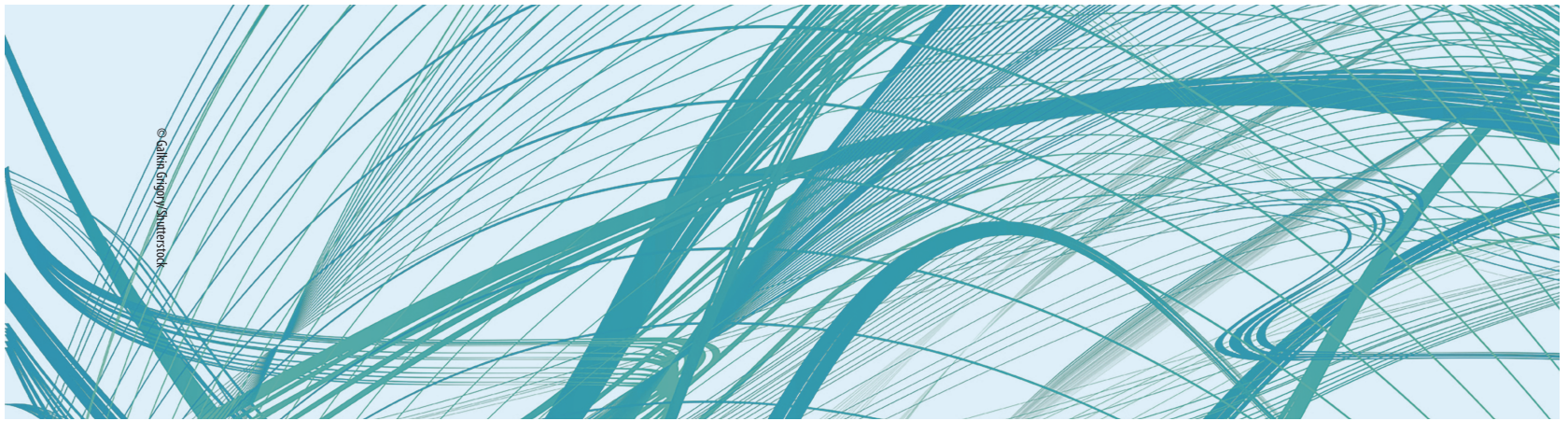




CHAPTER 1

Your World, Your Health

Claudia Parvanta

LEARNING OBJECTIVES

By the end of this chapter, the reader will be able to:

- Identify major factors affecting life expectancy and health outcomes.
- Define the approximate proportion of risk of premature death attributed to health care, genetics, social and environmental factors, and individual behavior.
- Explain how biological attributes of age, race, and sex are conditioned by social interpretations when it comes to health.
- Describe the leading causes of death for college-age individuals.
- Diagram an ecological model for a health issue.
- Explain how a communicator can use the people and places model to plan an intervention.

► Introduction

Mickey Mantle is known for saying, “If I knew I was going to live this long, I’d have taken better care of myself.” There is a good chance that many readers will not know that Mickey Mantle was a center fielder and first baseman for the New York Yankees from 1951 through 1968, and is considered one of the greats in the game. After decades of alcohol abuse, Mantle died of liver disease and a heart attack in 1995 at the age of 63.

Jumping forward in time, an insurance company ran an ad in which it asked people to place a blue sticker on a wall to indicate the age of the *oldest* person they knew. The 400 participants created a histogram that peaked around the age of 95. The advertisers

pointed out that the U.S. retirement age of 65 was developed around the time that Mickey Mantle was playing ball—and the average life expectancy was 61. By the year 2000, life expectancy had reached 74 for males and 79 for females,¹ and similar increases are projected through 2050. What does this increase in average life expectancy reflect?

► Major Factors Affecting Health Outcomes

Turning the question around, we can ask what factors are associated with dying “before your time,” or as population scientists put it, **premature death**. **FIGURE 1-1** illustrates the approximate contribution of major factors to premature death.

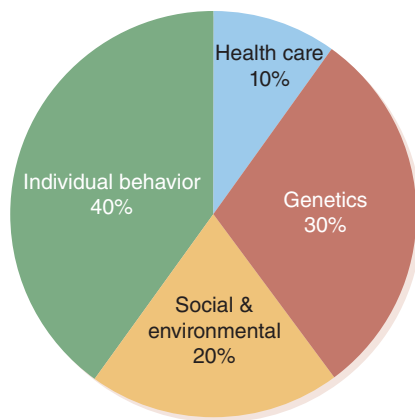


FIGURE 1-1 Risk of premature death attributed to different factors.

Data from Schroeder SA. We can do better—improving the health of the American people. *N Engl J Med*. 2007;357:1221-1228.

Are you surprised by this breakdown? Here is more about each major risk factor.

Health Care: The 10% Solution

Even though the United States spends more on health care than any other high-income country, Americans have the lowest life expectancy at birth and a greater prevalence of chronic diseases compared to the citizens of other high-income countries. Prior to the implementation of the **Affordable Care Act of 2010 (ACA)**, the United States spent 17.1% of its gross domestic product on health care. This was nearly twice what was spent in the United Kingdom (8.8%), for example. This spending was driven by greater use of expensive medical technologies (e.g., computed tomography scans) and higher healthcare and medication prices, but *not* more frequent doctor visits or hospital admissions.² So, Americans spend more money on drugs, tests, and fees but do not reap the benefit of healthier and longer lives. Why? Part of the reason is that so many individuals turn to health care only when something bad has already happened. In addition, many other factors contribute to our risk.

Genetics and Health: 30%³

The human genome contains about 20,500 genes. Of all these genes, we differ from every other human on earth by only about 1%. But it is this tiny percentage that determines our unique appearance, our potential for specific diseases, and our response to external factors, including therapeutic drugs.

As you learned in high school biology, in successful conception and pregnancy, the 23 chromosomes from your genetic father and 23 from your genetic mother develop into a 100-trillion-cell adult.

The 3 billion pairs of DNA letters that are copied and packaged during reproduction often contain slight variations that have no impact on health. But, sometimes these genetic instructions produce a damaged protein, extra protein, or no protein at all, which can result in a genetic mutation. Single gene mutations are responsible for more than 10,000 disorders. There are screening tests that parents can use prior to conception to identify autosomal recessive carrier status for more than 580 conditions. Autosomal recessive genes are not normally expressed in the heterozygous state, but if two carriers reproduce, they have a 25% chance that their offspring will be homozygous for the trait, and therefore have the condition. With appropriate genetic counseling, couples can avoid the heartache of giving birth to a child with a quickly fatal disease, such as Tay-Sachs, or a painful condition that shortens life, such as sickle cell anemia.

Women who carry a mutated form of either the BRCA1 or BRCA2 gene have an increased risk (i.e., greater than the 1 in 9 probability that all women carry) of developing breast or ovarian cancer at some point in their lives. Other adult onset diseases, such as colon cancer and heart disease, have genetic components. At this point in time, we have not discovered a genetic variation underlying most diseases.

The study of genetic variation, or genomics, is increasingly important in the development of treatments and drugs. These may be targeted to an individual's genome or the genome of the disease agent (e.g., a virus or a genetic form of cancer). As time goes on, we are discovering more genomic factors that may allow us to live more years free of disease. It is an exciting time for genomics, but for now, your best shot at being healthy is largely up to you—or is it?

Individual Behavior: 40%

Individual behaviors, which include what you eat, drink, or smoke; your sexual and reproductive activity; how fast you drive; how long you sit on the couch; and so on, play a significant role in determining your longevity. A study summarized the impact of six behaviors that the U.S. government has tracked in relation to changes in life expectancy and **quality-adjusted life expectancy** from 1960 to 2010.⁴ Overall life expectancy increased by 6.9 years during this period. As shown in **FIGURE 1-2**, the authors of the study estimated that reductions in cigarette smoking and motor vehicle fatalities contribute nearly 2 of these years; however, the benefit of these gains is partially offset by the negative effect of rising obesity and accidental drug overdose.

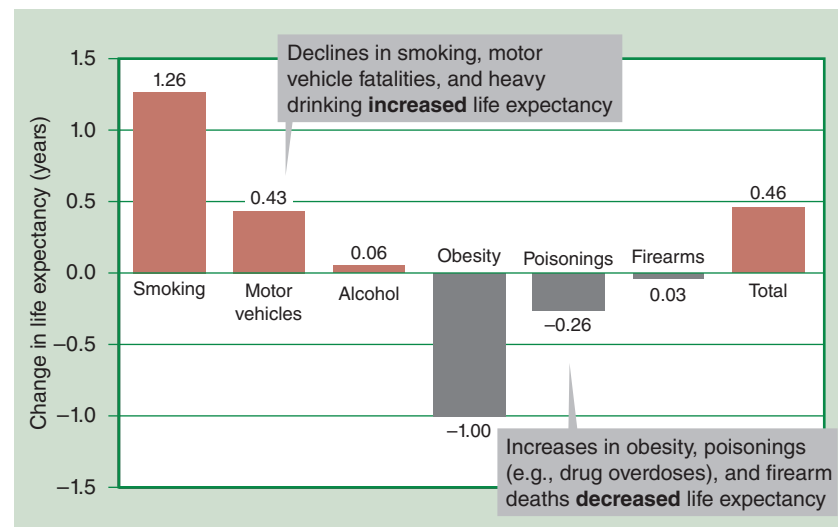


FIGURE 1-2 Impact of behavioral changes on life expectancy, 1960–2010.

