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## **THE INTERPRETATION--AND MISINTERPRETATION--OF HEALTH STATUS AND RISK ASSESSMENTS**

Researchers in gerontological health have made considerable progress in identifying and quantifying risks to health that can be attributed to behavioral factors. Longitudinal research from the Alameda County Population Study (Kaplan et al., 1987) and the Framingham studies (Harris et al., 1988) have provided insight into the association between behavioral risk factors, such as smoking, exercise, diet, and relative weight, and subsequent morbidity and mortality in the older population. Studies have also shown that when older adults change health practices, for example, when they quit smoking or control their weight, both immediate and long-term health benefits ensue (Chavez, Coulston and Foerster, 1988; LaCroix et al., 1991). However, along with this insight and understanding of behavioral risk factors for older populations, we have created possible problems stemming from misinterpretation of findings and inappropriate expectations for what the findings mean at an individual level.

How do we come to define behavioral risk factors for older adults? What does it mean to be considered "at risk" on the basis of health risk assessment? The potential for misinterpretation of personal risk based on research identifying health risk behaviors is great for practitioners and older individuals alike. We shall describe procedures used in research to determine health consequences of behavioral risk factors for older adults and how to interpret these research findings. We shall also examine typical sources for misinterpretation of risk from the perspective of both health professionals regarding their older patients and older people as they interpret their own personal risk.

### **DEFINITION OF HEALTH RISK BEHAVIOR**

Behaviors are said to be health risk factors if they are associated with a higher likelihood of people being in poor health or actually dying. For example, smoking is considered a health risk factor for older adults because the presence of the behavior is associated with poor health (e.g., high rates of disease) and premature death (LaCroix and Omenn, 1992). On the other hand, behaviors are said to be health protective factors if they are associated with beneficial health outcomes (e.g., physical fitness, psychological well-being), and low rates of disease. Maintaining a well-balanced diet is considered a health protective factor because the presence of this behavior is associated with lower adverse health outcome rates.

The designation of a health practice as a protective factor or a risk factor can be somewhat arbitrary depending on the reference group that is used as the standard of comparison. For example, there is general agreement that smoking is a risk factor. That is, compared to nonsmokers, those who currently smoke are at greater risk for adverse health outcomes like cardiovascular disease and lung cancer. However, activity level may be considered as either a risk factor or a protective factor, depending on the definition of activity. If the researcher defines activity level in terms of moderate to high amounts of exercise and the outcome in terms of good health, then it is considered a protective factor. If, on the other hand, activity level is defined in terms of sedentary lifestyle, it is considered a risk factor for poor health because older adults who have sedentary lifestyles are at greater risk of poor health than those who do not.

We typically use epidemiological and behavioral science research designs when trying to establish the importance of a possible behavioral risk factor for the health and well-being of the older population. The findings are based on the aggregate population under study. We identify individuals who exhibit the inappropriate behavioral risk factor (i.e., the exposed group) and compare them to a group of individuals who do not exhibit the behavioral risk factor (i.e., the non-exposed group). We then compare the percentage, or rate, of adverse health outcomes (morbidity, mortality) between the two groups. If the groups are comparable, the

rates of adverse health problems should be equal. If, however, the behavioral risk factor does increase the likelihood of poor health status, then the group with the inappropriate risk factor (exposed group) should have a greater percentage of people with health problems than the nonexposed group.

Two common methods of quantifying the number of persons with risk factors and/or health outcomes are the incidence rate and the prevalence rate. Using high blood pressure as an example, the prevalence of hypertension in the older population (which can be viewed as a risk factor or an outcome of other risk factors) refers to the proportion of the older adult population who have high blood pressure at a given time when the assessment is done. It is a "snapshot." This is often provided as a number per 1,000 persons, for example, 393 per 1,000 adults age 65 and older were reported to have hypertension in 1985-1987 (Mermelstein et al., 1992). On the other hand, the incidence rate of hypertension is the rate at which older people previously free of the illness develop hypertension over a specific period of time.

Estimation of risk level is based on evaluations of incidence and prevalence rates for adverse health outcomes between those who do and do not exhibit specific risk factors. We can assess whether these differences are statistically significant as well as meaningful. This is possible through the calculation of relative risk and attributable risk. Relative risk (risk ratio, rate ratio, or RR) is the ratio of the incidence or prevalence rates of adverse health outcomes in the group exposed to the risk factor (or health behavior) under study (e.g., smokers, hypertensives) compared to the incidence or prevalence in a reference group not exposed to that risk factor (nonsmokers, normotensives) (Duncan, 1988). If, for example, the health outcome rates between smokers and nonsmokers are equivalent, the relative risk is equal to one. If the adverse health effects for older adults who smoke are greater than for the non-smokers, the relative risk for smoking is greater than one. Thus a relative risk of 2.5 would mean that smokers are two and one-half times as likely to develop an adverse health outcome as non-smokers. Where the behavior under study, such as exercise, promotes good health (is health protective), the rate of adverse health outcomes is less than for the referent group (nonexercisers), and the relative risk is less than one. A relative risk of 0.5 for exercise means that people who exercise have half the risk for an adverse health outcome as have people who do not exercise.

