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Genetic Testing for Breast and Ovarian Cancer: Implications for Life Insurance

Editor's note: As the science of genetic testing progresses, the debate surrounding the uses of genetic information intensifies. In February, President Clinton signed an executive order prohibiting federal agencies from using such information to make hiring, promotion, or placement decisions. Concerns about privacy and discrimination have led many states to propose or enact statutes that prohibit health insurers from using genetic test results in their underwriting decisions. However, few statutes address access to these results by the life insurance industry. This Issue Brief summarizes the current debate on whether life insurers should have access to genetic testing information for breast and ovarian cancer, and provides actuarial insight into the potential effect of such testing on the voluntary term insurance market.

The debate: discrimination vs. adverse selection

About one in nine women in the U.S. will develop breast cancer in her lifetime, and about one in forty will die from it. Since 1996, commercial tests have been available to identify women with mutations in BRCA1 and BRCA2, two genes associated with breast and ovarian cancer. Although less than 3% of women carry a BRCA mutation, they have up to a 60% to 85% risk of developing one of these cancers. Because of the potential impact of this information on mortality risk, life insurers have sought access to genetic test results for underwriting purposes.

- Consumers are concerned that genetic information could result in employment and social discrimination. They fear that the use of this information by insurers could result in the creation of a biological underclass of uninsurable individuals. In response, the federal Health Insurance Portability and Accountability Act of 1996 prohibited health insurers from characterizing an employee's genetic information as a pre-existing condition for group health insurance. Life insurers were not considered in this legislation.
 - Life insurance representatives argue that all information available to an individual be available to insurers, to maintain a "level playing field" with applicants. They point to the danger of "adverse selection," the process by which people make insurance decisions based on characteristics known to them but not revealed to the insurer. People at high risk for premature death buy more insurance at low rates, and the insurer experiences greater losses than anticipated.
 - If significant adverse selection occurs, the insurer must raise premiums for everyone. Because prices rise, markets shrink, causing policies to become unaffordable (or unattractive), particularly to lower-risk people. In a worst-case scenario, the voluntary life insurance market would collapse from this spiral of high-risk people and higher premiums, leaving many people uninsured.
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Life insurers may have more to fear from genetic testing than health insurers

Although much of the legislative debate has focused on health insurance, life insurers may be at much greater financial risk from adverse selection.

- Life insurers face more risk of adverse selection than health insurers because their contracts—for example, a term life insurance policy—are in force for years with premium costs set at the time the policy is issued. Health insurers often renegotiate rates yearly.
- The vast majority of health insurance contracts in the U.S. are obtained through employers, are not risk-rated, and provide benefits limited to the costs incurred. In contrast, about half of life insurance contracts are obtained individually, and provide the insured with greater opportunities to increase or decrease the benefit amount. At the end of 1998, about 25 million individually-purchased term life policies were in force in the U.S., with a combined benefit amount nearing \$3 trillion.
- After purchasing life insurance, the policyholder can cancel the policy at any time, but the life insurance company typically guarantees renewability for a prolonged period. Thus, the company faces extensive financial exposure when issuing a policy.
- Individuals who believe themselves to be at high risk of early death can increase their life insurance coverage; however, most individuals have little room to increase health insurance coverage in response to a sense of increased risk.

Quantifying the effect of family history and mutations on life insurance costs

Underwriters classify applicants according to age, sex, and smoking behavior, and use medical factors to identify those whose expected mortality exceeds the established range for standard or preferred risks. With present underwriting standards, about 89% of all term life insurance applicants are accepted at standard or preferred rates. About 6% are offered insurance at an extra premium, proportionate to their additional mortality risk. About 5% of all applicants are turned down for coverage.

Even within the insurance industry, little is known about how a family history of, or genetic information about, breast or ovarian cancer affects life insurance costs. Using data from the medical literature, Lemaire and colleagues quantified the actuarial impact of family history and BRCA1 or BRCA2 mutations.