Reproduced from National Bureau of Economic Research. How behavioral changes have affected U.S. population health since 1960. *Bull Aging Health*. 2015;1. <http://www.nber.org/aginghealth/2015no1/w20631.html>. Accessed July 2, 2015.

We still could add many years to our life span by adopting healthier behaviors; for example, fewer than 13% of Americans eat the recommended five to seven daily servings of vegetables and fruits. It takes more than just a friendly reminder to get most people to change from an unhealthy to a beneficial behavior. For many, the choice seems out of their hands, which brings us to a discussion of **social determinants of health (SDH)**.

Social and Environmental Factors: 20%

Although some social and environmental factors directly affect health (such as gang membership, air pollution, or toxic exposure to lead paint), others work indirectly by limiting or shaping access to resources or lifestyle options; for example, “...children born to parents who have not completed high school are more likely to live in [unsafe] neighborhoods... have exposed garbage or litter, and have poor or dilapidated housing and vandalism....”⁵ A seminal meta-analysis concluded that social determinants are associated with a third of premature deaths in the United States.⁶

Because of the power of social determinants and the long history of disparities in the distribution of resources along societal lines, the World Health Organization (WHO)⁷ and the U.S. government have adopted an SDH approach in setting priorities for action. For example, **Healthy People 2020**, launched in 2010 by the U.S. Department of Health and Human Services, organizes SDH around five key domains: (1) Economic Stability, (2) Neighborhood and Physical Environment, (3) Education, (4) Community and

Social Context, and (5) the Health Care System. Other organizations include other factors, such as access to food, as shown in **FIGURE 1-3**.

Although problems with low literacy (listed under the Education domain) or playgrounds (listed under Neighborhoods) may seem outside the literal domain of health, not being able to read or understand English can have a tremendous impact on taking care of oneself or one’s family. And access to safe playgrounds, sidewalks, and other green spaces is closely associated with risks of obesity. Your world is made up of social determinants, and because these determinants have a profound influence on your health, we will discuss them in greater depth in the sections that follow.

► Socially Defined You

For centuries, humans have been recording information about births, deaths, and significant illnesses and noting the individual’s gender (male or female) and age, if known.

There were biological, social, and cultural forces that shaped these events. These forces still function today and determine, or at least provide a strong predictive contribution to, our own health outcomes.

There are protective factors, and similarly problems, associated with differences in:

- Sex and gender
- Race and ethnicity
- Age
- Environment
- Societal factors

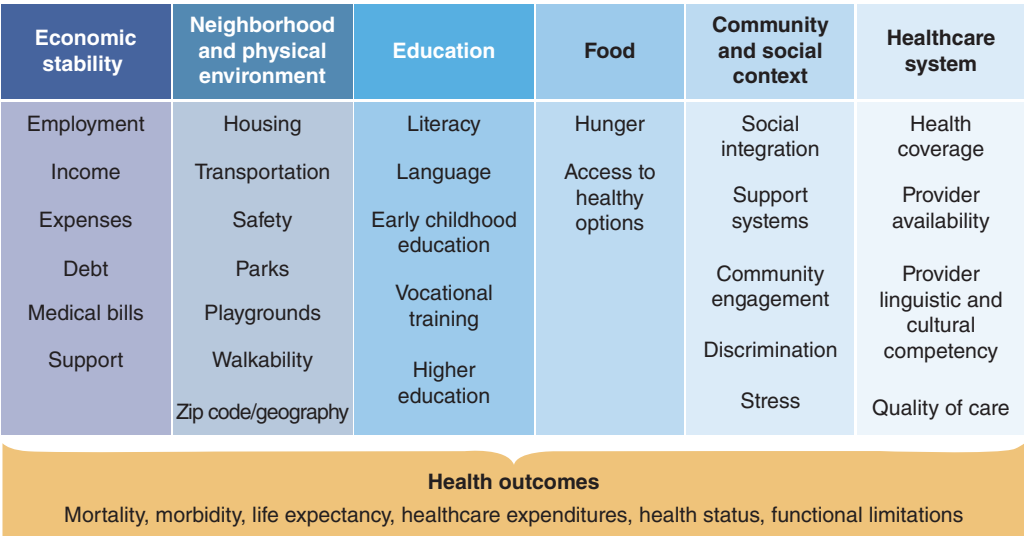


FIGURE 1-3 Social determinants of health.
Reproduced from Heiman HJ, Artiga S. Beyond health care: the role of social determinants in promoting health and health equity. KFF webpage. <https://www.kff.org/disparities-policy/issue-brief/beyond-health-care-the-role-of-social-determinants-in-promoting-health-and-health-equity/>. Published November 4, 2015. Accessed April 20, 2018.

These factors—added onto your genetic makeup—affect your personal health in ways that can be either beneficial or harmful.

Sex and Gender⁸

The term **sex** in biology refers to genetic expression of the genes inherited from one’s parents. In most cases individuals are either XY or XX. Those with one X and one Y chromosome in every cell of the body are biologically male; biological females have two X chromosomes in every cell. Because these cells make up all the tissues and organs, there are sex-linked differences throughout our physiology, including but not limited to genitalia, hormones, and glandular development. In addition, biological males and females can express different symptoms when ill; may experience sensations such as pain differently; and respond differently to medications and substances, including addictive ones. Recognizing these biological differences, the U.S. government requires that clinical trials of new drugs or other medical interventions include both men and women, unless there is a clear rationale not to do so (e.g., a study of a prostate cancer drug or intrauterine device). For most of recorded history, individuals have been classified as “male” or “female” with little further thought. Medical science began documenting variations more effectively in the 20th century.⁹

Some individuals are born with undetermined genitalia at birth, which may also be true on a cellular level (i.e., some cells contain XX and others XY, or other variations). These conditions are referred to as *intersex*. It is possible for an individual to not be aware of subtle intersex variations, whereas others may be

very aware of what they see and feel. Today’s medical standards advise against surgical interventions until the affected individual can make that decision. The thought that a parent may wish to “fix” a child’s body to look more like the sex they see most clearly expressed leads us to a discussion of gender.

Gender is a social or cultural concept that reflects how men and women, boys and girls, are meant to look and behave. By the age of 2 or 3, children will express strong identities as girls or boys, which are then reinforced or discouraged by their parents, teachers, or others in their social world. When children behave in ways that are discordant with their biological references (e.g., their genes, their genitalia), they may be labeled as *gender nonconforming*. This can be as casual as a girl playing with a truck and a boy playing with a doll. Some children eventually become comfortable adopting the societal roles assigned to their gender. Others may wish to change their outward appearance and fully behave in ways they feel are consistent with their internal concept of themselves. The term *transgender* refers to a range of behaviors associated with making this change. Some individuals go on to have *gender reassignment* surgery and take hormones to support this change.

As individuals mature to the point of seeking intimate partners, the term *sexual orientation* becomes meaningful. Sexual orientation refers to being sexually and romantically attracted to persons of the same or opposite sex. Kinsey and others have described a spectrum of attraction from consistently preferring the opposite sex (heterosexual), through preferring members of either sex (bisexual), to consistently preferring the same sex (homosexual).¹⁰

How Do Sex and Gender Affect Health Outcomes?

It is well known that, on average, women live longer than men, but they also experience more days of illness or disability. Setting aside the risks associated with childbearing, why should women experience more “sick time” and still outlive their male contemporaries?

Few researchers have separated the risks associated with the biological condition of being female or male from the lived experience of gendered identities. In other words, we have little data apart from birth outcomes that truly show the vulnerability associated with an XX or XY genotype versus the risks accumulated as a girl or a boy matures in a particular environment. Using the WHO’s original *Global Burden of Disease*, published in 2002, Snow¹¹ noted that the XY genotype is a necessary (but not sufficient) condition for the risk of hemophilia, prostate cancer, and testicular cancer. Being born XX was associated with a greater risk of breast and ovarian cancer, and all maternal causes of death. **TABLE 1-1** shows conditions worldwide from which men and women lose more active years of life.