An advantage of using the concept of relative risk is that one can compare across health risk factors to determine the relative importance of multiple risk factors for a given health outcome. For example, Kaplan et al. (1987) reported the association between a number of health risk factors (e.g., smoking, lack of exercise, alcohol consumption, being overweight) and 17-year mortality for people age 60 years and older. They reported a relative risk of death of 1.41 for those with low versus high levels of physical activity and 1.20 for people who did not maintain a moderate weight versus those who did maintain moderate weight. Given that the risk factors and the adverse health outcome (17-year mortality) were from the same population, we are able to compare the relative importance of the various health risk factors for people age 60 years and older.

Another important measure of association between health behaviors and health outcomes is attributable risk. This measures the amount of disease in a high-risk group that could be eliminated if that risk factor were eliminated. One measure of attributable risk is calculated by taking the difference between the incidence rate in the high-risk group and the incidence rate in the group without the risk behavior (Duncan, 1988). The "remaining rate" is the rate of disease due to the risk factor being evaluated. Attributable risk is a particularly important measure for the older population. Because the rate of morbidity and mortality in both high- and low-risk groups of older individuals increases with age, it is possible that the relative risk of a behavioral risk factor may remain stable or even decrease with age, while the attributable risk can increase dramatically with advancing age.

### **MISINTERPRETATION OF HEALTH RISK**

The most fundamental misinterpretation of behavioral risk factors is a direct inference of personal risk based on research that estimated population risk. Relative risk is based on probability within a population. This should not be translated as a guarantee of an individual's personal risk for a specific adverse health outcome. An older individual may have followed a healthy lifestyle appropriately and still, owing to chance, accident, or genetic predispositions, experience an adverse health outcome. All estimates of population risk have error associated with them. Because of this population error, it is impossible to guarantee freedom from risk at the individual level.

Another common misinterpretation of behavioral risk is that we often assume that health practices are the only, or the major, factors contributing to poor health outcomes. While important, behavioral risk factors often account for only a small portion of the total variance for a poor health outcome. For example, known risk factors (behavioral or other) explain only 25 to 33 percent of breast cancer cases (Kelsey and Gammon, 1991).

A disadvantage of the basic concept of relative risk is that one does not know the absolute risk for the health outcomes. That is, estimations of relative risk do not take into account the rarity of the disease or health outcome. For example, the relative risk of 4.0 for a risk factor for one disease may be more important than a relative risk of 20.0 for a risk factor for another disease if the incidence rate of the disease is 1 in 10 for the first and 1 in 100,000 for the second.

Rarely do researchers take into account the amount of time the person has been exposed to the risk factor. Personal risk must be

evaluated not only in terms of whether the individual is currently engaging in the behavior (e.g., smoking, not exercising, gaining or maintaining excess weight), but also the months or years he or she has been at risk. However, it is reassuring to note that older adults who modify health risk behaviors can often reduce their likelihood of adverse outcomes within short periods of time. For example, individuals who quit smoking have mortality rates similar to nonsmokers within one to five years after quitting (Jajich, Osfield and Freeman, 1984). Rogers et al. (1985) also found a significant improvement in cerebral circulation within one year of smoking cessation even for older adults who smoked for three or four decades.

Estimations of personal risk should also consider the number of behavioral risk factors exhibited by the older individual. Many behavioral risk factors have negative consequences for the same chronic conditions and for mortality. Estimation of personal risk should consider the additive effect of multiple risk factors on morbidity and mortality. Indeed, the seven health practices examined in the Alameda County Population Study (never smoking cigarettes, regular physical activity, moderate or no use of alcohol, seven to eight hours of sleep per day, maintaining proper weight, eating breakfast, not eating between meals) have been combined into a health habit index ranging from zero to seven. People following all seven health practices had lower mortality rates than those following zero to three of the health practices (Breslow and Enstrom, 1980).

A large proportion of what we know about estimations of risk is based on descriptive epidemiology which compares people with and without the presence of the risk factor. Most individuals are concerned with their risk if they change their health risk behavior. That is, what is my risk if I stop smoking or begin exercising? These two types of assessment of risk (with and without the risk factor versus those who change their risk behavior) do not always result in identical estimations of risk. For example, having a history of moderate excess weight may carry less risk than obtaining moderate excess weight late in life. Not all risk associated with a history of being overweight is eliminated simply by losing the weight. After exposure to a risk factor, there is no guarantee as to how much risk is reduced simply by changes in that risk factor.

