CHAPTER

2

Basic Concepts in Public Health

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DEFINITIONS IN PUBLIC HEALTH

Public health, as defined by C. E. A. Winslow, a leading figure in the history of public health, is

> the science and art of preventing disease, prolonging life, and promoting health and efficiency through organized community efforts for the sanitation of the environment, the control of community infections, the education of the individual in personal health, the organization of medical and nursing services for the early diagnosis and preventive treatment of disease, and the development of the social machinery which will ensure to every individual in the community a standard of living adequate for the maintenance or improvement of health....[1]

This was not a bad definition for 1920. Today the American Public Health Association (APHA) states that public health is the practice of preventing disease and promoting good health within groups of people, from small communities to entire countries.[2] APHA further states it includes health professionals from many fields working together with the common purpose of protecting the health of a population.

The goal of any community, or health care provider for that matter, should be to prolong the number of years of healthy life of the population it represents or cares for. With that goal in mind, people, social infrastructure, government aid to those most in need, and investigation of disease outbreaks may all play a role in the public's health. Public health uses the trends and occurrences of disease in our populations and population subsets to infer the *risk* of disease for individuals. To some degree, the basis of risk or a *risk factor* (making one more susceptible to a disease) takes its origin loosely from the work of Koch. Koch's postulates looked

at diseases caused by living organisms and stated that basically the following four relationships must occur regarding causes of disease:

1. One must observe the [causative] organism in every case of the disease.
2. It must be able to be grown in a pure culture.
3. The pure culture must, when inoculated into a susceptible host animal, reproduce the disease.
4. The microorganism must be observed in, and recovered from, the experimentally diseased animal.[3]

Koch's concepts would be great if they could be applied to every disease state, but how can one apply these to chronic diseases that take years to develop and perhaps are due to multiple causes or risks? Unfortunately, they can't. This brings up the concept of risk factors. *Risk factors* are those exposures or causal agents that make one more likely to suffer a disease or health problem. Although a risk factor may cause a disease if present, it may not actually be the true cause. The presence of other factors may be necessary to cause the disease to occur. One can use tobacco as an example of how one risk factor can predispose a person to several diseases at one time. Friis and Sellers point out that risk factors have three prerequisites.[3]

1. The frequency of the disease varies by category or value of the factor. Example: Using smoking and lung cancer, they state the relationship between smoking and cancer—the more one smokes, the greater the *risk* of cancer.
2. The risk factor must precede the onset of the disease. Example: Using the same lung cancer and smoking issue, they state if a smoker started smoking after developing lung cancer, it would be wrong to label smoking the cause of disease.
3. The observed association must not be due to any source of error. There are always points at which errors may be introduced in trying to assess causes of disease. Examples: Errors can occur in the selection of the study participants, in the measure of exposure and disease, and, of course, in statistical analysis.

Exposure to a risk factor may occur due to actions or behaviors one adheres to or may simply be inherent to the individual due to the genetic cards they have been dealt. For example, we know that prostate cancer is always going to occur in males and cancer of the cervix in females. This demonstrates that simply being born into one gender category or the other increases one's risk for some diseases. Race, socioeconomic grouping, nationality, ethnicity, and where one lives in proximity to the equator may be a risk factor for certain diseases. Hypertension is more prevalent in Blacks than Whites; that is, there are proportionally more *existing cases* of the disease among Blacks than Whites, which is the definition of the term *prevalence*. Living in an area of the country where sun exposure is greater more days of the year may increase risks of skin cancer, and living where there are fewer days of sun could reduce the amount of vitamin D one has circulating in the blood, which is now thought to increase risks for a host of diseases.[4] Generally, it is felt that there is a "web of causation" for most chronic diseases such that few instances exist where a single risk factor causes a disease to occur.

Epidemics occur when there are a large number of cases of a disease that are out of proportion with what is normally expected to be seen for that time, place, or group. The actual number may vary depending on the type of disease or the population that has been exposed. For instance, in a country where there is a high prevalence of malaria, a disease caused by a parasite in the blood carried by mosquitoes, a few extra cases may be meaningless, but in Panama City Beach, Florida, during Spring Break, even a half-dozen cases would sound an alarm. That is because even in Florida, malaria is not seen as an *endemic* disease; that is, a disease that is constantly present in the community or population. Unfortunately, diseases like human immunodeficiency virus or acquired immune deficiency syndrome (HIV/AIDS), influenza, hepatitis, and others are considered *endemic* in the United States.

Among those diseases endemic in a society, occasionally there are dramatic spikes in the numbers that are higher than those expected to be seen in the community or region. This is known as an *outbreak*. Any occurrence of an endemic disease that is out of proportion to what is expected may be seen as an outbreak. Certainly, an increase in a disease occurrence that is rarely seen or thought to be eradicated would also constitute an outbreak, and even one case of the latter may signal serious public health concerns. The U.S. Centers for Disease Control and Prevention (CDC) tracks thousands of outbreaks each year in the United States and abroad.[5] For more information on outbreak investigations, go to http://www.cdc.gov.