Most of the conditions in Table 1-1 are connected to social expectations for men and women. Virtually every human society expects boys and men to take risks and demonstrate courage or “manhood,” often resulting in the higher rates of fatalities due to hunting accidents, local fights, warfare, or even car crashes. Women and girls too often fall victim to the ugly side of the same expectations, resulting in domestic violence, rape, conflict, and trafficking. Women also are more subject to culturally sanctioned traditions of bodily mutilation, limits on property ownership, or freedom of movement, which are upheld by both men and women in their societies.¹² Risks for girls can be even more extreme, as in the case of *femicide*.

Femicide. Along with other sex-linked traits, slightly more boys are born alive than girls, with a resulting 105 boys born for 100 girls. In most cultures, this imbalance evens out as slightly more girls survive infancy. However, there are many societies where the perceived need and desire for males leads to parents killing female infants at birth, through either neglect or force. When and where ultrasound technology became widely available, abortion replaced infanticide by allowing so-inclined parents to detect and abort a female fetus; for example, in China, the birth ratio is presently 120 boys for every 100 girls. In India, despite a 1994 law banning use of ultrasound for sex selection, for second-born children, there are only 76

TABLE 1-1 Conditions with Greatest Difference in Global Burden of Disease for Men and Women

Conditions for Men
War
Gout
Alcohol use disorders
Road and traffic accidents
Violence
Other intentional injuries
Drug use disorders
Lymphatic filariasis
Mouth and pharynx cancers
Lung cancer
Liver cancer
Drowning
Bladder cancer
Conditions for Women
Breast cancer
Gonorrhea
Chlamydia
Trachoma
Migraine
Posttraumatic stress disorder
Rheumatoid arthritis
Panic disorder

Data from Snow RC. *Sex, Gender and Vulnerability*. Population Studies Center Research Report 07-628. Ann Arbor, MI: Population Studies Center, University of Michigan; 2007.

females born for every 100 males.¹³ In both countries, demographers warn of the stresses to society caused by these “missing” women. Numerous international agencies and voluntary organizations are working to reduce these gender inequalities. (A good place to start is with the United Nations Entity for Gender Equality and the Empowerment of Women at <http://www.unwomen.org/en/>.)

Sexual Orientation and Health

The National Health Interview Survey (NHIS) has been conducted annually in the United States for 57 years. **BOX 1-1** provides some information about the overall survey methods as well as questions pertaining to sexual orientation, used for the first time in 2013.

TABLE 1-2, reprinted from the National Health Statistics report, shows the sexual orientation among U.S.

adults aged 18 and over, by sex and age group, based on data from the 2013 survey. Among all U.S. adults aged 18 and over, 96.6% identified as straight, 1.6% identified as gay or lesbian, and 0.7% identified as bisexual. Of the remaining 1.1% of adults, 0.2% identified as “something else,” 0.4% selected “I don’t know the answer,” and 0.6% did not provide an answer.

The sexual orientation variables were analyzed against selected health behaviors, health status

BOX 1-1 National Health Interview Survey Methodology

Methods

NHIS is an annual multipurpose health survey conducted continuously throughout the year and serves as a primary source of health data on the civilian noninstitutionalized population of the United States.^a Data are collected by trained interviewers with the U.S. Census Bureau using computer-assisted personal interviewing (CAPI), a data collection method in which an interviewer meets with respondents face-to-face to ask questions and enter the answers into a laptop computer. When necessary, interviewers may complete missing portions of the interview over the telephone.

Analyses in this report were based on data collected from 34,557 sample adults aged 18 and over. The conditional sample adult response rate (i.e., the number of completed sample adult interviews divided by the total number of eligible sample adults) was 81.7%. The final sample adult response rate, calculated by multiplying the conditional response rate by the final family response rate, was 61.2%.^b

Sexual Orientation Questions

The first of the four cascading sexual orientation questions that were included in the 2013 NHIS, which is asked of all sample adults aged 18 and over, reads, “Which of the following best represents how you think of yourself?” It has five response options, which vary slightly by respondent sex.

For male respondents, they are:

- Gay,
- Straight, that is, not gay,
- Bisexual,
- Something else, and
- I don’t know the answer.

For female respondents, the response options are:

- Lesbian or gay,
- Straight, that is, not lesbian or gay,
- Bisexual,
- Something else, and
- I don’t know the answer.

Although not an explicit response option, respondents could refuse to provide an answer to any of these questions.

For the initial sexual orientation question (and the “something else” and “I don’t know the answer” follow-up questions), flashcards listing the response options were handed to respondents in the face-to-face interview setting. Respondents were asked to report the number corresponding to their answer. When the questions were administered over the telephone, the interviewer read the response options. Complete text and details of the NHIS sexual orientation questions are provided in the 2013 Sample Adult survey questionnaire, which can be accessed on the NHIS website: <http://www.cdc.gov/nchs/nhis.htm>.

^a National Center for Health Statistics. National Health Interview Survey, 2013. Public-use data file and documentation. Available from: http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm

^b National Center for Health Statistics. 2013 National Health Interview Survey (NHIS) public use data release survey description. 2014. Available from: ftp://ftp.cdc.gov/pub/Health_Statistics/NCHS/Dataset_Documentation/NHIS/2013/srvydesc.pdf

Reproduced from Ward BW, Dahlhamer JM, Galinsky AM, Joestl SS; Division of Health Interview Statistics, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services. *Sexual Orientation and Health Among U.S. Adults: National Health Interview Survey, 2013*. Hyattsville, MD: National Center for Health Statistics. <https://www.cdc.gov/nchs/data/nhsr077.pdf>

TABLE 1-2 National Health Statistics Report—Sexual Orientation

Sexual Orientation	Gay or Lesbian ^a		Straight ^b		Bisexual	
	Number in Thousands	Percent ^c (Standard Error)	Number in Thousands	Percent ^c (Standard Error)	Number in Thousands	Percent ^c (Standard Error)
Overall	3729	1.6 (0.09)	224,163	97.7 (0.11)	1514	0.7 (0.06)
<i>Sex</i>						
Men	2000	1.8 (0.14)	108,093	97.8 (0.15)	481	0.4 (0.06)
Women	1729	1.5 (0.12)	116,071	97.7 (0.15)	1033	0.9 (0.10)
<i>Age Group (Years)</i>						
18–44	2028	1.9 (0.15)	104,947	97.1 (0.18)	1153	1.1 (0.12)
45–64	1422	1.8 (0.16)	77,686	97.8 (0.17)	289	0.4 (0.07)
65 and over	278	0.7 (0.13)	41,531	99.2 (0.14)	73	0.2 (0.05)

Note: Estimate has a relative standard error greater than 30% and less than or equal to 50% and should be used with caution as it does not meet standards of reliability or precision.

^aResponse option provided on the National Health Interview Survey was “gay” for men, and “gay or lesbian” for women.

^bResponse option provided on the National Health Interview Survey was “straight, that is, not gay” for men, and “straight, that is, not gay or lesbian” for women.

^cPercent distributions in this table may not equal exactly 100.0% due to rounding.

Reproduced from National Health Interview Survey. National Center for Health Statistics website. <http://www.cdc.gov/nchs/nhis/index.htm>. Accessed February 20, 2018.

indicators, and access to health care. **BOX 1-2** summarizes some of the results from this analysis.

This somewhat dry summary suggests that men and women who identified as lesbian, gay, or bisexual on this national survey were insured and participated in basic healthcare options in about the same proportion as their self-identified heterosexual counterparts. Those who self-identified as gay or lesbian were more likely to engage in smoking and drinking than their heterosexual counterparts. Although the NHIS asked about these health risks, it did not ask about unprotected sex or violence.

Other U.S. health data show that a higher percentage of lesbian or gay adults (56.4%) and bisexual adults (47.4%) report intimate partner violence compared to heterosexual adults (17.5%). In addition, although the Centers for Disease Control and Prevention (CDC) estimates that men who have sex with men (MSM) account for 4% of the U.S. male population aged 13 or

older, the rate of new human immunodeficiency virus (HIV) diagnoses among MSM in the United States is 44 times that of other men.¹⁴

Another risk for individuals who identify as lesbian, gay, bisexual, or transgender (LGBT) that distinguishes them from their heterosexual counterparts is being the target of hate crimes. Even before the 2016 shooting rampage at a gay nightclub in Orlando, Florida, the Federal Bureau of Investigation (FBI) documented more hate crimes against LGBT people than any other collective group. Nearly 20% of the 5462 single-bias hate crimes reported to the FBI in 2014 were because of the target’s sexual orientation, or how the perpetrator perceived their victim’s orientation.¹⁵

So, your chromosomes, gender identification, sexual orientation, sexual behavior, and societal reactions to your gender identity and behavior all comprise how sex and gender influence your health risks.

