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The Skeptic's Guide to Health, Medicine, and the Media

Guidebook

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Dr. Benaroch has published two books on parenting and pediatric health topics: *Solving Health and Behavioral Problems from Birth through Preschool: A Parent's Guide* and *A Guide to Getting the Best Health Care for Your Child*. He has also authored chapters in *Visual Diagnosis and Treatment in Pediatrics* and the American Academy of Pediatrics' *Red Book*. Dr. Benaroch records a monthly podcast on professional education for physicians and has a blog for parents and health professionals at pediatricinsider.com. His essays on pediatric health have been widely published on the internet, and he has served as a featured expert for WebMD.

In addition to his work in private practice and as a teacher and writer, Dr. Benaroch also serves on the board of directors for The Children's Care Network, a clinically integrated network of more than 1000 Atlanta-area pediatric care providers.

Dr. Benaroch's other Great Courses are *Medical School for Everyone: Grand Rounds Cases*; *Medical School for Everyone: Emergency Medicine*; and *Medical School for Everyone: Pediatric Grand Rounds*. ■

TABLE OF CONTENTS

INTRODUCTION

LECTURE GUIDES

SUPPLEMENTARY MATERIAL

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THE SKEPTIC'S GUIDE

TO HEALTH, MEDICINE, AND THE MEDIA

COURSE SCOPE

There is no shortage of health news stories. We hear about the latest scientific studies in the newspaper, read lists of health recommendations posted on social media, and see stories about health tragedies and triumphs on the television every day. But which should you believe? How can you tell what health information is really going to improve your own health and the health of your family?

In this course, professor and physician Roy Benaroch will teach you to be a better consumer of health information. You will learn how not to fall for the latest health scare or sneaky attempts to sell you things you do not need. At the same time, you will become better at telling which health news stories are worthwhile to review and remember.

Throughout the course, Dr. Benaroch reviews fascinating health stories from a skeptic's point of view. That does not mean you should believe nothing in the news, but it does mean looking at stories critically to see if they are likely to be true and relevant.

The course will help you develop a skeptic's toolkit—that is, six simple questions to ask yourself when reviewing a news story or website for information. You will get plenty of practice using the toolkit during the course, and by the end, you will feel confident that you have the skills you need to critically and skeptically think about the latest news from the world of health. Though told through the lens of health and medicine, these same lessons will help you become less likely to be misled by other news stories, too.

Specific health topics covered include hormone replacement therapy, weight loss, medical marijuana, and the tremendous strides occurring in genetic science. The course also covers controversies in cancer screening and the role of mental health in crime and violence. It also looks at certain questions: Are coffee and red wine good or bad for your heart, and what are the best ways to keep your body young and fit? Is it necessary to "detoxify" your body? What about alternative medicine? Should you worry about the future mental health of a teenager who wants to play football? And why do drug prices keep going up and up?

Other topics include the opioid crisis, life expectancy, the common cold, and flossing. The course looks at all of these subjects, and at how these and other topics have been covered in the media. You will see a wide range of examples, including some excellent reporting that has dramatically changed how we look at the health effects of smoking, drunken driving, and lead in the water. You will also see examples of some shoddy reporting that is untruthful and at times biased. It is not just reporters who slip up: You will also learn from examples of misleading or fraudulent research, and how to spot bad science.

Critical thinking with a skeptical mindset will help you understand and appreciate the best in health news reporting—and it will also protect you from scams and scares. ■

THE SKEPTIC'S TOOLKIT

From time to time, this course makes use of the skeptic's toolkit to examine news stories. The concepts and questions in the toolkit are as follows:

Source: What is the source of a story? Is that source credible and free of bias?

Strength: How strong is the story's evidence? Stories that review large clinical trials are much stronger than stories about small pilot studies.

Salesmanship: Is the article trying to sell you something? Many media accounts are repackaged press releases whose purpose is to sell something. That does not mean the story is false, but it does mean you are probably not getting a balanced viewpoint.

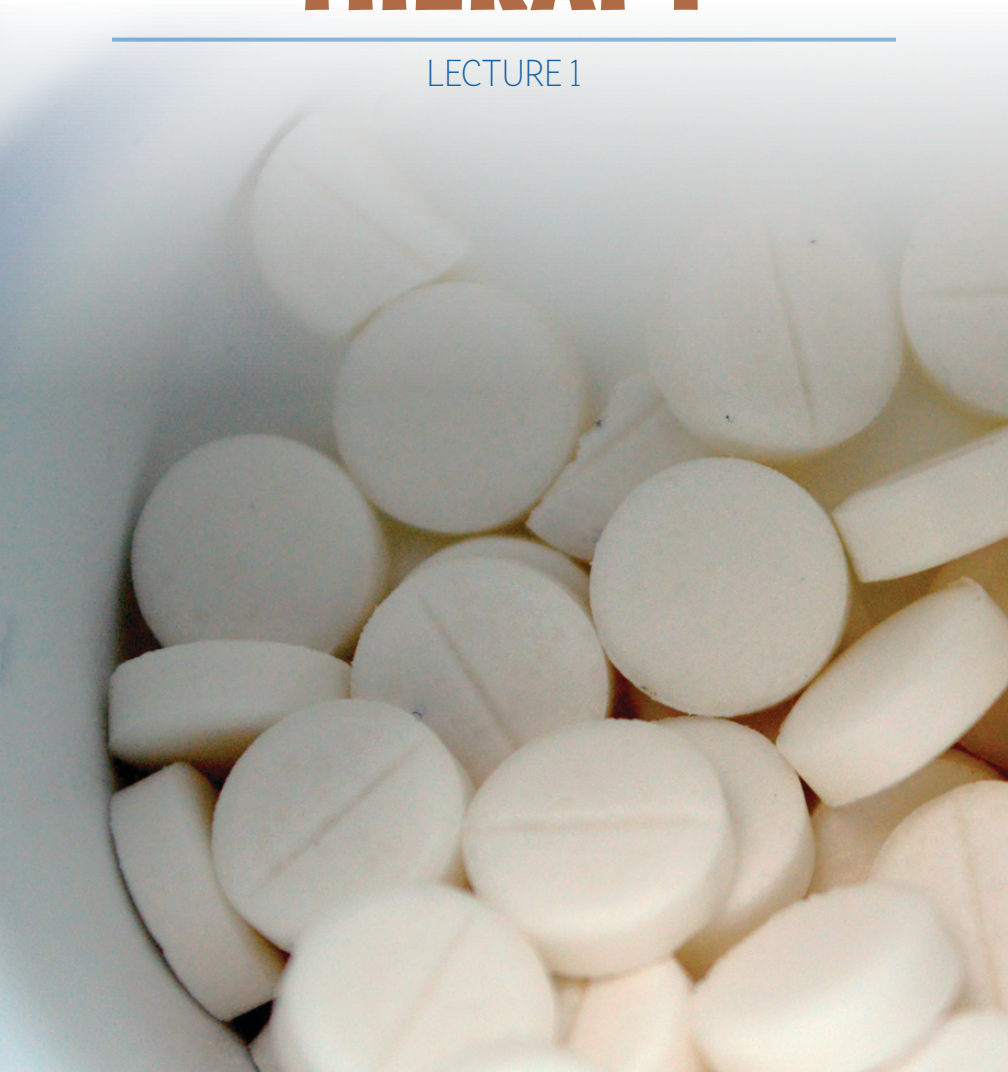
Salience: Is the story about you or people like you? Stories about animal studies or stories about people who have a different health background from yours may be interesting or revealing. However, their results may not apply to you

Sides of the Scale: Are you getting both sides of the story, or just one side? Most health stories ought to include quotes or information from people with differing views. That does not mean there are always two legitimate sides, or that both sides deserve equal weight. Good journalism does not mean equal access for unqualified sources or people who misrepresent the evidence.

Sensibility: After you have read and digested an article, does it seem sensible? Sometimes, you have to pause for a moment before buying into something that is hype or hyperbole. If you read a health article that does not seem sensible, your best bet is probably to ignore it.

HORMONE REPLACEMENT THERAPY

LECTURE 1



In the last 20 years of the 20th century, from about 1980 up until 2002, many women in the United States were treated with hormone replacement therapy (HRT). About 40% of all US women were prescribed these medicines during and after menopause. This lecture looks at the rise and fall of a prominent medication involved in hormone replacement therapy, and lessons that can be drawn from it.