Terms Used in Public Health Reporting

Numerous terms are used to describe public health events, risk levels, and causes of disease. Among the more common are *morbidity, mortality, prevalence,* and *incidence*. *Morbidity* is the number of people suffering from a

disease at a given time. It is related to illness. *Mortality* is the number of people who have died from a disease.

The two most common measures of disease in populations are prevalence and incidence. Sometimes both terms are used in the description of a disease or disease outbreak. *Prevalence*, which has already been mentioned, is the number of people who have a disease at a given time; that is, the number currently suffering from the disease or disorder. *Incidence*, on the other hand, is the number of new cases of a disease. One may hear a news report of the *incidence rates* of a disease, such as influenza, being higher than usual for the year. This indicates the number of new cases is higher than what is typically expected, whereas a report indicating increased *prevalence* would mean the number of existing cases is higher.

Epidemiology is the science that looks at the relationships between diseases occurring in populations and groups, typically in an attempt to reduce risks and "compress morbidity" into the last years of the populations' life span. *Life span* is the limit of natural life such that through all supports and efforts one has lived as long as is possible. *Life expectancy* means something different, in that this term applies to the average length of life one may live based on gender, race, where one lives, and so on. Public health scientists and epidemiologists feel that the current life expectancy is not equal to the possible life span; that is, we don't live as long as we could live due to unnecessary risks that are taken and other factors that are typically controllable through behavior, lifestyle, and environmental changes. In the United States, overall life expectancy is about 78 years, although women typically live longer than men. Currently, the life expectancy of women in the United States is about 80 years and for men, 75.[6]

Causation and Sir Austin Bradford Hill's Criteria

Causation or causal factors in the investigation of a disease occurrence or outbreak can be difficult to establish. After all, not all diseases are associated with a known exposure to a risk factor, nor do all diseases manifest themselves shortly after exposure to even a known risk factor. For instance, it is well established that there is an association between smoking tobacco products and lung cancer. But how long does it take to get cancer? Cancer in general has what is known as a long *latency period*; that is, from the time one is exposed to a substance known to cause cancer, called a *carcinogen*, sometimes it is years before one actually develops the

disease. During that time, multiple factors may come into play that could affect the individual's risks.

In the 1960s, the link between smoking and cancer was reported by the U.S. Surgeon General in a report titled, *Smoking and Health, Report of the Advisory Committee to the Surgeon General of the Public Health Service*.[7] Later, perhaps the most noted acknowledgment of this report came from Sir Austin Bradford Hill, a former professor of statistics at the University of London. In an address to the Occupational Medicine Section of the Royal Society of Medicine in 1965, Hill gave a speech in which he outlined the criteria he suggested were essential when trying to determine causation. He had derived much of his criteria from the report of the U.S. Surgeon General. Rather than fulfill Koch's criteria, Hill stated,

> With the aims of occupational, and almost synonymously preventive medicine in mind the decisive question is whether the frequency of the undesirable event B will be influenced by a change in the environmental feature A. How such a change exerts that influence may call for a great deal of research. However, before deducing "causation" and taking action we shall not invariably have to sit around awaiting the results of that research. The whole chain may have to be unraveled or a few links may suffice. It will depend upon the circumstances.[8]

From that point he defined the following nine issues that are relevant in public health when identifying causation:

1. *Strength of association:* Hill stated that, based on observation, in the 18th century Percival Pott noted the mortality rates from scrotal cancer of chimney sweeps in London to be 200 times that of those not exposed to the tar and mineral oils from that occupation. Hill also cited smoking and lung cancer and the knowledge that the more cigarettes smoked, the greater the incidence rates of lung cancer. He felt a strong association was less likely to be from errors in calculation or assessment of risks.

2. *Consistency of the observed association:* That is, has the same association been observed in more than one place by different persons at different times? Hill noted the U.S. Surgeon General's 1964 report on smoking and lung cancer had more than 30 studies linking smoking with an increased risk of cancer.

3. *Specificity:* If an association were to be noted in specific workers and limited to specific sites and specific types of diseases, there would also be a strong argument in favor of causation.

Hill suggested that conclusions could perhaps be drawn with less hesitation where strong specificity existed; with less specificity, the opposite would be true.

4. *Temporality:* Regarding time and association, Hill asked, "Which is the cart and which the horse?" Did a particular diet lead to a disease or do early stages of a disease cause one to start consuming a different diet? The exposure factor, therefore, should come before onset of disease.

5. *Biologic gradient:* Also known as dose–response. That is, with cigarettes as an example, scientists knew that the more one smoked, the greater the risks were for developing cancer. The higher the "dose" of tobacco consumed on a regular basis, the higher the "response" or risk of cancer. Hill also noted that a biologic gradient was not always present, but should be sought nevertheless.

6. *Plausibility:* It helps if the suspected causation is biologically plausible; however, he cautioned that what is thought to be implausible today may be more understood tomorrow and that plausibility was in relation to the scientific knowledge of the day.

7. *Coherence:* Is there coherence of the explanation regarding the known facts of the day? That is, the cause and effect data should not seriously conflict with the science of the day regarding the natural history and biology of the disease. He noted that lung cancer rates in smokers had increased as smoking as a habit had increased, and this was a coherent explanation of the increase in lung cancer incidence during that time.