BOX 1-2 Prevalence of Selected Health Indicators by Sexual Orientation for Adults Aged 18–64**Health-Related Behaviors**

- Current cigarette smoking:
 - A higher percentage of adults aged 18–64 who identified as gay or lesbian (27.2%) or bisexual (29.5%) were current cigarette smokers compared with their counterparts who identified as straight (19.6%).
- Binge drinking:
 - A higher percentage of adults aged 18–64 who identified as gay or lesbian (35.1%) or bisexual (41.5%) reported having had five or more drinks in one day at least once in the past year compared with those who identified as straight (26.0%).
- Meet federal guidelines for aerobic physical activity:
 - There were no significant differences among adults aged 18–64 who identified as gay or lesbian (57.9%), bisexual (55.5%), or straight (52.3%).

Health Status Indicators

- Health status described as excellent or very good:
 - No significant differences were found by sexual orientation for the percentage of adults aged 18–64 with excellent or very good health, neither overall nor among men. Among women, however, a higher percentage of those who identified as straight (63.3%) were in excellent or very good health compared with women who identified as gay or lesbian (54.0%).
- Experienced serious psychological distress in the past 30 days:
 - A higher percentage of adults aged 18–64 who identified as bisexual (11.0%) experienced serious psychological distress in the past 30 days compared with their counterparts who identified as gay or lesbian (5.0%) or straight (3.9%).
- Considered “obese” based on calculated weight and height (i.e., not asked directly):
 - No significant differences were found overall in the percentage of adults aged 18–64 who were obese. A higher percentage of men aged 18–64 who identified as straight (30.7%) were obese than men who identified as gay (23.2%); among women aged 18–64, a higher percentage of those who identified as bisexual (40.4%) were obese than women who identified as straight (28.8%).

Healthcare Service Utilization and Access

- Received influenza vaccination in the past year:
 - A higher percentage of adults aged 18–64 who identified as gay or lesbian (42.9%) received an influenza vaccination in the past year compared with those adults aged 18–64 who identified as straight (35.0%).
- Ever been tested for HIV:
 - A higher percentage of men who identified as gay (79.5%) or bisexual (56.7%) compared to straight (33.0%) have ever been tested for HIV. Among women, the differences in testing were not statistically significant (51.6% identified gay or lesbian, 52.6% identified bisexual, and 40.2% identified straight).
- Has a usual place to go for medical care:
 - Among men aged 18–64, no significant differences in having a usual place to go for medical care were found (gay: 81.2%, bisexual: 74.5%, straight: 76.4%). Among women aged 18–64, by contrast, a higher percentage of those who identified as straight (85.5%) had a usual place to go for medical care than those who identified as gay or lesbian (75.6%) or bisexual (71.6%).
- Failed to obtain needed medical care in past year due to cost:
 - Among women aged 18–64, a higher percentage of those who identified as gay or lesbian (15.2%) failed to obtain needed medical care in the past year due to cost compared with those who identified as straight (9.6%). No significant differences by sexual orientation were found among men aged 18–64 for this indicator.
- Currently uninsured:
 - Among men aged 18–64, a higher percentage of those who identified as straight (21.9%) were uninsured compared with those who identified as gay (15.7%). Among women, 19.1% of those who identified as gay or lesbian, 24.9% who identified as bisexual, and 18.4% of those who identified as straight were currently uninsured, but the difference was not statistically significant.

Data from Ward BW, Dahlhamer JM, Galinsky AM, Joestl SS; Division of Health Interview Statistics, Centers for Disease Control and Prevention (CDC), U.S. Department of Health and Human Services. *Sexual Orientation and Health Among U.S. Adults: National Health Interview Survey, 2013*. Hyattsville, MD: National Center for Health Statistics. <https://www.cdc.gov/nchs/data/nhsr077.pdf>

Race and Ethnicity

FIGURE 1-4 shows the statistics from the 2010 U.S. census (reported in 2012) on how many people identified themselves by a specific **race** as well as Hispanic ethnicity. It also shows the projected population in 2060. The largest change predicted for the future will be the near doubling of the ethnically Hispanic population, with some small increases in Asian and “other” groups, which includes Native Americans as well as Native Alaskans, Hawaiians, and Pacific Islanders. What do these broad classifications mean in terms of health?

Changing Views of Race and Ethnicity

Have you sent a cheek swab to National Geographic to have your ancestry determined? Or maybe you have tried 23andMe.com? These fun activities compare your mitochondrial DNA (passed down from your mother) and some markers on your Y chromosomes (from your father) to detect your deep, deep roots. And by deep, we mean learning where your ancestors lived more than 500 years ago. From actual eons of migration, mixing, and mingling, humanity is incredibly diverse, with much more variation existing *within* a so-called “racial group” than *between* racial groups. Therefore, many social scientists assert that race is not based in biology but constructed by society.

For example, skin color, a 19th-century approach to defining race, is controlled by more than 378 genetic loci. These genes regulate melanin production and

the skin’s reaction to light of various wavelengths.¹⁶ Anthropologist Nina Jablonski has pointed out that the geographical distribution of human skin color is related to distance from the equator. At more northern or southern latitudes, the level of ultraviolet B (UVB) rays hitting Earth’s surface decreases due to the planet’s tilt. The equator is bathed year-round in UVB rays, but seasonal variations mean that people in Northern Europe receive virtually no UVB exposure in winter. As a result, Jablonski said, humans living near the equator developed darker skin tones (to protect against the harmful effects of too much exposure), whereas those in northern climates developed lighter hues and are more efficient at synthesizing vitamin D from sunlight.¹⁷

Any population-level traits, including autosomal recessive conditions such as sickle cell disease (SCD) or Tay-Sachs, are carried down through generations due to social factors that have brought groups of people into gene pools (breeding populations) over time. (See **BOX 1-3** for more about these two conditions.) Sometimes populations had control over these groupings; at other times, they were against their wishes.

When many people share cultural traits, such as language, appearance, food, religion, dress, and meaningful symbols, and have a common ancestral homeland, they may be considered to have an **ethnic identity**. Does it match up with a set of physical or physiological traits? It can, if the population has lived and reproduced in the same place over a long period.

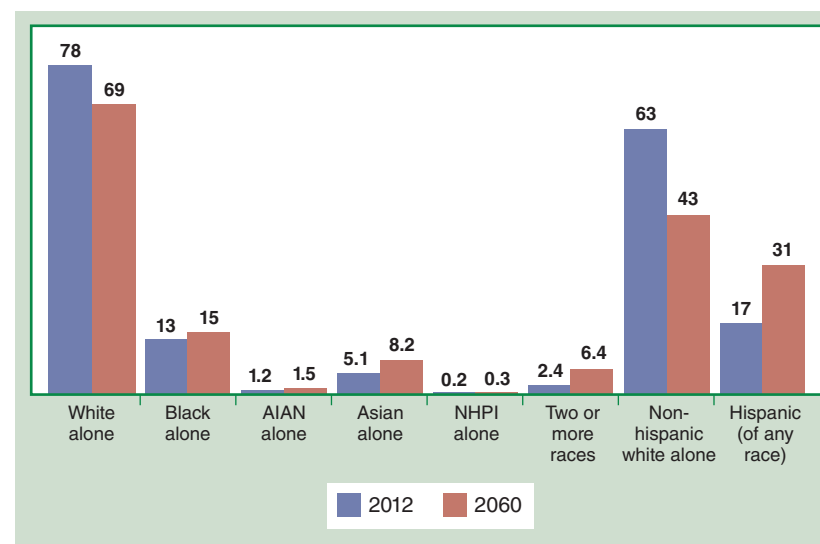


FIGURE 1-4 Population by race and Hispanic origin (percent of total population), 2012 and 2060.

Abbreviations: AIAN, American Indian and Alaska Native; NHPI, Native Hawaiian and Other Pacific Islander.

Reproduced from United States Census Bureau; U.S. Department of Commerce. Washington, DC. https://www.census.gov/newsroom/releases/img/racehispanic_graph.jpg. Accessed March 7, 2018.

BOX 1-3 Diseases of Origin?

Sickle Cell Disease^a

Red blood cells that contain normal hemoglobin are disc shaped, which allows the cells to move easily through large and small blood vessels to deliver oxygen. Sickle hemoglobin can form stiff rods within the red cell, changing it into a crescent or sickle shape. Sickle-shaped cells can stick to vessel walls, causing a blockage that slows or stops the flow of blood. When this happens, oxygen cannot reach nearby tissues.