PREMARIN

During most of the HRT boom, the top-selling medication in the US was Premarin, a combination of estrogens that replaced falling hormone levels in menopausal women. This medication effectively treated the short-term symptoms women were experiencing, such as hot flashes, night sweats, trouble finding words, and anxiety and depressive symptoms.

The idea was that replacing the hormones that fall during menopause stops the symptoms. It was also thought that hormone replacement would help prevent some of the long-term issues that typically became part of women's lives after menopause, including osteoporosis, stroke, and heart attacks.

Getting women onto HRT became the standard of care. The popular media was full of stories about how women felt better and stayed healthier on these medications.

However, a huge study published in 2002 grabbed the media's attention, and the headlines quickly changed to trumpet the "new" knowledge that HRT could cause cancer and other health problems. Women stopped taking their medicine, and Premarin prescriptions dropped dramatically.

Ironically, the new study's conclusions weren't completely unexpected, but they were widely misinterpreted in the media. The tides changed, literally overnight.

In retrospect, it's clear that HRT had been oversold to begin with. There hadn't ever been solid evidence for its long-term benefits. However, the dramatic fall of Premarin wasn't entirely justified, either.

Many women could have continued to benefit safely from treatment for some genuinely troublesome symptoms, but the era of routine HRT had abruptly come to an end.

HORMONES, MEDICINE, AND THE MEDIA

Medically, menopause marks the end of the functional life of a woman's ovaries. The ovaries will no longer release eggs, fertility is no longer possible, and the monthly cycle of menses ends. From the point of view of symptoms, it is not the lack of eggs that is the problem—rather, it is the end of the ovaries' other function as an endocrine organ.

The ovaries, throughout a woman's life after puberty, release what are called sex hormones, principally estrogens and progesterone. The actions of these hormones are complex and affect just about every other organ system in the body, and it is the fall of these hormones that cause the symptoms that accompany menopause.

In 1942, Ayerst Laboratories started marketing an oral estrogen product, Premarin, which was to become one of the best-selling medications in the world. Premarin's story was both a marketing triumph and, some say, a medical tragedy.

Keep in mind that menopause had been going on in humans for essentially forever, and though the symptoms were bothersome, most women probably never sought treatment. Menopause, unlike most of the things doctors treat, had never been an illness or a disease. Marketing a drug to treat a non-disease had seldom been done before, but Ayerst did so, with great initial success.

Premarin was initially sold at five times the price of competing products, and its first ad campaigns stressed that it was "upscale"—that is, to use the tired but very effective phrase, "new and improved." Initial ads showed glamorous women surrounded by happy families, having fun.

Ayerst went a step further. Society and doctors hadn't really seen menopause as a disease or a treatable condition, and that had to change. The drug manufacturer developed an educational program for physicians, concentrating on menopausal symptoms and, of course, therapy.

The goal of a media company is to sell stories, and the goal of a drug company is to sell drugs. When these interests work together, that leads to a lot of sales and perhaps some unintended consequences.

THE RISE OF PREMARIN

The 1960s saw skyrocketing sales of Premarin, pushed by a hugely successful campaign called "Keep her on Premarin." The campaign targeted men by saying, essentially, that Premarin makes women pleasant to live with, and doctors should prescribe it to help their husbands.

Women were targeted directly too. A book by British gynecologist Robert Wilson, titled *Feminine Forever*, became a best seller when it was released in 1966. It helped convince millions of women that estrogen replacement around menopause wasn't just a helpful way to relieve symptoms, but something that was necessary to protect their very identities as women.

It is no coincidence that Wilson's text reflected marketing messages. He was receiving payouts from companies making estrogen compounds, both for his book and for speaking tours. These messages pervaded articles in women's magazines and the popular press. Sales of hormone replacement prescriptions quadrupled around the time of the book's release.

HRT FALLS AND RISES AGAIN

There were some studies, though, that showed a downside of these hormone pills. Two studies published in 1975 reported that estrogen therapy dramatically increased the risk of endometrial cancer. These studies were widely publicized, and estrogen prescriptions plummeted.

A few years later, newer studies showed that this increased cancer risk could be mitigated by the addition of a second hormone to the estrogen regimen: progesterone. Sales of both of these medicines headed back up. In 1992, Premarin became the most frequently prescribed medication in the US, and it remained in first or second place for the rest of the century.

By then, its use was entrenched for both the treatment of menopausal symptoms, but also for the prevention of osteoporosis and, it was thought, the prevention of cardiovascular disease. It was these latter, long-term purported health benefits that had truly propelled these medications to blockbuster status.

Premarin had been approved by the Food and Drug Administration (FDA) in 1942, and at that time, the law only required the manufacturer to show that it was safe, not that it was useful or effective for any specific indication. Later laws compelled the FDA to look at and approve the indications for medications, which could then guide their marketing—that is, drug companies could only market their drugs for reasons approved by the FDA.

In 1972, six years after Wilson's influential book, the FDA officially announced that Premarin was effective for the symptoms of menopause. In 1986, the FDA announced that Premarin and similar drugs were also effective at fighting the bone loss associated with osteoporosis.

Suddenly, a drug that many women had been taking for a relatively short term was now a treatment for a long-term, essentially lifetime condition—and a condition that was common, and silently affected millions of women, putting them at risk for debilitating fractures and back pain. There was talk, then, not only in the popular press but also in the medical literature that literally every postmenopausal woman should take Premarin for the rest of her life.

Another boost for Premarin came in 1991, when the FDA withdrew their approval of less expensive, generic estrogen products. Their reasoning went like this: Premarin, itself, is a mixture of at least 50 chemically different estrogen compounds. It was manufactured (and is still manufactured) by collecting and processing the urine of pregnant mares.

Other manufacturers of estrogen compounds couldn't copy Ayerst's exact production methods, so their drugs didn't have the same exact mix of natural estrogens. The studies that showed Premarin could improve osteoporosis were done with brand-name, genuine Premarin. Essentially, the FDA said to the generic manufacturers that since their drug was not exactly the same as Premarin, they could not sell it by claiming that it works for the same things.

It took several years for generic makers to be able to reintroduce their products to the market, and only for narrower indications. To this day, there is no truly generic Premarin—no other estrogen compound can be substituted for the original.

ANOTHER TURNING POINT

By 1999, sales of Premarin in the United States totaled $1.5 billion a year. However, it was time for the science to catch up with the marketing. The "Heart and Estrogen/Progestin Replacement Study," published in 1998, was the first significant, randomized controlled study of hormone replacement therapy.

It enrolled nearly 3000 women and followed them for an average of four years. The study found that treatment with hormone replacement did not reduce the risk of heart disease, but it did increase the risk of blood clots. The authors recommended that these medicines not be prescribed as a way to prevent heart disease, though allowed that women already taking the meds might as well continue them.

These results were amplified in 2002 with the release of the first Women's Health Initiative study. This was a much larger trial, whose results showed that long-term combination hormone therapy did not improve survival or prevent chronic illnesses in postmenopausal women. The study was actually halted earlier than expected because the results were so striking.

The study also showed that hormone replacement therapy increased the risk of heart attacks, strokes, and breast cancer. Some benefits were seen, but this study, as it was originally published, showed that the risks of hormone therapy far outweighed the benefits.

Headlines screamed that hormone replacement therapy was causing death and cancer in women. *The Guardian*, in 2002, said, "HRT Study Cancelled over Cancer and Stroke Fears." NBC's chief science and health correspondent wrote about breast cancer: "Millions of women could have developed and even died from the disease because of excessive use of hormone replacement therapy."

Sales reflected these fears: At its peak, an estimated 40% of women in the US, age 50 and older, were taking hormone replacement therapy. That figure dropped to 5% by 2009.

A MISUNDERSTOOD STUDY

Physicians and the popular media both misunderstood the conclusions of the landmark study. It was designed to look at the risks and benefits of using hormone replacement therapy to prevent long-term health risks. Most of the almost 30,000 women enrolled in the Women's Health Initiative study were already well past 60 years of age, already at least a decade past menopause.

Subsequent analyses of the huge data sets from the Women's Health Initiative have shown that the health risks associated with HRT are only really seen in older women. So-called post-hoc analyses are later published papers that scour large data sets for new insights by asking different questions.