8. *Experiment:* Hill said it was occasionally possible to observe a natural experiment in the works. This is simply the observation of some disease phenomenon and then some preventive action taken that results in a reversal of that phenomenon. A strong association could be noted if a preventive effort resulted in a decrease in frequency of the disease.

9. *Analogy:* Hill stated that in some cases a similar effect might be observed in a similar situation that could enhance the association. He used the drug thalidomide and the disease rubella as causes of birth defects to demonstrate that because these could cause such increased risks, it would make sense that other drugs or diseases could increase the risk of birth defects as well. Looking for a similar existing analogy could produce a stronger association if one

were to be discovered in a new disease investigation.

Generally, it is felt that all of these criteria will not be seen together for any one assessment of causation, but the more that are present, the stronger the chance there is an association. Hill concluded that all scientific work was incomplete and liable to be upset by new scientific knowledge. However, his concepts are taught in every public health and epidemiology course to this day.

The reader should be reminded that in public health, studies are performed using populations and not individuals. At times there is a tendency to suggest that a risk factor noted within a population or large group is automatically assumed for an individual who may live within that group. To suggest that, for example, a person living in a city where there is a high incidence of cancer from smoking is at greater risk for lung cancer would be inappropriate. This person may be a nonsmoker, and therefore would not be at increased risk from smoking at all. The tendency to overlay a risk from population-based studies onto the individual is referred to as *ecologic fallacy*.

ASSESSMENT OF RISK AND OCCURRENCE OF DISEASE

When looking at the occurrence of disease or risks for disease, scientists in public health often look at *rates*. Rates are just frequencies of disease. As previously described, the *incidence rate* is the number of new cases of a disease, typically during a specific time period in a population. Incidence is a measure of risk for developing the disease. The incidence rate is typically defined per 1000 or even per 10,000 people. This would most appropriately be based on the population size one is investigating. The incidence rate is calculated by taking the number of new cases of a disease occurring in a population of interest during a specified time and dividing it by the number of persons at risk of developing the disease during that time per 1000, or perhaps 10,000 or more. Those in the denominator are those in the population who could become a new case in the population being assessed. So back to the example of diseases within gender. If we were to assess potential new cases of cervical cancer, we would definitely not include males in the equation, even though there are surely males in the population being studied. Simply put, you can't have the risk for disease in an organ you don't possess!

Measures of incidence often include a period of time that is of interest. When this is done, the definition is that of *cumulative incidence*. One could calculate the

number of new cases reported in a week, a month, a year, 5 years, and so on. It is up to the person calculating to decide what is most logical time period based on the disease being studied. Rapidly developing infectious disease rates may best be calculated in days, whereas chronic diseases that take years to develop would perhaps be best evaluated over several years.

Prevalence is also reported, but is really a proportion of those affected by a disease at a given time. So the calculation for this assessment is the number of affected persons present in a population at a point in time divided by the number of persons in the population at that time. This also can be calculated per 100, 1000, or more. Occasionally it is better to assess prevalence over a longer period of time, such as years. This creates two types of prevalence—*point prevalence* is the number of cases present at a certain time, such as in the previous example, and *period prevalence* is how many cases there were in a population over perhaps the last year or 5 years. Sometimes *lifetime prevalence* is assessed. For instance, the lifetime prevalence of lower back pain is near 80%; that is, about 80% of people in the United States will suffer from lower back pain at some point in their life. In contrast, how many people in the United States have lower back pain right now is an example of *point prevalence*, which is generally what is reported. And finally, how many have suffered lower back pain in the last year is an example of *period prevalence*. Note that this calculation does not provide evidence of when the disease started, nor does it help determine risk. People in the group assessed for prevalence may have had varying durations of disease and the calculation does not define new cases, so if you want to determine risk you must calculate incidence instead.

Prevalence of a disease is usually unsteady. For example, when a cure for a disease occurs, prevalence tends to be lower. When treatment for a disease prolongs life, however, prevalence may actually go up because more people are living longer with the disease. In essence, prevalence goes up if the death rate goes down in a treatable disease that is not cured. Some cancers, diabetes, and even HIV are examples of this phenomenon over the past several years.

Risk, when calculated, is a statement regarding the chance an individual will develop a disease over a specific period of time. Risk is calculated with a range between 0 and 1. Recall one needs a time frame as well. With people moving into and out of an area where an assessment is made over time, it becomes difficult to know the exact number of people being assessed. For example, what about a person who moves out of the area being assessed and then develops the disease? The opposite may also occur. This is why rates are used to determine an indication of risk in some cases. However, they should be used only when the rate of a disease is fairly constant and the chance of losing people from the population or follow-up time frame is relatively low.

Rates Reported in Public Health

There all sorts of rates thrown around in public health. Many are referred to as *crude rates*. These are the summaries of the numbers of actual situations occurring in a population over a given time. Death rates, infant mortality rates, and birth rates are examples of crude rates. Sometimes these rates are adjusted for race, age, geographic region, or socioeconomic status (SES), to name a few. These adjustments give a clearer picture of risk in many cases, based on the variables mentioned above. A good example of lower and higher SES groupings is the delineation between death rates or infant mortality rates in the lower SES groupings compared to higher groupings. These rates are known to be higher in lower SES categories, so this makes a statement about risks in that group versus in wealthier groups of a society. This information can then be used to plan the delivery of health services, health care, and even processes for health education campaigns.