People who have SCD inherit two abnormal hemoglobin genes, one from each parent. In all forms of SCD, at least one of the two abnormal genes causes a person's body to make hemoglobin S. When a person has two hemoglobin S genes, hemoglobin SS, the disease is called sickle cell anemia. This is the most common and often most severe kind of SCD. Hemoglobin SC disease and hemoglobin Sβ thalassemia are two other common forms of SCD.

A common myth about SCD is that it is an African disease affecting only people in Africa or their descendants. In fact, SCD occurs more often among people who come from areas where malaria was common, such as Africa, but also including the Middle East, India, some Mediterranean countries, and Latin America. Anthropologists theorize this is related to the protective effect that the sickle cell mutation provides against malaria infection in the heterozygous state.

Tay-Sachs: Not Only a “Jewish Disease”^b

Tay-Sachs is a neurodegenerative disease that is fatal in the homozygous state. Babies born with Tay-Sachs disease appear normal at birth, but begin to show symptoms at 4 to 6 months of age. Children then gradually lose their sight, hearing, and swallowing abilities, and usually die by the age of 5 years.

Jewish individuals whose families originated in Eastern Europe, so-called Ashkenazi Jews, have long known to test for carrier status of Tay-Sachs before starting a family. Among the more orthodox populations that arrange marriages, rabbis often require blood tests before condoning a match. Of course, practicing Judaism as a religion had nothing to do with the disease directly, but because Jews in that part of the world limited their marriages to within their communities, and the carrier status was nonfatal, the gene was maintained at a higher rate within this ethnic group. Today, it is known that French Canadian, Cajun (Louisiana), and Irish populations also have higher than average rates of the disease. These days, due to more mixing of populations than was done in past centuries, all young adults are advised to get genetic screening before starting families.

^a Data from Sickle cell disease. National Heart, Lung, and Blood Institute website. <http://www.nhlbi.nih.gov/health/health-topics/topics/sca>. Accessed February 13, 2018; Sickle cell disease (SCD). Centers for Disease Control and Prevention website. <https://www.cdc.gov/ncbddd/sickleceldata.html>. Accessed February 13, 2018; About sickle cell: myths and misconceptions. The Sickle Cell Association of Ontario. <https://sites.google.com/a/sicklecellontario.org/www/sickle-cell-101/myths-and-misconceptions>. Accessed February 13, 2018.

^b Data from Tay-Sachs disease. Einstein Healthcare Network website. <http://www.einstein.edu/genetic/tay-sachs-disease/>. Accessed February 13, 2018.

Therefore, although race may not be clearly defined biologically, it is very real socially, by which we mean that society may allocate valued resources based on this construct. Ethnicity tends to work through the transmission of cultural learning from one generation to another. As such, race and ethnicity can strongly affect health outcomes through the media of culture and society, including selection of mates from within only specific groups.

Age

Have you seen the questions in TABLE 1-3 before? If so, you are likely to be one of nearly 23,000 students (graduate and undergraduate) who completed the American College Health Association’s National College Health Assessment in the past few years. Table 1-3 shows data from the first set of questions that asks about topics addressed by college health information providers as well as student interest in these topics.

More than 50% of students wanted more information about the following topics, in descending order of interest:

- Stress reduction
- Nutrition
- Helping others in distress
- Sleep difficulties
- Depression and anxiety
- Physical activity

Lagging only slightly behind was information pertaining to sexual assault or violence prevention, sexually transmitted diseases (STDs), and suicide prevention. Runners-up included tobacco use, pregnancy prevention, and cold/flu/sore throats. If you were a health education coordinator at a university, what would you do with these data?

Now compare the issues of concern to college students to the data in FIGURE 1-5 showing the CDC’s depiction of the leading causes of death by age group in the United States. Examining the columns

TABLE 1-3 Items from the National College Health Assessment, 2015—Undergraduates

	Have You Ever Received Information on the Following Topics from Your College or University? (Percentage Saying Yes)	Are You Interested in Receiving Information on the Following Topics from Your College or University? (Percentage Saying Yes)
Alcohol and other drug use	80.5	28.0
Cold/flu/sore throat	45.4	38.8
Depression/anxiety	57.9	54.4
Eating disorders	31.2	33.2
Grief and loss	33.4	42.1
How to help others in distress	52.0	59.5
Injury prevention	38.3	41.6
Nutrition	54.2	60.0
Physical activity	59.6	56.1
Pregnancy prevention	44.0	35.1
Problem use of internet/computer games	20.3	24.6
Relationship difficulties	40.8	42.3
Sexual assault/relationship violence prevention	81.5	45.7
Sexually transmitted disease/infection prevention	57.9	42.0
Sleep difficulties	22.3	58.0
Stress reduction	58.4	68.4
Suicide prevention	52.5	46.1
Tobacco use	48.1	25.6
Violence prevention	56.4	43.0

Note: Data from 16,760 students at 40 schools across the United States.

Data from American College Health Association. *American College Health Association—National College Health Assessment II: Undergraduate Students Reference Group Data Report Fall 2015*. Hanover, MD: American College Health Association; 2016.

representing the ages when most individuals attend college (15–24 years and 25–34 years), the first thing to understand is that the total number of deaths in these columns is relatively low. For example, a total of 583 individuals died from HIV in 2014, and only in the older age group; however, there were more than 29,000 deaths from unintentional injury. The majority of these deaths were motor vehicle–related or caused by accidental poisoning, which chiefly refers to drug or alcohol overdose. More than 11,000 individuals took their own lives in 2014, and more than 8000 were killed by others.

Leaving homicide aside for the moment, the educational topics offered on most college campuses

seem to correspond with the greater risks of self-harm experienced by this age group. Although students might not necessarily feel their schools need to share information with them about alcohol and drugs, studies make it clear that fatalities in this age group often involve substance abuse. Nearly one third of all traffic fatalities involve alcohol-impaired drivers, and drugs other than alcohol (legal and illegal) are involved in 16% of motor vehicle crashes.¹⁸ According to the Substance Abuse and Mental Health Services Administration (SAMHSA), approximately 30% of 18- to 25-year-olds with mental health disorders had a co-occurring substance abuse disorder.¹⁹

Age Groups											
Rank	< 1	1–4	5–9	10–14	15–24	25–34	35–44	45–54	55–64	65+	Total
1	Congenital anomalies 4825	Unintentional injury 1235	Unintentional injury 755	Unintentional injury 763	Unintentional injury 12,514	Unintentional injury 19,795	Unintentional injury 17,818	Malignant neoplasms 43,054	Malignant neoplasms 116,122	Heart disease 507,138	Heart disease 633,842
2	Short gestation 4084	Congenital anomalies 435	Malignant neoplasms 437	Malignant neoplasms 428	Suicide 5491	Suicide 6947	Malignant neoplasms 10,909	Heart disease 34,248	Heart disease 76,872	Malignant neoplasms 419,389	Malignant neoplasms 595,930
3	SIDS 1568	Homicide 369	Congenital anomalies 181	Suicide 409	Homicide 4733	Homicide 4863	Heart disease 10,387	Unintentional injury 21,499	Unintentional injury 19,488	Chronic low. respiratory disease 131,804	Chronic low. respiratory disease 155,041
4	Maternal pregnancy comp. 1522	Malignant neoplasms 354	Homicide 140	Homicide 158	Malignant neoplasms 1469	Malignant neoplasms 3704	Suicide 6936	Liver disease 8874	Chronic low. respiratory disease 17,457	Cerebro-vascular 120,156	Unintentional injury 146,571
5	Unintentional injury 1291	Heart disease 147	Heart disease 85	Congenital anomalies 156	Heart disease 997	Heart disease 3522	Homicide 2895	Suicide 8751	Diabetes mellitus 14,166	Alzheimer's disease 109,495	Cerebro-vascular 140,323
6	Placenta cord. membranes 910	Influenza & pneumonia 88	Chronic low. respiratory disease 80	Heart disease 125	Congenital anomalies 386	Liver disease 844	Liver disease 2861	Diabetes mellitus 6212	Liver disease 13,278	Diabetes mellitus 56,142	Alzheimer's disease 110,561
7	Bacterial sepsis 599	Septicemia 54	Influenza & pneumonia 44	Chronic low. respiratory disease 93	Chronic low. respiratory disease 202	Diabetes mellitus 798	Diabetes mellitus 1986	Cerebro-vascular 5307	Cerebro-vascular 12,116	Unintentional injury 51,395	Diabetes mellitus 79,535
8	Respiratory distress 462	Perinatal period 50	Cerebro-vascular 42	Cerebro-vascular 42	Diabetes mellitus 196	Cerebro-vascular 567	Cerebro-vascular 1788	Chronic low. respiratory disease 4345	Suicide 7739	Influenza & pneumonia 48,774	Influenza & pneumonia 57,062
9	Circulatory system disease 428	Cerebro-vascular 42	Benign neoplasms 39	Influenza & pneumonia 39	Influenza & pneumonia 184	HIV 529	HIV 1055	Septicemia 2542	Septicemia 5774	Nephritis 41,258	Nephritis 49,959
10	Neonatal hemorrhage 406	Chronic low. respiratory disease 40	Septicemia 31	Two tied: benign neo./septicemia 33	Cerebro-vascular 166	Congenital anomalies 443	Septicemia 829	Nephritis 2124	Nephritis 5452	Septicemia 30,817	Suicide 44,193

FIGURE 1-5 The 10 leading causes of death by age group—United States, 2015.