Current guidelines say that most women in their 40s and 50s struggling with menopausal symptoms should take hormone replacement therapy. These medicines can safely relieve symptoms, improve the quality of life, and even reduce short-term mortality—though that doesn't mean women should keep taking them forever.

TESTOSTERONE

There is another side to the story of hormones, this one involving men. Though men don't experience something akin to menopause, men do experience a gradual drop in their sex hormone, testosterone, over decades as they age.

A huge industry has developed to treat men for what has become known as low T. Testosterone therapy is being pushed to treat a variety of ailments including fatigue, sexual dysfunction, and declining muscle mass.

Genuine low testosterone is called hypogonadism in the medical literature, and it is a valid indication for testosterone therapy. Men with genuinely low testosterone levels do experience genuine symptoms that can be serious and, at times, debilitating.

However, just how many men have genuinely low testosterone is a matter of some debate—there are reasonable questions about what cutoffs should be used. But many men who have been prescribed testosterone have not even had their testosterone levels measured, and they are not being monitored to see if replacement normalizes blood levels or consistently improves symptoms.

A 2016 systematic review of the literature summarized that testosterone supplementation overall did not show consistent benefits for sexual function, mood, or behavior—it doesn't really work, at least for some of the most important reasons men give for taking it. Additionally, testosterone supplementation can increase the risk of cardiovascular events, like heart attacks.

Men with genuinely low testosterone can benefit from supplementation, and for them, the benefits may well exceed the risks. However, one concern is that hype about testosterone has driven prescriptions and sales to too many men, and especially too many men who probably won't have much benefit.

In 2014, the FDA clamped down on testosterone advertising. They declared that product labels need to explicitly say that testosterone is only to be used for men with objectively low testosterone levels, and that testosterone therapy may raise the risk of cardiovascular problems. Sales of testosterone products, predictably, have begun to drop.

However, as with hormone replacement for menopausal women, we need to be careful that we don't push the pendulum too far. The bottom line with hormone replacement for men and women is that it's not a magic elixir that everyone should take—but neither are these therapies automatically bad. These are nuanced decisions that need to be made based on the best medical evidence, considering each patient's own medical history and needs.

Suggested Readings

Huo, et al., "Treatment of Men for 'Low Testosterone.'"

The North American Menopause Society, http://www.menopause.org/.

Watkins, *The Estrogen Elixir*.

Questions to Consider

1. Looking back, why did it seem like a good idea for women to take supplemental hormones at menopause? Why did that recommendation change?

2. Is it the media's job to warn men against supplemental testosterone?

CONCUSSIONS AND THE FUTURE OF FOOTBALL

LECTURE 2

Broadly speaking, there are two kinds of brain injuries: devastating ones that cause physical damage to the brain, such as major trauma or a stroke, and more subtle injuries. Injuries in that latter category are known as minor head trauma, minor brain injury, or concussions. These can be overlooked at the time of the initial event, and though in some ways they're subtle, they can have lasting and very serious consequences. They are the subject of this lecture, which uses sports as a lens through which to view them.

THE CAUSE OF CONCUSSIONS

It is important to understand why these injuries occur. The brain is encased in the skull. There is a small space, three to five millimeters, between the brain and skull filled with fluid and membranes that provides some cushioning.

Imagine that the head is struck, as if by a swung baseball bat, and it accelerates quickly away from the blow. The brain, inside the head, doesn't move immediately. It stays in place because of momentum, and it ends up slamming into the inside of the moving skull.

The brain is soft, and it's made up of about 100 billion cells, with trillions of interconnections between those cells. When the brain is suddenly jarred or moved, the tissue twists and stretches. The nerve cells themselves are stretched, or pulled away from each other, and this causes a chaotic release of neurotransmitters along with an uncontrolled depolarization of each cell's electrical charge.

The cells can't communicate with each other, and they'll need a lot of energy to repair and rebuild, and to reestablish normal physiology. If they can't get that energy, some cells may be irreversibly damaged.

AFTER A CONCUSSION

The brain is in the skull, the skull is in the head, and the head is attached to the rest of an athlete's body. A sudden hit anywhere that changes the direction and speed of the head's movement can damage the brain and result in concussion—even if the head didn't take a direct hit.

Second Impact Syndrome

Second impact syndrome occurs when the brain sustains a second injury before it has recovered from a first concussion. For example, it can occur if a football player returns to the field of play before they have fully healed. Though not common, it can be especially devastating for teenagers, who may be more vulnerable because of their still-developing anatomy.

There are both immediate and delayed effects of concussions, and the symptoms depend on which cells are affected most. In the immediate sense, a concussion is accompanied by a change in brain functioning. This could be a complete loss of consciousness, a period of confusion or delirium, or trouble walking or remembering things.

Essentially any brain function could be affected, from balance to eyesight to knowing how to take your football helmet off. The usual definition of a concussion requires that there be some immediate symptoms, but if these symptoms are subtle, they can be overlooked.

Any player with any neurologic symptoms following a hit has had a concussion and needs to come out of the game or practice to be evaluated. Also keep in mind that concussions don't only occur after a direct blow to the head.

Brain cells can usually heal, given time and rest. However, the brain remains especially vulnerable after a concussion, while brain cells are already requiring lots of extra energy to heal. This is an especially dangerous time for players to return to the field.

CONCUSSIONS IN THE LONG TERM

Though there has been more media attention to concussions lately, in some ways, these stories do not seem to be getting through to the people who need to hear it most: the athletes, especially young athletes. The vast majority of these injuries are not being evaluated, treated, or even tracked. The long-term effects of these mostly missed concussions can have the most serious consequences.

In the days and weeks after a concussion, symptoms depend on which area of the brain was damaged. None of this damage can be seen on a typical MRI or CT scan. Depending on which cells are damaged, symptoms after a concussion can include problems with balance, trouble concentrating, difficulty sleeping, headaches, anxiety, or depression. Sometimes, these symptoms can linger for weeks or even months.

Certain athletes are more at risk for concussions. American football presents the highest cause, with a 60% higher rate than the next sport, lacrosse.

The greatest single factor predicting future concussions in an athlete is whether the athlete has had previous concussions. There are multiple reasons for this. Some people are genetically more vulnerable to concussion, and some people, because of personality or education or increased self-awareness of symptoms, are more likely to report concussion.

Different athletes may have different styles of play, perhaps putting the more aggressive, physical players at greater risk. Past concussions, even if the symptoms have completely resolved, may leave some damage behind, predisposing the brain to be damaged again.

CONCUSSIONS AND THE MEDIA

Until relatively recently, there wasn't much media attention to sports concussions at all. Brain injuries and concussions had been a part of sports and specifically a part of football since the game was invented.

In 1905, President Theodore Roosevelt summoned the coaches of the largest college football teams to the White House to discuss the brutality and serious injuries that plagued the game. That year, there had been 19 deaths during games, and there was far less football played back then compared to now.

Though many reforms were put in place, football remained a physical and dangerous sport. The National Football League tried for many years to minimize the impact of concussions on their players. In 1994, Dr. Elliot Pellman, who had recently been appointed as the chair of the National Football League's new Mild Traumatic Brain Injury Committee, characterized concussions as an "occupational risk" of football.

Media interest grew after a widely viewed sports replay showing a hit on quarterback Troy Aikman, who took a knee to the head. Aikman said he did not remember the game afterward. However, NFL commissioner Paul Tagliabue didn't buy into any concern; he said that the concussion issue was being caused not by football, but by journalists.

Journalists did drive this story. The concussion story is a great example of the media getting it right. The NFL wanted the story to go away, but that's not what happened.

MIKE WEBSTER

Mike Webster was a hard-playing center in the NFL for 17 seasons, mostly with the Pittsburgh Steelers. He retired in 1990 at age 38. Afterward, his mental and physical health was terrible. He suffered amnesia and depression, and debilitating body pains. For a while, he was homeless, living out of his truck or in train stations.

In 1999, the NFL retirement board declared that he was permanently and totally disabled as a result of head injuries sustained as a football player, awarding him disability payments for what was left of his life—but this ruling wasn't made public until two reporters uncovered the story. The media would not let the NFL bury this.

In 2002, Webster died of a heart attack. The medical examiner, Dr. Bennet Omalu, decided to take a closer look at his brain, knowing that Webster had suffered serious mental illness. He found a brain showing years of damage, with a pathologic condition called chronic traumatic encephalopathy, or CTE.