The effect of risk factors may vary across demographic groups within the elderly population. For example, we know that the impact of risk factors for cardiovascular disease among the younger population is not the same for males and females (Stokes et al., 1987). However, little is known about the differential impact of specific risk factors in older subpopulations. Evidence from the Alameda County Population Study suggests that the relative risk of health behaviors is not uniform across the older adult life span (Kaplan and Haan, 1989).

Another major difficulty in determining personal risk is the problem of multiple definitions of a risk factor from study to study, and even changing definitions of a risk factor over time. We often discuss risk factors as if there were complete agreement as to how the risk factor is being used or defined. For example, the consequences of hypertension for older adults have been demonstrated (Harris et al., 1988; Kannel and Gordon, 1987). We conclude that hypertension is a risk factor and that older adults should lower their blood pressure. However, there are two forms of high blood pressure in older people, isolated systolic hypertension (ISH) and systolic-diastolic hypertension (SDH) (Applegate, 1992), and health professionals are not always in agreement as to what type and level of hypertension should be treated. The definition of hypertension is based on a cutoff point above and below which we classify people as normotensive and hypertensive. The appropriate cutoff point for classification has been debated in the past, and researchers have differed in their definition of hypertension. However, it is generally true that the greater the blood pressure, especially systolic blood pressure, the greater is the risk for adverse health consequences. Thus, two older individuals, both defined as having high blood pressure, may differ considerably in terms of risk depending on how great their deviation is from the cutoff point.

### **OLDER INDIVIDUALS' MISINTERPRETATION OF PERSONAL HEALTH RISK**

Most surveys find that older adults are just as aware of the health consequences of behavioral risk factors as are younger individuals (Thornberry, Wilson and Golden, 1986; Prohaska et al., 1985). However, interpretation of personal risk is based on one's health risk profile, current health status, and identification with high risk groups. Adults evaluate this personal risk in the context of the total behavior risk profile (Prohaska et al., 1990). That is, people feel less at risk for an inappropriate health practice when other health practices are positive. Such is the case of the older smoker who feels relatively free of the risk from tobacco since he or she exercises on a regular basis.

Personal risk is also evaluated in the context of health status. "I am seventy-four years old, have been smoking for over fifty years and feel fine. If I was going to become ill from smoking, it would have happened by now." In fact, some physicians also believe this and feel it is inappropriate to counsel their patients who smoke if they are free of smoking-related symptoms (Fortmann et al., 1985).

Determining personal risk is not an exact science. No one--not the physician, the gerontological researcher, or the individual--can state with certainty that the individual will or will not experience a specific adverse health outcome as a result of inappropriate health practices. Also, there is no guarantee that an individual will experience benefits from a behavior change he or she has made to eliminate risk. However, our understanding of behavioral risk factors for older adults has progressed sufficiently to allow us to offer general rules to guide older people in estimating their own personal risk. Guidelines for determining personal risk include the

following:

Personal risk is greater the more extreme the deviation from the cutoff point defining the risk factor. For example, extremes in hypertension, obesity, and alcohol consumption place the older individual more at risk than if he or she were at a more moderate level of the risk factor.

Personal risk is greater the longer the older person has engaged in the inappropriate health behavior. A history of inactivity or smoking places the individual at greater risk than would the same behavior adopted more recently.

Personal risk is greater when the older individual has multiple risk factors. The effects of behavioral risk factors may be additive.

Personal risk is greater for frail older adults and those in poor health. For example, although flu shots are recommended for older adults in general, they are highly recommended for frail older adults (Berg and Cassells, 1990).

Personal risk from behavioral risk factors is often greater for specific demographic subgroups of older adults, for example, males and the oldest-old.

These guidelines for determining personal risk suffer from the same limitations discussed throughout this paper. That is, these are principles based on research with populations but applied to the individual. Therefore, you may be the one exception who continues to have good health despite a history of inappropriate health behaviors. However, you are still at risk--you have simply beaten the odds.

"As critical as health promotion and illness prevention are to the health and well-being of older adults, in most cases the individual has the right and responsibility to engage or not engage in these activities" (Prohaska, Trites and Scott, in press). Health professionals are responsible for providing an accurate assessment of the risks associated with specific health risk behaviors and the benefits of a healthy lifestyle, regardless of the age and current health status of the older individual. Furthermore, it is inappropriate to provide individual "guarantees" for either positive outcomes or adverse health outcomes based on health risk behaviors. Finally, it is just as inappropriate for an older individual to assume that a lack of a guarantee for good health is sufficient justification to continue health risk behaviors.

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