Reproduced from 10 leading causes of death by age group, United States – 2015. Centers for Disease Prevention and Control website. https://www.cdc.gov/injury/wisqars/pdf/leading_causes_of_death_by_age_group_2015-a.pdf. Accessed June 15, 2018. Data source: National Vital Statistics System, National Center for Health Statistics, CDC. Produced by: National Center for Injury Prevention and Control, CDC using WISQARS™.

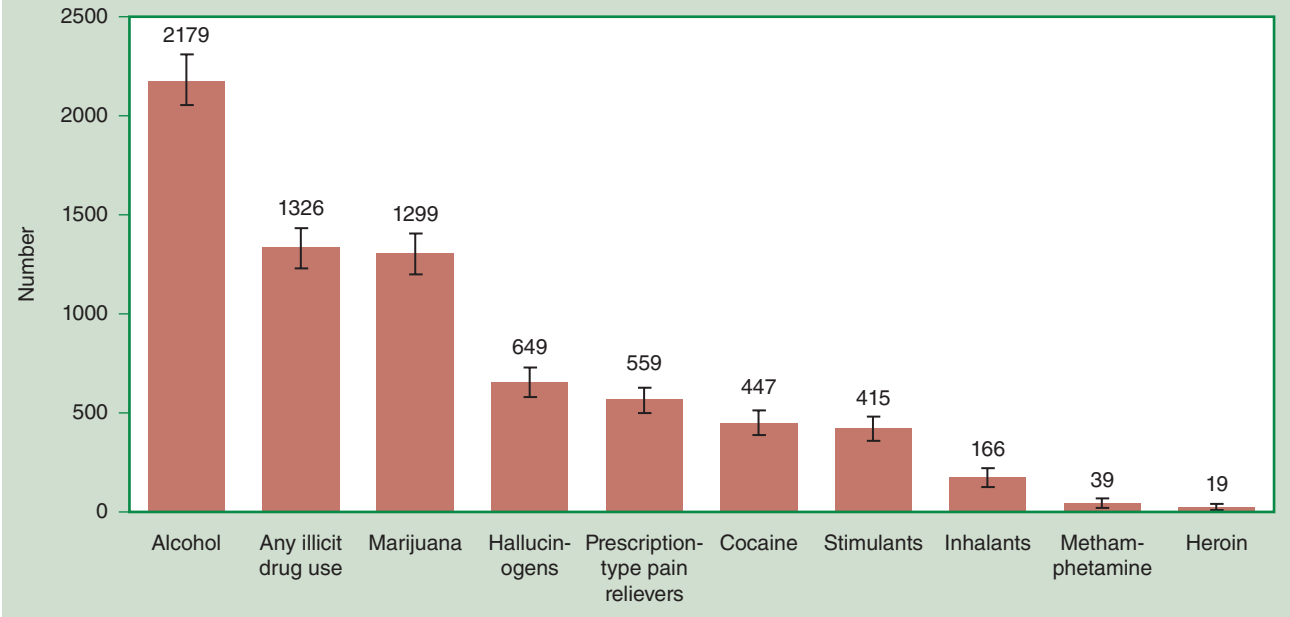


FIGURE 1-6 Substance use by college students.

Reproduced from Lipari RN, Jean-Francois B. A day in the life of college students aged 18 to 22: substance use facts. *The CBHSQ Report*. Center for Behavioral Health Statistics and Quality website. https://www.samhsa.gov/data/sites/default/files/report_2361/ShortReport-2361.html. Published May 26, 2016. Accessed February 14, 2018.

Many college students will say they turn to alcohol, drugs, or tobacco (including e-cigarettes and vaping) to relieve the stress they feel from their academic or social environment. **FIGURE 1-6** shows the number

of full-time college students who reported using an illegal substance for the first time. (Part-time student rates are much lower.) In addition, of the 9 million full-time college students in the United States, 1.2 million

drank alcohol and 703,759 used marijuana on an almost daily or daily basis in 2015.²⁰

So, it seems that in the United States, young adulthood is a fairly safe time of life from a disease perspective. The major health risks in this age group are behavior-related. Self-inflicted harm is the greatest cause of death, often in association with overdose or misuse of drugs and alcohol. Substance misuse and abuse can be triggered by elevated levels of stress or other emotional discomfort. Our environment plays a role in creating this stress.

The Environment

In the early part of the 20th century, the leading causes of disease and death in the United States were directly tied to environmental conditions such as close living quarters and poor sanitation, an unsafe and unhealthy food supply, and hazardous workplaces or occupations. In response to these health problems, the U.S. government at all levels created laws and regulations to clean up toxic waste, manage infectious disease outbreaks, ensure that food was safe to eat, and so on. These policies led to dramatic reductions in communicable diseases and maternal and infant mortality. In many low-income countries, however, much of the population continues to suffer from illnesses attributable to unsanitary and unsafe environmental and workplace conditions. According to the WHO, environmental factors account for 24% of the global disease burden and 23% of all deaths.

The environment is once again very much on our minds, whether because of mosquito-borne illness such as Zika virus, increases in childhood asthma, or populations affected by flooding, tornadoes, or other “natural” disasters. The environment affects all of us on a global level, such as through climate change, and on an individual level, such as how one reacts to heat, dust mites, cockroach droppings, pollen, and so on. The climatic trends associated with global warming indicate that we need to develop solutions to reduce environmental pollution and protect ourselves against environmental risks.

The CDC has published numerous infographics that depict different environmental health issues, some of which appear in **FIGURES 1-7** and **1-8**.

Although the environment affects everyone, the risk of exposure to poor quality environments or having access to safe and salubrious spaces is largely a matter of how society allocates resources. For example, **FIGURE 1-9** depicts the Washington, DC, subway (Metro) system showing life expectancy at various destinations.



FIGURE 1-7 Childhood lead poisoning.

Reproduced from National environmental public health tracking: childhood lead poisoning communication tools. Centers for Disease Control and Prevention website. <https://ephtracking.cdc.gov/showClipCommunicationTools.action>. Updated October 26, 2016. Accessed February 21, 2018.



FIGURE 1-8 Asthma and air pollution.

Reproduced from National environmental public health tracking infographics. Centers for Disease Control and Prevention website. <https://ephtracking.cdc.gov/showInfographics>. Updated December 14, 2017. Accessed February 21, 2018.

People living at one end of the so called “Red Line” or “Yellow Line” have six to seven more years of life expectancy than those at the opposite end of the “Blue Line” or living in the center of town. The economic, educational, and resource availability associated with a place can be found in cities around the country.²¹ So, growing up on the proverbial wrong side of the tracks not only is a matter of status, but it also is associated with health disparities.

► How to Change This Picture

The Ecological Model

Just as health problems arise from multiple sources (i.e., individual biology, family life, community resources), solutions can also be developed on multiple levels. Social scientists use an **ecological model**, such as that depicted in **FIGURE 1-10**, to begin identifying the roots of problems and potential points of intervention.

The basic idea in using an ecological model is to look at the outer layers of a problem and work on solutions to these. New policies and structural interventions will be more sustainable over time than individualized interventions. Take water contaminated by lead or other pollutants. Cleaning up the water supply will be more sustainable over time than handing out bottled water to individuals. Bottled drinking water should be viewed as a short-term, emergency intervention.

BOX 1-4 presents an ecological model for violence prevention, suggesting points of intervention at all levels of the model.

Sometimes a problem that appears to be individual has its roots in the outer layers of the model. **FIGURE 1-11** shows a simplified ecological model for childhood obesity, modeled after Davison and Birch.²²

Points of Intervention

Health communicators work through a causal analysis to determine the modifiable factors existing at each level of an ecological model. With the example of students turning to drugs or alcohol to relieve stress, it would be important to go beyond simple interdiction of on-campus drug use or drinking and search for modifiable causes of the stress. A process to do this is root cause analysis.