CTE

Until then, CTE had only been seen in boxers and never in a football player. But once Omalu documented it in Mike Webster, there was no way for the NFL to minimize the truth of what their sport was doing to at least some of their players' brains. Still, they tried. In a series of papers, the since-disbanded NFL brain injury committee said that no NFL players had ever experienced brain damage from repeat concussions.

However, when doctors looked for CTE, they found it. One of Mike Webster's teammates on the offensive line, Terry Long, killed himself by drinking antifreeze. His autopsy showed he had CTE, which almost certainly led to his depression and suicide. Another NFL player, Justin Strzelczyk, died in a car crash after a hit-and-run accident and a 40-minute chase with police. He had CTE on autopsy, too.

When former Philadelphia Eagles safety Andre Waters committed suicide, his story ended up on the front page of the *New York Times*, on January 18, 2007. That story was the first in an extended series of articles that rapidly expanded in scope, discussing the hardships faced by ex-NFL players and by younger athletes.

It is now known that NFL players have 5 to 19 times the risk of dementia as the general population. Their brains, examined at autopsies, often show glaring damage. Additionally, it is not just professional footballers at risk: CTE has been found in 79% of the donated brains of people with any football-playing experience, even down to the high school level.

Research has shown that lifetime exposure to repetitive head trauma is associated with CTE—the longer you've played, the higher the risk. Head trauma at a sub-concussion threshold contributes to risk, too.

Brain Damage in Other Sports

American football is not the only sport causing brain damage. Bellini, Brazil's soccer team's captain in the 1958 world cup, had CTE on his autopsy, as did semi-pro American soccer player Patrick Grange, who died at age 29. Autopsies of wrestlers, rugby players, bull riders, stuntmen, and ice hockey players have all revealed similar chronic brain damage. Any time heads get banged up, concussions and CTE are going to occur.

COUNTERING CONCUSSIONS

Clearly, players experiencing symptoms of brain injury during a game or practice need to come out of the game and rest until they've recovered, under the guidance of someone knowledgeable in concussion care. However, the question remains: Is there anything we can do to prevent concussions before they occur?

The rules of play can be tweaked. The NFL recently took the step of moving kickoffs up by five yards, reducing the distance between the opposing teams and making it more likely that the kicked ball would end up in the end zone. That obviates the kick return, which can be a very dangerous play. This rule change did, statistically, reduce concussions, but in the big picture, most concussions do not occur on kickoffs. The total number of concussions per year went only from 270 to 266.

Another idea to improve the safety of football is better training for players, teaching them to tackle without using their heads. A cohort study of one specific high school program, called Heads Up Football, did show a reduction in overall injury rates, but not a reduction in concussions.

One more proposed idea is improving helmets. However, while helmets do protect against head damage—like skull fractures, broken teeth, and scalp lacerations—there is very little evidence that helmets can actually prevent or ameliorate the effects of concussions.

THE FALLOUT

In 2013, the NFL agreed to pay $765 million to settle a lawsuit over brain injuries covering over 18,000 players. Payouts will depend on the severity of illness, how long the player was in the NFL, and other factors.

Many former NFL players do have regrets, and these messages are trickling through the media. They may change the future of football. Youth participation in football has dropped by almost 30% since 2010, and college and professional programs are paying attention.

The NFL now has put multiple independent medical observers at every football game, empowered to stop play and get injured players off the field. Many states and municipalities have passed legislation requiring that players suffering concussion come out of play and get a medical evaluation.

Still, a lot of damage has been done. Generations of athletes, now retired, are only now realizing what happens after a career of brain injuries.

Suggested Readings

Fainaru-Wada and Fainaru, *League of Denial*.

Stoler and Hill, *Coping with Concussion and Mild Traumatic Brain Injury*.

Questions to Consider

1. Who should decide if football is an unsafe sport?
2. Why did it take so long for media attention to focus on sports and concussions?

NEW DRUGS ON THE BLOCK

LECTURE 3

This lecture looks at new drugs, the process for making and studying them, and tips for deciding on whether or not to try a new drug or procedure. Particular areas of focus include medication for Alzheimer's disease, medical studies, and medication for the flu.

ALZHEIMER'S DISEASE

Alzheimer's disease progressively destroys mental functions, including memory, in those that suffer from it. Its symptoms typically appear later in life, and with the aging of our population, the disease will only become more common.

It is unknown exactly what causes Alzheimer's disease. However, the doctor for whom the discovery of the disease is named, Alois Alzheimer, noted plaques of material in the brain cells of his patients with a certain type of dementia. These plaques were later found to be made of tangles of proteins called beta amyloid. Though these clumps of protein are always seen in Alzheimer's disease (and in some other neurodegenerative diseases as well), we don't actually know for sure whether they cause Alzheimer's, or are caused by some other factor.

Regardless, medications that might reduce the appearance or growth of these amyloid plaques could be a promising lead in the fight against Alzheimer's disease. But the initial studies of one such medicine showed only mixed results. The drug maker Lilly developed a medication called Solanezumab, or Sola for short.

SOLA

Sola is a unique and potentially powerful way to fight these plaques. The drug is a monoclonal antibody—that is, a molecule that mimics part of your immune system to bind to the amyloid and clear it from the body. Lilly sponsored two trials studying its effects on people with mild to moderate Alzheimer's disease, but in 2012, the studies showed that Sola did not work.

Lilly found that Alzheimer's patients taking Sola didn't find a positive impact on their cognition (thinking power) or functional outcomes (what they were able to do). These were the primary endpoints of the studies—that is, the main measures that the studies were designed to look for.

In the initial press releases in 2012, Lilly said that while Sola failed in the primary endpoints of their two studies, there was still a glimmer of hope. When they combined the two studies and focused on the patients with milder Alzheimer's disease, they did see a small but significant improvement. That glimmer of hope in 2012 led to huge expectations with excited headlines from the media.

Lilly needed to prove that their drug really worked on patients with mild Alzheimer's and launched a new placebo-controlled trial, focusing only on the patients most likely to benefit from the drug. About 2100 patients were enrolled, and the data from that study was released in November 2016.

These headlines painted a very different story. From *The Telegraph* came this: "Bitter Disappointment as Alzheimer's Wonder Drug Fails to Help Patients in Final Trials." The drug showed no benefit, and Lilly said they wouldn't be pursuing regulatory approval to market the drug.

They did, however, announce that they were organizing another clinical trial, this time looking at patients in an even earlier stage of Alzheimer's. The Sola story may not be over, but so far, it shows that the press over-relied on preliminary information and press releases. They emphasized the potential positive news far more than the negative findings of the original studies.

MEDICAL STUDIES

When researching new medicines, researchers must compare what happens with and without the drug to really know if it was the drug that made the difference. To do this, a legitimate clinical study must include at least two groups of people. One group, called the study group, takes the new medicine. The other group, called the control group, does not.

Comparing two groups lets researchers separate out the effect of the natural history of the disease. The control group also lets researchers take into account the placebo effect—that is, when people feel that their symptoms improved after a treatment that was not actually a treatment. The study group and control group do not know if they are receiving the placebo, or sham medicine, or the real medicine.

Drugs: An Expensive Business

The Tufts Center for the Study of Drug Development estimated in 2014 that it took, on average, $2.6 billion to develop a new drug and bring it to market. That number has been hotly disputed, especially since the Tufts Center is heavily funded by the pharmaceutical industry. Regardless, even though the exact numbers can be argued, a successful drug can potentially generate huge revenue.

Additionally, the doctors and nurses caring for the patients cannot know which group an individual patient belongs to. A double-blinded study means that neither the patients nor their doctors and nurses know who's taking the real drug. The best studies randomize the study participants into these two groups, in a pattern that cannot be guessed.

Perfect studies aren't always practical or possible, but the double-blinded, randomized, placebo-controlled study is the gold standard, or the best way to know if a therapy really works. However, even these studies aren't always executed or reported effectively.

TAMIFLU

One drug that hit it big in the United States and abroad is Tamiflu, the Roche pharmaceutical company's influenza drug. It was synthesized, originally, from an extract that came from the Chinese star anise and licensed for sale to help fight influenza infections in the United States in 1999. Since its launch, cumulative sales have totaled at least $18 billion.

Tamiflu deactivates a protein on the outside of the influenza virus so the virus can't travel through cell membranes. It doesn't destroy the virus, but it can prevent it from replicating and spreading and infecting more cells.

