behaved markets.

- Systematic risks of adverse selection and moral hazard and random statistical risks, along with an array of insurance business risks, lead to the need for risk bearers to maintain adequate capital.

- Managed care organizations shifting risk to providers do not forestall the need for capital; they merely shift the need to providers who accept risk.

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