- Actuarial analysis reveals that the type of affected relative and her age at onset are key underwriting features. Excess mortality can approach 100% for women with two relatives with breast cancer, and 35% for women with a first-degree relative (mother, sister) who developed cancer before age 30. A 20-year term policy for some of these women might cost 56% more than for women with no family history.
 - Excess mortality in women with a BRCA gene mutation can reach 250% depending on the age of the applicant and the term of the policy. The cost of a 20-year term policy for some of these women might be two and a half times as much as for women with no family history.
 - Among insurers, it is common practice to accept at standard rates applicants with expected mortality up to 150% of the norm. Therefore, some women with a family history of breast cancer might be accepted at standard rates, while others need to be quoted substandard rates. Depending on the underwriting policy of the company, women with the gene mutation might be accepted, but with a substantial surcharge.
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Developing a model to estimate adverse selection costs

The above actuarial analysis assumes that adverse selection does not occur—meaning that women who find they are at high risk do not increase their life insurance coverage and women who find their risk is lower do not decrease it. Lemaire and colleagues then developed a model to estimate the cost of adverse selection in an insurance market with genetic testing for breast and ovarian cancer. They assumed that women would have access to genetic test results, but insurers would not be allowed to use that information in underwriting. The following factors were considered in the model:

- Age and family history. The model predicted adverse selection costs for three age groups (30, 40 and 50) and four family histories (no family history of breast or ovarian cancer, one first-degree relative with early-onset breast cancer, one first-degree relative with ovarian cancer, and two first-degree relatives with early-onset breast cancer.)
- The rate of genetic testing and test results. Given that few women presently choose to be tested for the BRCA mutations, the model assumed that just 5% of women in an insurance portfolio would be tested annually. Because women with a family history are more likely to test positive for the mutations, the model varied the probability of a positive result, from 0.5% for women with no family history to 40% for women with two first-degree relatives affected with early onset of breast cancer.
- Purchasing behavior after testing. The model assumed that most people would not change their life insurance status after testing, and thus provides conservative estimates of the cost of adverse selection. For example, it assumed that testing positive would lead only 25% of uninsured women to buy a policy and only 27% of insured women to increase their policy benefits. Conversely, it assumed that 95% of uninsured women would remain uninsured after a negative test, and that 75% of insured women would keep their policies unchanged after a negative result.

Adverse selection costs could be manageable, if insurers use family history in underwriting

The costs of adverse selection vary by age, family history, benefit amounts, and term length.

- Not surprisingly, adverse selection in women with no family history of breast or ovarian cancer is negligible, because the probability that these women have a mutation is small. Insurance companies should not be concerned with restrictions on the use of genetic testing information in these women.
 - For women with a first-degree relative with ovarian cancer, adverse selection costs become significant in women who get tested and select high benefit levels. These costs may reach 10% of premiums in some cases.
 - Adverse selection costs are highest for women with one or two relatives with early-onset breast cancer, reaching 20% of premiums in some cases involving high benefit amounts.
 - Overall, the average adverse selection cost is expected to be less than 10% of premiums. This cost is likely to be offset by the overall long-term trend of decrease in mortality rates that currently stands around 0.5% per year.
 - The previous results assumed that women report their family histories truthfully (and that insurers fully use family history in underwriting). If an insurer makes no use of family history in underwriting, the model estimates huge adverse selection costs attributable to genetic testing, reaching nearly 300% of premiums in some cases.
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POLICY IMPLICATIONS

These results inform the debate over whether the life insurance industry should have access to genetic test information. It may help craft public policy that balances the public's desire to protect the privacy of genetic information with the life insurance market's need to classify risk accurately and avoid adverse selection.

- By actuarial standards, women with a BRCA mutation face an excess risk of premature mortality and should be accepted for voluntary term life policies only at substandard rates. However, such a practice may conflict with broader social concerns about discrimination. If insurers cannot use genetic information, adverse selection could result.
- At current testing rates, adverse selection should be controllable if companies apply strict underwriting rules, requesting cancer history and age of onset for all first-degree relatives. If companies do not request precise family information, adverse selection costs might disrupt the voluntary insurance market.
- Adverse selection costs are highest when women select high benefit levels following a positive test. Therefore, one practical strategy is to allow life insurers to use genetic test results only when underwriting large policies. This kind of voluntary restriction has been in effect for the past two years in Britain, where life insurers do not require disclosure of genetic test results for many policies with benefits of less than 100,000 pounds (about \$158,000).

This Issue Brief is based on the following articles: K. Subramanian, J. Lemaire, J.C. Hershey, M. Pauly, K. Armstrong, D.A. Asch. Estimating adverse selection costs from genetic testing for breast and ovarian cancer: the case of life insurance. Journal of Risk and Insurance, December 1999, vol. 66, pp. 531-550; J. Lemaire, K. Subramanian, K. Armstrong, D.A. Asch. Pricing term insurance in the presence of a family history of breast or ovarian cancer. North American Actuarial Journal, April 2000 (in press).

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