In 2003, a meta-analysis of all of the Tamiflu studies to date was published. A meta-analysis combines data from clinical trials to make one huge study. The 2003 meta-analysis concluded that Tamiflu was effective in reducing complications and hospitalization and helped support the idea of stockpiling Tamiflu for future emergencies. Roche claimed overall that Tamiflu reduced hospital admissions by over 60% and reduced serious complications of flu by two-thirds.

Tamiflu became part of the standard, recommended care for flu in many countries, and the World Health Organization added it to the list of essential medications that should be available to everyone.

THE STORY CHANGES

However, the news about Tamiflu changed. In Japan, episodes of hallucinations and psychosis were reported. These events weren't seen in the earlier trials. In 2006, the US FDA urged caution in using Tamiflu, warning doctors to look out for abnormal behaviors perhaps caused by the drug. In 2007, a new Roche study again reported no neuropsychiatric side effects.

The Cochrane collaboration experience opened eyes not only about Tamiflu specifically, but about some of the pitfalls in drug development and regulation. The Cochrane collaboration is a well-respected nonprofit organization with about 11,000 members. They objectively, and without any industry support, review data on medical therapies.

Their reviews of Tamiflu up through 2008 were basically positive. It was a simple comment on their website from a Japanese pediatrician named Hayashi that led to an investigation that continues to reverberate.

Hayashi pointed out that the big 2003 meta-analysis contained only 10 studies, and of those only 2 had actually been published as full articles in peer-reviewed, established medical journals. The remainder had been informally presented at meetings or published only as summaries. The drug's manufacturer had sponsored all 10 of these studies.

The Cochrane reviewers agreed that the Tamiflu data needed another look and went back to the study authors to get their more complete data. They then learned that in most cases the authors didn't have the data. That information was held by Roche, since the drug company, sponsored the studies. The Cochrane team also learned that none of the government organizations, including the US FDA, ever had access to the full data, either.

Cochrane enlisted the help of the *British Medical Journal* and Great Britain's Channel 4 News, who helped pressure the manufacturer to release their data. American media outlets, like *The Atlantic*, started to voice similar concerns. In 2009, Roche committed to making all of the Tamiflu data from all of their trials available to researchers, but it took four more years until the Cochrane collaboration finally obtained all of the data they needed to independently and completely assess the evidence.

EXAMINING THE DATA

They examined 83 trials, including many that had yet been unpublished. They published their revised review in 2014, and their conclusions were quite different from what had been said before.

Tamiflu, Cochrane concluded, did shorten the length of symptoms—by less than a day, in adults, from an average of 7 to 6.3 days. However, Tamiflu had no net effect on serious complications, as measured by hospitalization rates. Tamiflu, to treat influenza, really had only modest symptomatic benefit. Despite that, Tamiflu was successful in preventing influenza. It had a 55% overall success rate, and it was 80% effective if looking only at household members exposed to flu.

The 2014 headlines, based on this review, show how quickly the media can change their tune—and how headlines can oversimplify or gloss over complicated issues. A 2004 story from NBC News had talked about what families should stock in their homes in case flu were to strike. They included tissues and acetaminophen—both very good ideas—but also prescription antivirals, which they said would be effective up to 90% of the time.

Keeping prescription medicines on hand led to hoarding of medications and headlines like this one, from *The Washington Post* in 2005: "Run on Drug for Avian Flu Has Physicians Worried." The text here talked about how people were begging doctors for Tamiflu prescriptions to buy their own family stockpile. These stories reinforced the idea that Tamiflu was a crucial drug to be hoarded.

After the Cochrane report, stories had a different outlook, like this one from the BBC: "Millions Wasted on Flu Drug." Another example comes from a Canadian newspaper: "Tamiflu is No Better Than a Placebo, Researchers Say."

The media pendulum swung too far. The new report showed that most people treated for influenza with Tamiflu probably get only a modest benefit. However, it also showed that Tamiflu has some real effectiveness in prevention. During a pandemic year, when influenza rates can soar, it might be a crucial part of our public health response.

The question of whether Tamiflu is worth stockpiling just to have the option available has no clear answer at this time. However, the sentiment of "we don't know" is rarely seen in headlines.

CONCLUSION

Until Cochrane insisted on obtaining the Tamiflu data, many details about the studies' findings and shortcomings had been hidden from public view. The benefits of Tamiflu had been overstated and the harms hidden, and it took years to figure this out.

The biggest scandal here is that Roche broke no laws by withholding or slow-pedaling their data. To this day, details from clinical trials, especially those sponsored by drug companies, never see the light of day. There are probably many other drugs with doctors making treatment decisions based on incomplete and misleading data.

The medical media deserves credit for helping hound Roche to release their data, but in retrospect, they (and the doctors, hospitals, and public health officials) were too quick to accept the manufacturer's claims about how well the drug worked.

Institutional changes are now underway to enforce the disclosure of full trial data. Europe's drug agency will make all of the clinical trial data they use to approve drugs public, at least for all drug applications going forward.

Several big drug companies, including Roche, have announced policies to improve data transparency. Large databases like the one maintained at the website AllTrials.net encourage researchers to register and share information from all of their trials, not just the ones that end up published in medical journals.

UK and other European authorities now require this kind of registration, so at least future researchers can more easily and quickly find all of the data rather than only the data that the drug makers want us to see. These are very important steps. Medical journal editors, nonprofits like Cochrane, and government health authorities all have their role, but it's up to the health media to make sure that consumers get the truthful, complete health information they need.

Suggested Readings

Hicks, *Economics of Health and Medical Care*.

US Food and Drug Administration, "The Drug Development Process." Available at https://www.fda.gov/ForPatients/Approvals/Drugs/default.htm.

Questions to Consider

1 How do doctors and patients learn about new drugs, and does that affect how they are prescribed?

2 Should direct-to-consumer advertising of medications be allowed?

IS IT TIME FOR MEDICAL MARIJUANA?

LECTURE 4

In 1996, California voters approved Proposition 215, the first state legislation legalizing the use of marijuana for medical purposes. The trend spread rapidly. Most US states now allow either marijuana or its derivatives to be prescribed and used for a variety of ailments, including cancer, anxiety disorders, chronic pain, multiple sclerosis, and epilepsy. One might think that the rapid expansion of the availability of medical marijuana means that there is a good consensus about how well it works and how to use it—but that is not the case.

MARIJUANA TERMS

Cannabis is the most proper word to use for the marijuana plant, any variety of a plant more formally called *Cannabis sativa*. The word c*annabis* also sometimes refers to different preparations of the plant, either dried flowers or other parts, or to other plant products.

Cannabinoids are a large group of chemicals that are found in the cannabis plant. Different strains of cannabis have different amounts of these chemicals, which are also affected by cultivation and processing techniques. That's an important confounder in medical marijuana research and reports: The products, themselves, may be vastly different and may be labeled inconsistently.

Although there are dozens of biologically active cannabinoids, the two found in the highest concentration are tetrahydrocannabinol (THC) and cannabidiol (CBD). THC is the major psychoactive compound. Whether smoked or eaten, THC gets users high.

CBD is the other major cannabinoid, and it's purported to have medicinal properties especially to combat seizures, cancer, anxiety, and many other ailments. While the concentration of THC has increased in many marijuana strains, the amount of CBD has dropped. Along with THC and CBD, marijuana products have many other compounds, including biologic and chemical contaminants that may themselves have health effects, either good or bad.

MARIJUANA AND EPILEPSY

Many people with epilepsy—a condition that causes repeated seizures—can have most or all of their seizures prevented with medications or other therapies. However, some people have intractable or difficult-to-control seizures. Epilepsy medications, like all medicines, can have side effects. Many people with epilepsy are looking for a safer or more effective alternative.

Parents, especially, are looking for help, especially for children whose seizures can't be prevented with traditional therapy. CBD, the non-psychoactive compound in marijuana, has been shown in animal and other early studies from the 1970s and 1980s to have anti-seizure properties. Stories like one from CNN in 2013—"Marijuana Stops Child's Severe Seizures"—give parents hope, but the science has not confirmed the anecdotes.

Looking at studies of seizure therapy in children, overall, there's about a 30% response rate. However, some of the studies that support FDA-approved seizure medications showed about a 30% response rate to placebos. A large review from the Cochrane Collaboration concluded that the research on cannabis for epilepsy was inconclusive, finding no solid evidence to recommend it for treatment.