Root Cause Analysis

Root cause analysis is a technique from engineering used to analyze what went wrong in a disaster. For example, if a building collapses, engineers look at what precipitated the event at a deeper level. The well-known parable attributed to Ben Franklin, “For the want of a nail, the shoe was lost; for the want of a shoe, the horse was lost . . .,” ending up with the loss of a kingdom, is a kind of reverse root cause analysis. In relatively modern times, the Space Shuttle *Challenger*, with its crew of seven (including Christa McAuliffe, a science teacher), exploded a little more than a minute into its flight in 1986. Famed physicist Richard Feynman was among the group charged with the root cause analysis of this

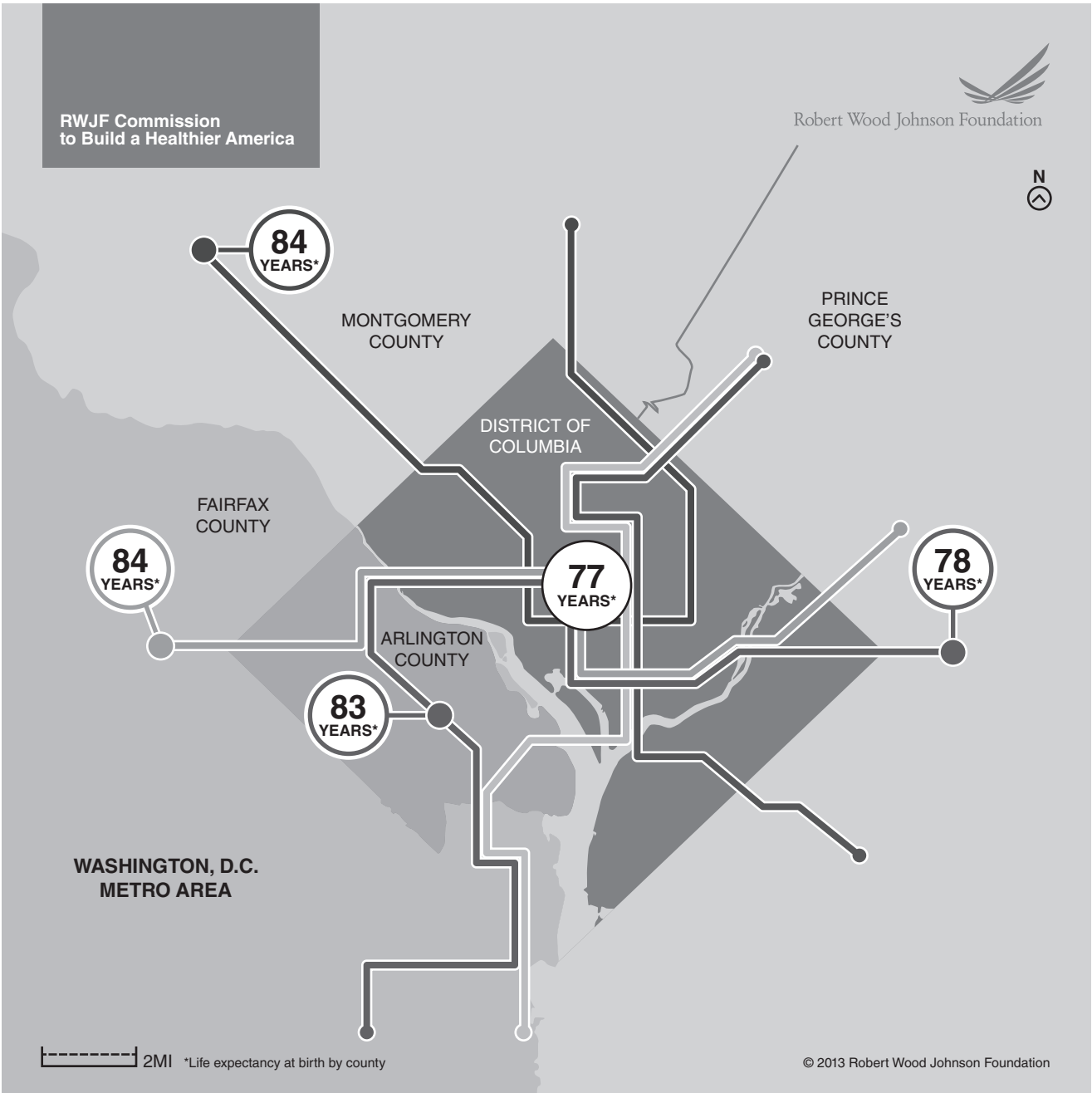


FIGURE 1-9 DC metro map by life expectancy.
© 2013 Robert Wood Johnson Foundation. Reprinted with permission from the VCU Center on Society and Health.

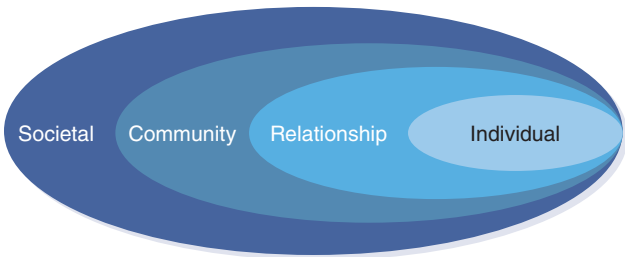


FIGURE 1-10 Social-ecological model.
Reproduced from Krug E, Dahlberg LL, Mercy JA, Zwi AB, Lozano R, eds. *World Report on Violence and Health*. Geneva, Switzerland: World Health Organization; 2002.

disaster. In speaking to the National Aeronautics and Space Administration (NASA) engineers, the group discovered that the “O rings” seal of the solid rocket was sheared off by strong wind and cold temperatures. It was a shocking moment to the world watching the launch and set the space program back by several years. But the underlying cause, according to Feynman and the scientific commission, was the prevailing culture of “all systems go” that discouraged NASA scientists from raising issues that might impede a launch. A cultural and political change was necessary to prevent disasters like what occurred with the *Challenger* from occurring again.

BOX 1-4 CDC Ecological Model for Violence Prevention**Individual-Level Forces**

The first level identifies biological and personal history factors that increase the likelihood of becoming a victim or perpetrator of violence. Some of these factors are age, education, income, substance use, and history of abuse. Prevention strategies at this level are often designed to promote attitudes, beliefs, and behaviors that ultimately prevent violence. Specific approaches may include education and life skills training.

Relationship-Level Forces

The second level examines close relationships that may increase the risk of experiencing violence as a victim or perpetrator. A person's closest social circle—peers, partners, and family members—influences their behavior and contributes to their range of experience. Prevention strategies at this level may include parenting or family-focused prevention programs, and mentoring and peer programs designed to reduce conflict, foster problem-solving skills, and promote healthy relationships.

Community-Level Forces

The third level explores the settings, such as schools, workplaces, and neighborhoods, in which social relationships occur and seeks to identify the characteristics of these settings that are associated with becoming victims or perpetrators of violence. Prevention strategies at this level are typically designed to impact the social and physical environment—for example, by reducing social isolation, improving economic and housing opportunities in neighborhoods, and improving the climate, processes, and policies within schools and workplaces.

Societal-Level Forces

The fourth level looks at the broad societal factors that help create a climate in which violence is encouraged or inhibited. These factors include social and cultural norms that support violence as an acceptable way to resolve conflicts. Other large societal factors include the health, economic, educational, and social policies that help to maintain economic or social inequalities between groups in society.

Reproduced from The social-ecological model: a framework for prevention. Centers for Disease Control and Prevention website. <http://www.cdc.gov/violenceprevention/overview/social-ecologicalmodel.html>. Updated March 25, 2015. Accessed February 19, 2018.

Root cause analysis has found its way into health-care settings, particularly in eliminating intravenous line infections, mistakes in drug delivery, and similar human errors. It can also be used to prevent disasters, such as young adult suicide or drug overdose. For example, if a college student is feeling so stressed that they take drugs, what is causing the stress? It could be difficult coursework and tests, relationships not working out as hoped, financial difficulties, lack of sleep, and even poor nutrition. Why are students losing sleep and not eating well? How would you get to the root causes of any of these conditions?

Counseling might be an effective strategy for helping students cope with personal relationships, difficulties with coursework, or possibly addiction. However, communication to address parental pressure, clubs or fraternities, or how professors interact with students or set up testing might also be likely candidates for intervention.

Health communication strategies can be organized in terms of their relative utility within each level of the ecological model. Some approaches are more effective at influencing the outer layers, including the policymakers who develop regulations or

implement programs that provide resources to communities and individuals. Other processes are more effective midway by influencing community dynamics, and others work by facilitating individual behavior change.

The People and Places Framework

Maibach, Abrams, and Marosits²³ have developed a framework to diagram the processes of communication in terms of its potential impact within an ecological model. They call this the *people and places model of social change* (FIGURE 1-12).