Another example of a crude rate is the *crude birth rate*. This is the number of live births during a specific period of time, such as a calendar year, per resident population during the midpoint of that year, typically expressed as rate per 1000. The population of the United States is estimated at the midyear point, and that is the number used in the calculation. The crude birth rate is used to measure the population and for comparison among countries of the world. Infant mortality rates are also a measure of the health of a nation and are often used to compare countries when keeping score of how effective a health care system is for a population. Unfortunately, the United States ranks lower than many industrialized nations when it comes to infant mortality rates, indicating that many other countries do a better job in this area. Specific adjusted rates broken down by race categories and socioeconomic groups demonstrate existing disparities within the United States when it comes to how well a newborn will fare.

MEASURING FOR CAUSATION AND RISK ASSESSMENT

To determine causation, scientists must measure differences between groups. A typical measurement is to discern risks regarding the frequency of a disease by comparing a

Table 2-1 The 2 × 2 Contingency Table

	Disease Present		
	YES	NO	Totals
Risk Factor Present YES	A	B	A + B
NO	C	D	C + D
Totals	A + C	B + D	A + B + C + D

A = those with the risk factor and with the disease
B = those with the risk factor and not the disease
C = those without the risk factor but with the disease
D = those without the risk factor and not the disease

Therefore;

"A + B" represents everyone with the risk factor.
"C + D" represents everyone without the risk factor.
"A + C" represents everyone with the disease.
"B + D" represents everyone without the disease.
"A + B + C + D" represents everyone in the study population.

group that has been exposed to a risk factor and a group that is unexposed. Examples of exposures include a known infectious agent, a vitamin that one group gets and another group does not get adequate amounts of, exposure to an education intervention, or a drug. Risk between the exposed and unexposed groups is typically compared through the use of a 2 × 2 contingency table. See **Table 2-1**.

Based on the table, one can mathematically assess risk and odds. Essentially, the risk of getting the disease among those exposed to the risk factor becomes the simple equation A/(A + B). The odds of getting the disease among the exposed is A/B. An example often used is the risk of 1 person getting a disease out of a group of 100 in, say, 1 year. In that case, the risk is 1/100 or 0.0100. The odds of getting the disease, however, become 1:99 or 0.0101. An *odds ratio* (OR) then can be calculated by dividing the odds of exposure in those with the disease by the odds of exposure in those without the disease. Or, as follows:

$$OR = (A/C)/(B/C)$$

$$OR = AD/BC$$

Because this is a ratio, the range will usually be from zero to infinity, but can actually calculate out to be below zero and rarely goes above 10. This calculation

will result from a cross-tabulation, so if the odds of disease are exactly the same in both groups, the odds ratio will be 1.0. In this case, there is no risk for the exposed that is greater than for the unexposed. By that same token, an odds ratio of 1.5 indicates a 50% greater risk for the exposed; an odds ratio of less than zero indicates a protective effect in the exposed group. As a rule of thumb, the exposed group is usually placed in the numerator.

It may sound impossible to see an exposure reduce risks, but occasionally exposure to something does appear to reduce the risk of certain disorders. Recent studies on coffee are an example in that those who drank large amounts of coffee (exposure group) had less risk of type 2 diabetes or problems with insulin regulation.[9,10] In addition, the example of exposing a person to an education campaign to increase screening for skin cancer or breast cancer would hopefully result in a lower risk for those in the education group versus the group who does not get exposed to the education.

RISK DIFFERENCE

Sometimes it is important to determine the difference in risk between two groups. Usually this will be the difference between the risk in an exposed group versus the risk in an unexposed group. This is called the *risk difference*. Occasionally it is called the *attributable risk* because it assesses the risk that is attributed to the exposure factor or risk factor. The risk difference or attributable risk (AR) can be defined as

$$AR = [A/(A + B)] - [C/(C + D)]$$
$$= \text{Risk among the exposed} - \text{Risk among the unexposed}$$

Note that the difference is taken, so subtraction is the proper mathematical operation. When the risk is the same for the exposed as it is for the unexposed the calculation will derive a difference of 0.0, meaning that the risk factor seemed to have no effect on those who were in the exposed group. If the exposure factor produces a positive difference, there is greater risk of disease among the exposed. If it produces a difference of less than zero, there is a reduction in the risk associated with those exposed to the risk factor. One example of a reduction in risk would be those exposed to folic acid having a lower risk of neural tube defects than those not exposed.

RISK RATIO

A *risk ratio* is another measure common to the science of public health. This is the ratio of the risk in the exposed group compared to the ratio of the risk in those who are unexposed. Sometimes it is called the *relative risk*. If the risks are the same in both groups, the risk ratio will equal 1. The greater the ratio, the more the risk is for the exposed. Smaller numbers indicate less risk or protective effects among those exposed.