There is one bright spot, though: A *New England Journal of Medicine* study from 2017 used a randomized, controlled design to look at CBD for children with one specific, very difficult kind of epilepsy called Dravet syndrome. In this study, adding CBD to the usual medical regimen was significantly more effective than placebo, providing the first solid evidence for CBD in seizure disorders. Still, this was only used to treat one very specific type of epilepsy. It's not clear that these results apply to other kinds of seizure disorders in children or adults.

MARIJUANA AND PAIN

Another potential use for marijuana is the treatment of pain, especially chronic pain. Many traditional pain-treating medications are narcotics, derivatives of opium or morphine that can be addictive and can have some very serious side effects. Better ways to treat pain are sorely needed.

Can cannabis be part of the solution? As with seizure disorders, the answer is maybe. An in-depth, comprehensive review of all available literature through 2016 done by the National Academy of Sciences found 30 randomized controlled trials using cannabis products to treat pain.

Many of these used specific synthetics or other derivates that aren't available in the US. Looking at one summary of the eight studies of plant-derived cannabinoids, the marijuana extracts increased the chance of improvement by about 40% more than placebo. That is not a huge difference, but there is some effectiveness.

Only one of those eight studies looked at smoked cannabis, in 50 patients with HIV-associated sensory neuropathy. It did document somewhat better pain reduction than a placebo, but the confidence interval—that is, the statistical measurement of the range of likely effect sizes—was very large. A confidence interval indicates that the researchers believe the true result lies between two numbers.

The result of that study was expressed as an odds ratio—that is, a ratio expressing how many people responded to the medicine versus placebo. A ratio of 1 means the responses were equal. In this study, the odds ratio was about 3.4, meaning people getting cannabis were 3.4 times as likely to report a benefit than those given placebo.

That looks good, but when taking into account the confidence intervals, the real odds ratio was somewhere between 1.03 and 11.48. The study only had 50 subjects, and that was too small to get a narrow, more accurate estimate.

Studies like these—small studies with large confidence intervals—have their place, as pilot studies or as a starting point for larger investigations. However, it's difficult to draw broad conclusions about using marijuana to treat pain from the limited evidence available so far.

Regardless, marijuana is being used to treat pain. Chronic pain is the most commonly cited condition for medical marijuana use. In Colorado alone, about 600,000 servings of edible marijuana are being sold each month for a combination of medical and now recreational use—and orally, eaten cannabis has not been studied as a pain reliever.

MARIJUANA AND CANCER

Headlines have been touting the using of cannabis to treat cancer. From the *Daily Caller*, a headline from 2017 reads: "Weed Is a Cancer Cell Destroyer, Study Finds." The headline refers to a British study that added purified cannabis extracts—not just ordinary weed—to traditional chemotherapy.

It did seem to help kill cancer cells. However, the study was done in a lab, on cancer cells in a dish—not in patients. There is a big jump between these kinds of pre-clinical studies to actual proof that this will help people.

Still, there does seem to be genuine evidence that chemicals in the marijuana plant may have cancer-fighting properties. Better research is needed to understand which compounds are effective and how to use them to fight which kinds of cancer. There is promise, but still a lot of work to be done.

Another way that cannabis might help cancer patients is to treat the side effects of traditional cancer treatments, like chemotherapy. Those side effects include nausea, vomiting, appetite loss, and fatigue.

A COMPREHENSIVE REVIEW

In 2017, the National Academies of Science reviewed over 10,000 studies on cannabis products to treat medical conditions. They concluded, after looking at essentially all of the evidence, that there was good evidence to support the use of cannabis as medicine for three conditions: to relieve chronic pain in adults, to lessen chemotherapy-induced nausea and vomiting, and to relieve some symptoms of multiple sclerosis.

They also felt that there was "moderate" evidence for relieving some sleep problems associated with certain medical conditions. However, this is still almost no evidence for exactly what kinds of cannabis compounds to use in what dose to treat these conditions.

The question remains: What's the harm in having people just try it, to see if it helps? The biggest drawback is the potential side effects. Cannabis compounds can contribute to anxiety and paranoia, and have been linked to schizophrenia.

In some people, it increases the risk of seizures, and can cause nausea and loss of appetite. Cannabis compounds affect cognition and memory, and may have especially worrisome long-term effects when used by children and teens whose brains are still developing.

None of this should disqualify cannabis as a potential medicine. After all, all real medicines have potential side effects, many of which are even more serious or more common than those seen with cannabis.

It does mean, though, that cannabis is just like any other drug. It may have some uses, and some important benefits for some people, but those have to be weighed against potential side effects. Marijuana should be held to the same standards as medicines.

Suggested Readings

Jacobson, "Medical Marijuana."

National Academies of Sciences, Engineering, and Medicine, *The Health Effects of Cannabis and Cannabinoids: The Current State of Evidence and Recommendations for Research*.

Whiting, et al., "Cannabinoids for Medical Use."

Questions to Consider

1. What have you heard from different media sources (traditional news versus internet-based news or social media news) about the effectiveness of medical marijuana?

2. What specific health indications have been shown to be helped by the medicinal use of cannabis products?

THE MEDIA AND WEIGHT LOSS

LECTURE 5

Obesity is the most significant public health hazard facing the United States and the rest of the developing world. Two out of three Americans are overweight, and one in three is obese—that is, at a weight well above what's healthy, in a range where complications and a shortened lifespan become likely.

CALORIES AND OBESITY

To make progress against obesity, we have to decide what the cause is. For many years, the thinking was based on simple thermodynamics, or what has been called the energy balance theory. We consume food, and that gives us the energy we need to function. That energy is measured in calories. A calorie is a measure of the energy content of a food. (It is more properly known as a kilocalorie or kcal, but often referred to as a calorie out of convenience.)

The energy balance theory of weight control says that if you consume too many calories for your energy needs, the calories left over will be stored in your body, mostly as fat. Over time, eating more calories than you need will cause you to gain weight. Conversely, eating fewer calories than needed will burn your stored energy, causing you to lose weight.

A natural conclusion one might make from this energy balance theory is that it's a good idea to eat foods with fewer calories. There are three main components of any food that make up its energy content, or the number of calories per serving: carbohydrates, proteins, and fats. Carbs include simple sugars and starches, and they provide about four kcals per gram of food consumed. The energy content of protein is about the same. Fats, when broken down by the body, provide over twice the energy, at nine kcals per gram.

Therefore, if you're trying to eat foods that give fewer calories per bite, it makes sense to decrease your consumption of high–caloric density fat. However, many people, especially starting in the 1980s, shifted their consumption of foods to those made with less fat and therefore more added carbohydrates. Those carbohydrates often came in the form of sugar, and especially a form of inexpensive sugar called high-fructose corn syrup.

That didn't work, in part because our consumption of fat really didn't decrease much. From 1970 to 2000, the average daily intake of calories from fat decreased by only 46 net calories per day, which is close to negligible. At the same time, the daily consumption of carbohydrate calories increased by 240. Rates of obesity only continued to increase.

Today, obesity and heart-health research shows that all simple sugars, especially those added to processed foods, are problematic. They all provide too many calories, and they can all contribute to a hunger-inducing insulin surge, which can lead to the development of diabetes and contribute to being overweight.

The Snackwell Effect

The Snackwell effect is named after a popular line of cookies and treats introduced in 1992 by Nabisco. People thought that the Snackwell cookies were healthier because they were made with very little fat—even though they were packed with carbs and had about the same number of calories as ordinary cookies. More calories means more weight gain, and that is exactly what happened. Snackwells flew off the shelves, and people gained weight.

IMPROPER AVOIDANCE

The advice to avoid too much fat may not have been wrong, but it did become overblown and oversimplified. Many fats are now considered so-called good fats, like olive and canola oils. These can help improve cardiovascular health. Other fats, especially trans fats found in margarine and other processed foods, can increase your risk of health problems like stroke and cardiovascular disease.

Taking fat out of the diet did lead to a big surge in added carbohydrates. We're seeing a backlash now, with headlines like "Official Advice on Low-Fat Diet and Cholesterol is Wrong, Says Health Charity" from *The Guardian*. Such headlines are overblown. Fat was never the enemy. Total caloric intake still matters, and a high-fat diet usually means a high-calorie diet.