The people and places framework (PPF) asks, “What about the people, and what about the places, needs to be happening for all to be healthy?” Forces that affect people at the individual, social network, or community/population level are referred to as “people fields of influence.” Forces that are linked to a higher administrative level (state, nation, world) are referred to as “place fields of influence.” PPF suggests that business-to-business approaches and policy (legislative, corporate) advocacy mainly affect place fields of influence. Social marketing and health

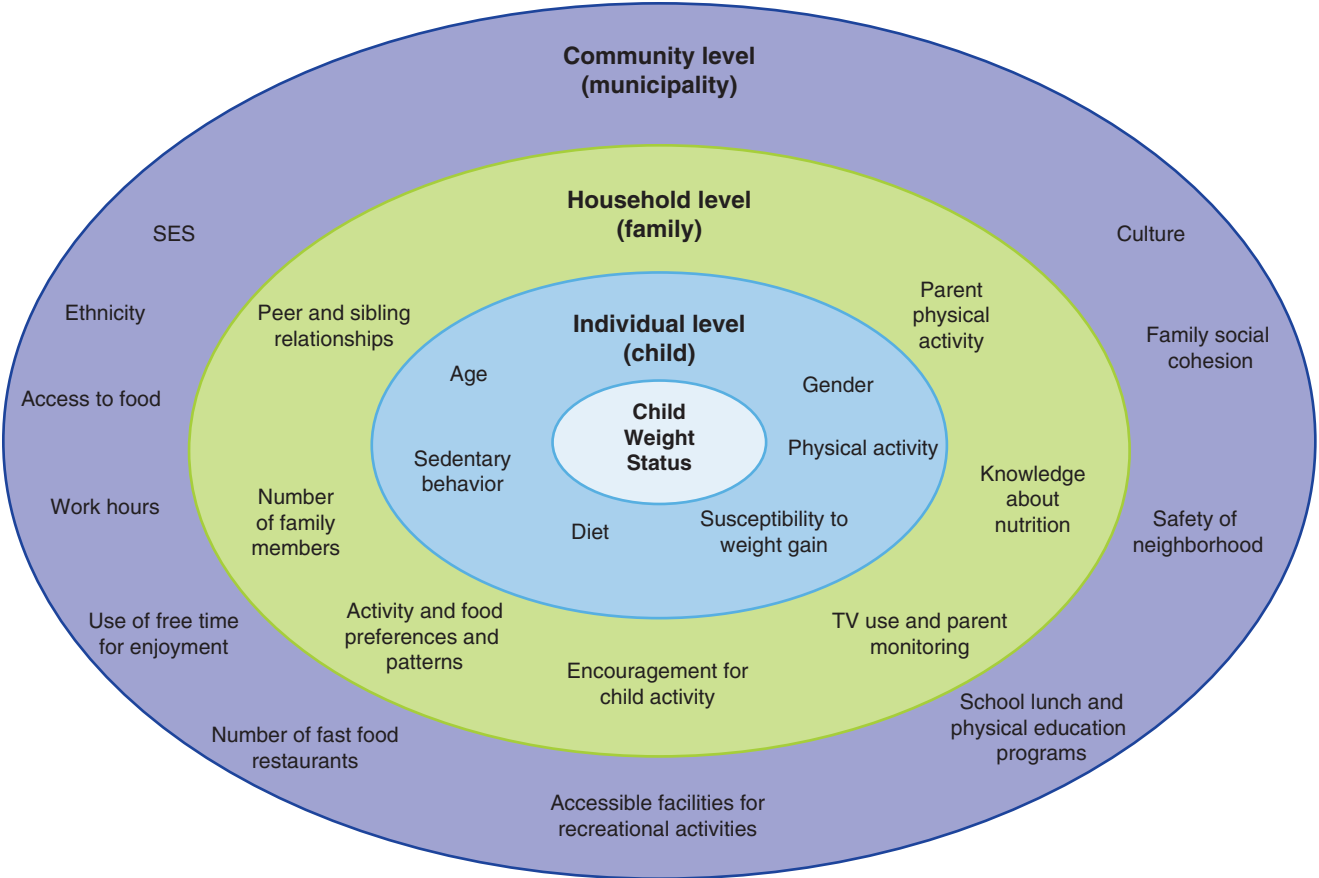


FIGURE 1-11 Ecological model for childhood obesity.
Modified from Gonzalez-Casanova I, Lucia Sarmiento O, Pratt M, et al. Individual, family, and community predictors of overweight and obesity among Colombian children and adolescents. *Prev Chronic Dis* 2014;11:140065. <http://dx.doi.org/10.5888/pcd11.140065>

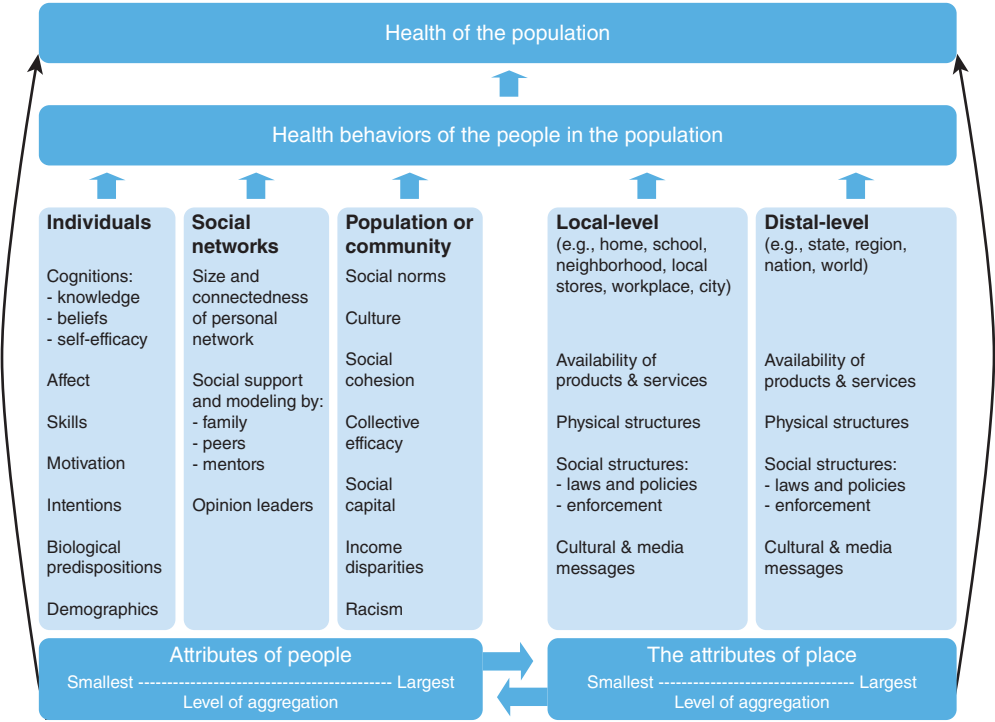


FIGURE 1-12 People and places framework.
Reproduced from Maibach EW, Abrams LC, Marosits M. Communication and marketing as tools to cultivate the public's health: a proposed "people and places" framework. *BMC Public Health*. 2007;7:88. <https://doi.org/10.1186/1471-2458-7-88>.

communication promote voluntary behavior change based on information, motivation, and self-efficacy, among other psychological processes, and are more effective at changing people fields. A health communicator can use this information to develop an overarching intervention strategy that will target the desired ecological level(s).

► Conclusion

It would be great if staying healthy was everyone’s default position. Except for those born with insurmountable obstacles to their health, most children can achieve good health, given a supportive social and physical environment. Health communication can:

- Inform policies and regulations contributing to social determinants
- Educate, motivate, and persuade individuals to choose healthier behaviors

- Assist individuals to access health care, interact with healthcare providers, and follow healthcare instructions
- Work with healthcare providers to be better communicators

This text is designed to provide you with a foundation for appreciating, understanding, and applying health communication methods in educational, government, worksite, and healthcare settings, and maybe in your own life, family, and community. In the 19th century, public health had enormous impact on population health through infection control. The 20th century brought the power of technology and medicine to improve health through medical treatment. At the outset of the 21st century, health communication—which affects individual knowledge, behaviors, and collective policies—has the power to bring the next major changes in our health and our world.

Key Terms

Affordable Care Act of 2010 (ACA)	Healthy People 2020	Sex
Ecological model	Premature death	Social determinants of health (SDH)
Ethnic identity	Quality-adjusted life expectancy	
Gender	Race	
	Root cause analysis	

Chapter Questions

1. What are the differences between sex and gender?
2. Describe how factors shaping your identity contribute to health outcomes.
3. Using the ecological model, describe a health disparity.

4. Discuss femicide. What are some unanticipated consequences of removing girl infants from the population?
5. Choose a health condition. Using the technique of root cause analysis, what are some potential underlying causes for this condition?
6. Describe one way that health communication can contribute to positive health outcomes.

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