The calculation for risk ratio (RR) is as follows:

$$RR = [A/(A + B)]/[C/(C + D)]$$

$$= \text{Risk in the exposed/Risk in the unexposed}$$

Later chapters of the text will cover the types of studies that use these statistics in detail and provide a better understanding of the applications of these measurements of risks. Just remember that the goal is to determine the risks to a population, so that methods of disease prevention and health promotion may be applied in order to reduce those risks in the community or among the group being investigated.

PREVENTION

The outcome of any investigation on risk is to determine what may be done in order to reduce those health risks within the population. Public health scientists and health care providers should focus efforts on prevention, when this is determined to be possible. As discussed in Chapter 1, prevention has typically been defined with three levels—primary, secondary, and tertiary. In the case of *primary prevention*, the efforts are focused on keeping the healthy in a healthy state; that is, true prevention of disease. Recall that a goal among public health professionals is to compress morbidity so that more years of healthy life may be enjoyed, with the morbidity, which will one day come for all persons, being reduced to the last part of a person's natural life span.

Primary prevention employs what are often referred to as *upstream approaches*. This simply means that one looks to the actual cause of disease rather than looking on down the line after a disease has manifested itself within a population. The latter are referred to as *downstream approaches*. An example of an upstream or primary preventive effort is to get people to partake in regular exercise and a healthy diet so they don't become overweight or obese, rather than having to encourage a weight loss program or a surgical intervention once a person or group is known to be overweight or obese (a downstream approach).

Secondary prevention is the next level of interest. This indicates a problem has already occurred. Perhaps a person has discovered that they have higher than normal blood pressure. They know their blood pressure is high and they take action to reduce it by changing their diet and starting an exercise program. This is an effort to thwart the damages of a disease before it causes permanent changes that can't be undone. Although this is not primary prevention, it is a necessary part of health care delivery in the United States. Unfortunately, a lot of money is spent on this level of prevention and on the third and final level, *tertiary prevention*. In this case, a person has suffered from a disease that has caused some damage to his or her health. Maybe they have suffered from a heart attack or stroke and have been told by their doctor that they must change their ways or they will suffer further consequences. In that case, the efforts they put forth from this point on constitute tertiary prevention—those efforts to prevent the problem from getting worse or ending their life prematurely if this is possible. Clearly, there is a need to focus as much effort as possible on primary prevention. To some, this represents what is known as health education and health promotion.

Figure 2-1 indicates where treatment falls within the levels of prevention.

Health education is the delivery of any information that is conducive to health. *Health promotion* takes this a step further and may include any social supports, laws, or policy changes that may facilitate efforts conducive to health. A health education campaign may be aimed at children to try to prevent them from smoking. Health promotion efforts have banned the sale of cigarettes to minors in an effort to facilitate this education process. These definitions bring up two additional definitions that are used when speaking of preventive methods in a population: micro issues and macro issues. *Micro issues* related to promoting health include those that are germane to the individual. The genetic make-up of the individual; their knowledge, attitudes, or beliefs; and even their past medical history can be considered as micro issues. A doctor who tells his or her teenage patient not to take up smoking is following a micro approach.

Macro issues are the opposite. They involve everything environmental and social that may influence how people behave. Social networks, policies, laws, and the occupational culture one works in all influence health indirectly but must be considered when planning any preventive
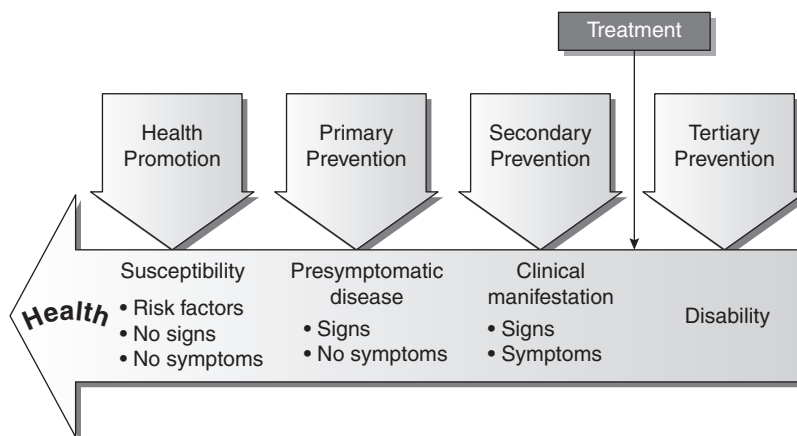
Figure 2-1 Phases of prevention.
Source: Courtesy of Dr. Cheryl Hawk, DC, PhD.

effort for a population. After all, not every community has the same social issues or cultural norms, and each of these may play a part in whether a population is healthy or unhealthy. A city or county law banning smoking in public places is an example of a macro approach to health promotion.

The Mission of Healthy People in the Prevention of Disease

In the late 1970s, the U.S. government worked to facilitate a plan to help our nation reach a healthier status. This project was known as Healthy People.[11] The original goals of this initiative were to be achieved by the year 2000. Unfortunately, they were not met. However, they have had an impact on how health care, public health, and health professionals as individuals work toward helping our population reach its health goals. Healthy People 2010 was the next permutation of the Healthy People project and in 2010, Healthy People 2020.