The headlines have swung from saying fat is bad to saying carbs are bad, when in fact, either one is probably OK in moderation and especially when consumed as part of a varied diet with few processed foods. This headline from the *Chicago Tribune* captures that changing view: "Dieticians: The War on Dietary Fat Missed the Point."

SALIENCE

This lecture now covers two skeptic's toolkit questions to help determine if a study is salient—that is, if it is directly relevant to you. First, ask yourself: Is this study about people like me? Second, ask yourself: Is the endpoint—the thing they're measuring in the study—really important to me?

There are roughly 50,000 studies per week published in the English language literature. Though they may be interesting or revealing, a tiny percentage of these are truly clinically relevant to people. Two recent studies can serve as examples of how the salience tests work.

EXAMPLE 1: HOT PEPPERS

One example is a study that, according to an article from the UK, revealed "an extract in red hot peppers that may speed [metabolism] up as you get older, and therefore help you ward off obesity." Metabolism was increased to the equivalent of burning an extra 116 calories a day.

To answer the first question—is this study about people like me?—consider the subjects of the study. They were 40 healthy men and women of average weight between the ages of 22 and 47. That means the findings may be less applicable to people outside of that age range and weight, but overall, it is a good mix of study subjects, providing a strong answer to the first toolkit question.

The second question—is this study really important to me?—has a more problematic answer. The investigators used a measure of metabolic rate over three hours, and they did not measure weights. It is unknown if that metabolic change would be sustained over 24 hours, let alone a longer period.

Additionally, the study's authors were employed by a company that makes and sells a hot pepper extract. That doesn't automatically mean that the results should be dismissed, but another important consideration is to look at who paid for a study and who did it.

EXAMPLE 2: METABOLISM AND MICE

Another example comes from a *Washington Post* article, with the headline, "New drug tricks metabolism into burning fat as if you've just finished a meal." The article says that researchers developed a compound that "tricks the metabolism into responding as if a meal has been eaten, causing it to burn fat." Better yet, the article continues, the new compound is "much safer than" other existing drugs.

To their credit, *The Washington Post* does address one of the questions of salience. They mention that the study was done in mice, and that primate studies will also be needed before potential human trials years down the road.

The answer to "Is this study about me?" is no. Though studies in lab animals can provide valuable information, few compounds studied in animals ever make it to become human medications.

The *Washington Post* article also said that the new compound would be safer than existing medications, but it wasn't compared to any existing medicines, and it wasn't even given to people. It's a huge stretch to go from this kind of mouse trial to declare that a medicine is safe in people. Be very wary of conclusions when they haven't directly and objectively measured it on people just like yourself. A story is much less salient to you if it wasn't performed on people.

As for the other toolkit question—if the results are important to you—the study did show a reduced weight gain in the treated mice. That is an important endpoint to measure. There were other measured endpoints, too, including measurements of inflammation and metabolism. Those other endpoints contributed to the headline focusing on tricking the metabolism into burning fat.

The headline is meant to be more attention-grabbing than just talking about mice losing weight. People seem to like the idea of an easy, sneaky way to burn fat. However, it will be a long time, if ever, before this medication is shown to be safe and effective for human use.

CONCLUSION

When it comes to achieving and maintaining a healthy weight, perhaps the real enemy isn't sugar, fat, or people depicted as eating too much in news stories. Strategies that demonize particular foods or particular people aren't helping, and media stories that hype breakthrough medications and the newest way to boost metabolism aren't helping either.

Perhaps more helpful would be increased media attention on a few neglected topics. Instead of spilling ink and fishing for clicks on preliminary studies on mice, there should be more attention to the need for high-quality, long-term studies in human beings. There should be less attention to the latest superfood or fad diet, and more attention to simple ways of eating more healthfully: smaller portions, family meals, eating slower, drinking water, and making home-cooked food with more fruits, vegetables, and whole grains.

Staying active, too, is crucial. In fact, good studies have shown that even if increased exercise doesn't lead to weight loss, it improves health in many other ways, including reducing complications like diabetes and heart disease.

Suggested Readings

Satter, *Secrets of Feeding a Healthy Family*.

The American Diabetes Association, http://www.diabetes.org/.

Questions to Consider

1 What is the best source of information for someone looking to start a diet for weight loss?

2 How can you tell if a weight-loss product or idea is too good to be true?

ALTERNATIVE MEDICINE IN THE NEWS

LECTURE 6

This lecture looks at media coverage of alternative medicine. Particular topics of discussion include stem cell treatment, fish oil supplements, and acupuncture. What makes alternative medicine distinct from other kinds of medical approaches is that their healing or health-giving effects are either unproven (that is, never studied), or have in many cases clearly been disproven, sometimes by medical trials, or sometimes by our understanding of how the natural world works.

STEM CELLS AND GORDIE HOWE

Gordie Howe was one of the greatest professional hockey players of all time, known for his toughness and longevity. At age 86, he suffered a major stroke, paralyzing the right side of his body. Media reports in the weeks afterwards said that there was some improvement.

About two months later, he was rushed to the hospital after a feared second stroke, though some reports said this deterioration came from dehydration. In other words, as often happens after a stroke, there were some ups and downs.

Next, Howe underwent a procedure in Tijuana, Mexico, where millions of stem cells were infused into his spinal column. The hope was that these cells could then migrate up to his brain to help with repair. He also had an intravenous infusion of a different kind of stem cells into his blood, though the rationale for that part of the treatment wasn't as clear.

His family was overjoyed at his progress afterwards. They reported that for the first time after his stroke he walked, unassisted. He was said in media reports to have made almost incredible physical and cognitive progress. It was a wonderful story, and it was natural for people to cheer for Howe's recovery. But the story had a second side too.

Though headlines and reporters said that Howe had undergone an experimental treatment, sometimes worded as "treatment as part of a clinical trial," no such trial had been registered. In fact, to this day, no trial including this kind of treatment for this kind of patient has been published.

Howe's recovery, as dramatic as it was, could have been the routine recovery often seen after stroke and after dehydration. Additionally, he was receiving excellent care from physical and speech therapists. Perhaps their help could have played a role.

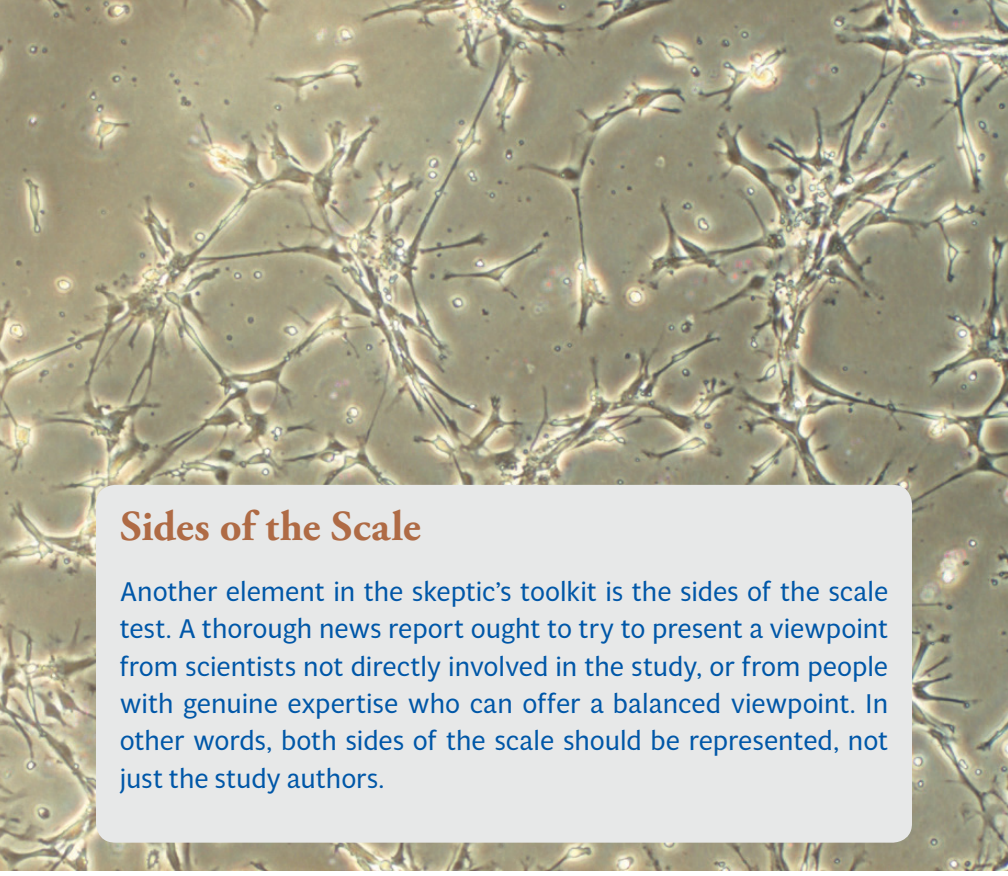
The family's involvement with the company that worked with the Tijuana medical facility raised some eyebrows, too. Gordie's son Murray became an investor, and information about his father's recovery became rich marketing material.