Healthy People 2010[12] had two broad goals to: (1) increase the quality and years of healthy life, and (2) eliminate health disparities. In addition to these overreaching goals, this public health directive lists 28 focus areas and 10 leading health indicators. These are listed in **Tables 2-2** and **2-3**, respectively. As can be seen by looking at these focus areas and leading health indices, all health care providers, including chiropractors, have a role to play in preventive care. Among the areas where chiropractors could clearly involve themselves are helping patients increase levels of physical activity, and addressing overweight and obesity, tobacco use, and injury prevention. Each

constitutes an area of special concern because they are associated with increased incidence of chronic spine disease.[13–15]

Table 2-2 Twenty-Eight Focus Areas of Healthy People 2010 (listed alphabetically)

Access to quality health services
Arthritis, osteoporosis, and chronic back conditions
Cancer
Chronic kidney disease
Diabetes
Disability and secondary conditions
Educational and community-based programs
Environmental health
Family planning
Food safety
Health communication
Heart disease and stroke
Human immunodeficiency virus
Immunization and infectious diseases
Injury and violence prevention
Maternal, infant, and child health
Medical product safety
Mental health and mental disorders
Nutrition and overweight
Occupational safety and health
Oral health
Physical activity and fitness
Public health infrastructure
Respiratory diseases
Sexually transmitted diseases
Substance abuse
Tobacco use
Vision and hearing

Table 2-3 Leading Health Indicators from Healthy People 2010

1. Physical activity
2. Overweight and obesity
3. Tobacco use
4. Substance abuse
5. Responsible sexual behavior
6. Mental health
7. Injury and violence
8. Environmental quality
9. Immunization
10. Access to health care

Screening

Screening patients for disease risks can be as simple as asking them questions on patient intake forms; for instance, asking if they use tobacco products, and if so for how long and how often, screens for risk of diseases associated with smoking and other tobacco usage. Patient history may reveal familial tendencies toward cardiovascular disease or cancer for which preventive efforts are known to be effective, especially with lifestyle modification and changes in behaviors. In addition, proper use of screening tests from simple blood pressure checks or height and weight assessments to blood lipid and blood sugar can be done in many chiropractic offices or ordered as a routine or where indicated. Certainly, screening for scoliosis and other chronic musculoskeletal conditions would be warranted in chiropractic practices as well.

Screening should be a routine procedure for all clinicians. Although some types of screening may be more in line with family practice or through a primary care medical physician, all health care providers should do their part to address the modifiable risk factors for early morbidity, mortality, and disability. The U.S. Preventative Services Taskforce has a guide to recommended preventive screenings that addresses topics from cancer and cardiovascular disease to mental health, injury and violence, and musculoskeletal and most other conditions where screening may be indicated.[16] This guide lists the evidence base for various screening tools or procedures and gives the clinician an idea of what should be done and what may be unwarranted based on the latest scientific information. The guide is available at http://www.ahrq.gov/clinic/uspstf/uspstopics.htm.

COUNSELING PATIENTS ON BEHAVIOR CHANGE

Typically, for clinicians the opportunity to have an effect on lifestyle or behavior modification occurs in the micro setting described earlier. This deals with those traits the individual is responsible for. Although the micro area may involve genetics or even past medical history issues, it mainly involves the knowledge, attitudes, and belief systems of patients. Several theoretical models exist that can assist health care providers when it comes to better understanding how behavior will or will not change. The old adage regarding health behavior that "knowledge is necessary but not sufficient" is very true. After all, every smoker can read on a pack of cigarettes that the behavior may kill them. Simply stating the facts to a patient will not typically result in behavior change. They may already be aware that a change is needed but may not be ready or willing to make a change. When to counsel and how to work with patients, people, and populations on health behavior change is aided by an understanding of health behavioral theory models. Some of the more commonly used models are described in the following sections.

Stages of Change

In the field of health education and health promotion, a noted theoretical model of behavior change is the *Transtheoretical Stages of Change model*, developed by Prochaska and DiClemente.[17] This model has been employed for years to better evaluate an individual's level of readiness for a change in behavior. The model may be best utilized in clinical practice for identifying those people most likely to accept a behavior change message and to make an attempt at follow-through.

The model has five stages of susceptibility for change. People don't necessarily move through them in a linear fashion but may go back and forth among the stages as they struggle to change their behavior over time.

First, a person who has no intention, desire, or knowledge of a need to change is referred to as being in the *precontemplation* stage. They may simply be unaware of a need for change or they may know of the need but have no interest or intention of making any changes within the next 6 months. The next stage within the model is of course *contemplation*. People in this stage may be contemplating a change within the next 6 months or so. This could be a smoker who knows they need to quit and is waiting until New Year's Day to make it a resolution or perhaps waiting for

the Great American Smokeout marketed by the American Lung Association.

Once a person reaches the *preparation* stage, they are actually deciding on what steps to take in order to reach the next level, which is referred to as the *action* stage. Those in the preparation stage are often gathering information and perhaps asking others what they should do next. Some kind of action is typically being taken at some point, and this means the individual has done something constructive toward changing their behavior. Once a change has been made and the person has held on to the new behavior for 6 months they are said to be in the final stage, called *maintenance*.

It is easy to see that with the Stages of Change model, one would counsel a patient differently based on what stage they are in. If they are a precontemplator one would want to try and move them into at least contemplation. This may involve bringing to their attention a known risk factor they were previously unaware they had. In the case of smoking, they know it is bad for their health but maybe no health care provider has ever told them they should quit. Current studies on smoking cessation suggest that only a minority of patients have been told by their doctor they should quit.[18–20] Information should be given such that every precontemplator has the opportunity to move to the contemplation phase. Of course, the contemplator should be encouraged and given resources that will allow them to move on to the preparation or action stages of the model. The goal is to move the patient in the direction of change. Once in the maintenance stage, the provider can focus on ways to help the person maintain the new, healthy behavior and not succumb to relapse. Having patients list action steps

and think of previous episodes where they were unsuccessful and how they could act differently in their current situation may be helpful as well.

It should be noted that groups such as the American Lung Association, American Heart Association, U.S. Centers for Disease Control and Prevention, and others have information that is actually stage-specific for helping patients change behavior. Again, the goal is to identify the stage the patient is in and focus the appropriate level of action on them, based on their susceptibility toward receiving advice on behavior change. This model has been utilized extensively in health promotion research and has been shown to be effective in assisting the counseling and education process at the micro level. **Table 2-4** lists the Stages of Change and some ideas on implementing them in clinical practice.

Health Belief Model

Another model that has been in use for many years is the *Health Belief Model (HBM)*.[21] First utilized by the U.S. Public Health Service to better understand who may be most likely to get a tuberculosis screening, HBM has now been used in many different campaigns to get people to take action. It is perhaps best used to get a patient or person in general to take a single specific action, such as get a mammogram or other screening test. The model has six basic constructs, as follows.

The first of the constructs is called *perceived susceptibility*. In other words, if a health care provider wants an individual to take a certain screening test, does that individual even think they are susceptible to the disease being screened for? If not, they are less likely to see the

Table 2-4 Counseling Options for the Stages of Change

Stage of Change	Counseling Options
Precontemplation	Advise patient on risk factors that need to be changed (increase awareness). Provide personalized information and cue them to take action. Attempt to move them toward *contemplation* or *preparation*.
Contemplation	Motivate and encourage patient to make changes and mark a chart to follow up with them on their next visit. Attempt to move them toward *preparation* or *action*.
Preparation	Help set action steps and achievable goals for patient. Mark chart to follow up. Attempt to move toward *action*.
Action	Behavior has changed. Assist with problems and social support, reinforce new behavior, and help prevent relapse. Attempt to move toward *maintenance*. Provide stay the course messages.
Maintenance	Help avoid relapses, assist with coping, and reinforce new behavior. Reward or praise whenever possible. Provide stay the course messages.

test as necessary and important enough to go through with. The next consideration in the model is whether the person will deem the condition severe enough that they may need screening. This construct is called *perceived severity*. Dreaded diseases tend to carry more perceived severity than diseases that are rarer or more obscure. The next two things to take into account are *perceived benefits* and *barriers*. If there are perceived barriers to having a test done or going to a location for a screening, the perceived benefits of having the procedure performed have to outweigh the perceived barriers, or an individual is less likely to submit to a test.

Two added features of HBM are *cues to action* and *self-efficacy*. A commercial, a brochure, and even the health care provider are all sources of action cues. In fact, health care providers are some of the most noted cues to action known. The doctor's advice carries a lot of weight in the eyes of most patients. Self-efficacy is the level of confidence a person has that they can perform a task. This can range from successfully getting to a test site to whether they feel they can be successful in changing a behavior.

Health promotion scientists often use the features within the HBM along with other models, because it is typically best to reduce as many barriers as possible, and targeted persons want to clearly understand the benefits of a procedure or behavior change.

Ecological Model of Health Promotion

Among the more comprehensive models used in health promotion efforts is the *Ecological Model*.[22] Developed to be a comprehensive model aimed more at a macro level, it has constructs that take into account both the micro and macro issues of the person. The Ecological Model has five areas for focusing efforts at assisting in behavior change. Each level should be considered as important as the others. The first is the *intrapersonal level.* This emphasizes micro-level issues a person has to overcome in order to change their behavior. This includes knowledge, attitudes, beliefs, and personality traits. Fortunately or unfortunately, it also includes genetics.

The next level of emphasis within the Ecological Model is *interpersonal relationships*. Interactions with family, friends, peers, or even the family doctor may determine what a person feels or believes about a given process or behavior. This can be a double-edged sword, in that sometimes these interactions have a positive effect on behaviors and sometimes they have a negative effect. The *community level* is considered next, and certainly has a macro level of influence.

Social networks, community norms, and standards, whether formal or informal, sometimes determine which health behaviors are acceptable. *Institutional factors* or rules come next, followed by *public policy or laws*. Rules at work, such as no smoking policies, affect health, as do seat-belt laws, child safety-restraint laws, and even clean indoor air ordinances that restrict smoking in public places. Taking all of these levels of potential influence into effect can help aid the process of behavior change. Leaving one or more of these constructs out of any planning process for widespread behavior change will almost guarantee failure of a health promotion effort.

Though not a primary model used in helping individuals, the Ecological Model is a key to successful community public health efforts that has been proven time and time again to be successful in macro-level interventions. Any health care provider who wants to involve themselves in a role as a community health advocate would be wise to incorporate the constructs of the Ecological Model into their plan of attack.

Working with Patients Toward Behavior Change

Anyone who has made a change in behavior knows how difficult this can be. Sometimes it is difficult just to reach a jumping off point. Even then, many New Year's resolutions fail because the individual is poorly prepared and has few resources to help them reach their goals. Sometimes the goals themselves are too lofty.

Health care providers have an opportunity to serve as resource persons for patients who want to change their current behaviors. Even if a patient is a precontemplator, they still may move to the next level with some advice from their doctor. Counseling patients has been shown to be effective, especially when repeated messages are utilized. Although one does not have to be a jack-of-all-trades, it is important to realize that you may be their most influential cue to action. The importance of looking your patient straight in the eye and telling them that the desired behavior change is one of the most important things they can do today for their health cannot be understated. Telling them they need to make this proposed change a priority is equally important. They should be encouraged to set a date to put the change in motion. In addition, develop a list of resources to help them; for example, a brochure rack with appropriate information based on their stage of susceptibility for making a change or even a list of smoking cessation workshops in the area.

Do you have the number for a personal trainer, or the closest YMCA or community fitness center? What if a patient told you that they are ready to make a change in their behavior right now and have been looking for a person who could assist them? Would you be ready to help? If not, this could be worse for the patient than saying nothing at all.

The *abstinence violation effect* is a concept that applies to individuals who make an attempt to change a behavior and are unsuccessful. In essence, this is when they are told to lose 15 pounds before seeing the doctor again and are given no resources to be successful. They try on their own and fail, which causes them to experience this effect. It is the feeling that they have tried to abstain from a behavior and were not successful; therefore, they feel they can't do it and are less likely to attempt the behavior change again. When a health care provider says, "Change your ways," pats the patient on the back, and offers no other assistance, this is the likely outcome. Don't expect to change patients with your charisma. You need a plan, some resources, and a system to follow up so they don't get lost in the shuffle. Although this may not be your primary focus as a health care clinician, you are one of your patients' only knowledgeable sources for health care information; without you, patients are liable to make decisions based on faulty information from friends, social networks, and the Internet, which can be the least reliable places to find health information—particularly when it comes to behavior change.

One way to start the process of promoting health in your practice is to use the mnemonic of ABC'S.[23] The "A" is to remind clinicians to assess the actual health needs of the patient. What do they need to address right now? "B" is to remind clinicians to extol the benefits of positive behavior change. Sometimes it is better to stress the benefits of what they will gain by changing the behavior than to constantly remind them they are going to suffer negatives if they don't. This is called "gain-framing" the message. "C" is the use of regular chiropractic visits to facilitate this process. This doesn't mean that one should add extra visits to a treatment plan; instead, use those teachable moments during regular chiropractic visits to educate your patients. All practitioners have patients whom they see on a somewhat regular basis for chronic conditions or because the patient chooses the DC for preventive care. Start the process of advocating behavior change with these patients who already trust your message and your care. Then phase this practice in with all patients as it becomes possible to do so. Finally, the "S" is to remind you to keep up the stay the course messaging with your patients. Behavior change is a process and there are likely to be ups and downs for most patients. Encourage them to continue working toward their goals, which is indeed a process. Help them to set reachable goals and provide them with resources when possible that will assist in the process.

Learning More About the Behavior Change Process

There are many potential sources of information for helping patients change their behaviors. Repeated messages over time have been shown to produce positive effects and, because chiropractors typically encounter their patients several times for treatment, this gives them an added advantage over other health care providers—dose response; that is, you may have six, eight, or more visits with this patient during which you can "cue them to act." A visit to the family doctor twice a year provides fewer teachable moments. With this opportunity, however, comes the need to know more about how patients change. A guide to understanding health behavior change is available from the National Cancer Institute (NCI) of the National Institutes of Health, and can be downloaded from the NCI site free of charge at http://www.cancer.gov/theory. The guide, entitled *Theory at a Glance*,[24] describes several behavioral change theories and several planning theories as well. Each can assist you in understanding how to help people change their health-related behaviors.

Virtually all authorities in chiropractic now call on the profession to counsel patients on lifestyle changes. The American Chiropractic Association has a position statement on wellness[25] and the Association of Chiropractic Colleges' paradigm holds health promotion high in priority for doctors of chiropractic and the education institutions they serve.[26] In addition, the Council on Chiropractic Education has a standard that specifically directs colleges to teach, implement, and test for the ability to promote health at each accredited institution.[27] There is simply no reason that the chiropractic profession should not promote the counseling of patients about the preventable causes of disease that can be accomplished though lifestyle modification and behavior change. Helping patients add healthy years to their life is something both patient and provider gain from. For the clinician who chooses this course, perhaps very few other initiatives in practice will be so rewarding.

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