STEM CELLS: A COMPLICATED PICTURE

A factor contributing to the optimistic reporting, in retrospect, was that many of the stories came from the sports pages. They were written by sports journalists ill-equipped to skeptically look at the science behind this story.

Stem cells themselves do hold promise. But because of the promise that stem cells may help multiple, serious, and otherwise untreatable diseases, it's very easy for the public (and the press) to get confused about the current state of the science and the very real limitations we know about how stem cells work.

Stem cells, used in ways that have no scientific support, are a small part of what's often referred to as alternative medicine. That's a very broad term, encompassing things as simple, inexpensive, and benign as deep breathing exercises to modalities that seem perhaps more incongruous to many people, like long-distance faith healing.



Sides of the Scale

Another element in the skeptic's toolkit is the sides of the scale test. A thorough news report ought to try to present a viewpoint from scientists not directly involved in the study, or from people with genuine expertise who can offer a balanced viewpoint. In other words, both sides of the scale should be represented, not just the study authors.

FISH OIL

In the US, fish oil supplements are a $1.2 billion industry, and about 8% of adults report taking these supplements—despite the fact that the vast majority of recently published research shows no evidence of any health benefit.

The fish oil story begins in several remote villages in Greenland in the 1970s. Two Danish scientists, Hans Olaf Bang and Jorn Dyerberg, had noticed that very few of the Inuit Eskimos living there had heart disease. Their diet, which consisted mainly of whale, seals, and fish, contained a lot of fat and cholesterol. The thinking at the time was that these animal fats contributed to cardiovascular risk. However, their hearts stayed healthy.

Bang and Dyerberg hypothesized that it was a certain kind of fat, known as omega-3 fatty acids, which helped protect the heart. These omega-3s are found in abundance in diets that are rich in seafood, especially from oily fish like mackerel and sardines. Study after study did show that a diet relying on fish was associated with good long-term heart health. However, consuming a fish-based supplement like fish oil is not the same as eating fish.

Pharmacies and health food stores started to stock up on fish oil supplements in the 1980s, but it was in the early 2000s that they started to become popular. This was driven by advice from the American Heart Association, who issued a statement in 2002 that concluded that omega-3 fatty acid supplements reduced the incidence of heart disease.

The 2000s became the decade of fish oil. For example, here is a quote from the *Chicago Tribune*, from 2002: "Fish oils display a remarkable ability to improve health in all ways, even reducing your risk for heart attacks and stroke." It also listed several other conditions fish oil might help with. This brings up another tip for your skeptic's toolbox: The more disparate conditions a medicine or supplement claims to treat, the less likely it is to do anything.

In 2003, a long-term followup study of 3000 Welsh men was published that should have at least begun to put the brakes on fish oil enthusiasm. These were men who already had heart disease, some of whom were advised to either eat more fish or take fish oil supplements.

In this study, the men who consumed more fish were actually more likely to die than those who didn't change their diets—and the group that took fish oil supplements fared even worse.

More studies like that one followed over the next decade. In 2012, a large meta-analysis of 14 high-quality clinical trials involving a total of over 20,000 patients concluded that purified fish oil supplements did not help people with heart disease. Another analysis showed that 22 of the 24 clinical trials looking at fish oil for heart disease published from 2005 to 2012 showed no benefit.

The recommendations do seem to be shifting, though slowly. The American Heart Association now says that people with heart disease "may want to talk with their doctors" about omega-3 supplements.

The takeaway from this story is that dietary influences on health are complicated. Eating fish is healthy, but that doesn't mean that you can get the same health benefits from eating fish-derived supplements.

Vitamin Deficiency

During the Age of Discovery, more sailors died of scurvy from vitamin C deficiency than people killed during the American Civil War. Luckily, such vitamin deficiencies have since become very rare in the developed world, with few exceptions.

ACUPUNCTURE

This section of the lecture focuses on two acupuncture studies, widely reported in the media. The first was from 2017, published in the *Medical Journal of Australia* and titled "Acupuncture for Analgesia in the Emergency Department." This was a big trial involving four hospitals in Australia. It randomized over 500 adults with back pain, ankle sprains, or migraines to acupuncture alone, medications alone, or a combination of the two. Unfortunately, the patients themselves weren't blinded to what group they were in, which could have biased the results.

The authors found that the relief of pain was about equal between the three groups. They concluded that "the effectiveness of acupuncture in providing acute analgesia for patients with back pain and ankle sprain was comparable with that of pharmacotherapy." However, there were problems with the study. The biggest is that all three groups were allowed to get a dose of rescue pain medication. The acupuncture patients received three times as much rescue medicine as the people in the medication group.

In other words, the patients randomized to acupuncture got medicine, anyway. Additionally, in all of the groups, adequate pain relief was reached only 16% of the time. The correct conclusion of this study was that that patients didn't get good pain relief in these emergency departments. It certainly does not support the idea that acupuncture was effective. However, for the most part, the mainstream media reported only the positive findings.

Another acupuncture study made positive headlines that year. The study was about using acupuncture to treat colic in babies. Headlines included "The Soothing Benefit of Acupuncture for Babies" from *Time* magazine. However, the study reviewed failed to show a statistical improvement in the main, primary endpoint—the finding the study is measuring.

In the colic study, the primary endpoint was the measured amount of total time that the babies were crying. The study didn't find any difference in this endpoint between the study groups given acupuncture or not given acupuncture.

However, the authors claimed that some of the secondary endpoints showed a positive effect from acupuncture. They applied 24 different secondary statistical tests to the same data and found 3 of those 24 alternative ways did show a difference.

This method of massaging the data and reanalyzing it for a desired result is called p-hacking, and editors and journalists shouldn't be fooled by such trickery. This acupuncture study showed quite clearly that acupuncture was not more effective than placebo for the treatment of colic.

Suggested Readings

Ernst, *Trick or Treatment*.

Offit, *Killing Us Softly*.

The National Center for Complementary and Integrative Health, https://nccih.nih.gov/.

Questions to Consider

1. What does the term *alternative medicine* mean?
2. Should the media treat alternative medicine differently from ordinary medicine?

QUIZ 1

Is each statement true or false?

1 The name Premarin for the hormone replacement drug comes from "pregnant mare urine."

2 For the average healthy male, testosterone supplementation improves sexual function, mood, and behavior, and decreases risk of heart attacks.

3 Chronic traumatic encephalopathy, or CTE, is a danger for American football players but not for soccer players.

4 CTE can be caused not only by major head trauma, but also by repeated minor head injuries.

5 A person's condition never improves when taking a placebo.

6 A double-blind study means neither the patient nor the health professional giving the medication knows whether the study medication is real or a placebo.

7 A large confidence interval means the results are very accurate.

8 The findings of a research study may show a true difference between study aims even if they are not statistically significant.

9 Drugs that help mice lose weight do not necessarily translate to efficacy in humans.

10 If two-thirds of Americans are now overweight, maybe that is the new normal, and we should not worry so much about an extra 20 pounds.

11 The benefits of drugs hailed as "wonder drugs," "magic bullets," and "life-saving miracles," as well as drugs claiming to cure a wide range of illnesses, are almost certainly exaggerated.

12 The term *p-hacking* refers to looking at multiple sets of study outcomes to find a positive result.

Answers on page 208

THE MEDIA'S TAKE ON MENTAL HEALTH

LECTURE 7

In any given year, about one in five adults in the United States experiences a mental illness. Over a lifetime, roughly half of us will receive a mental health diagnosis. However, by one measure, 58% of Americans don't want people with mental illness in their workplace, and 68% don't want someone with a mental illness marrying into their family.

How could something so common carry such a stigma? In large part, it is because media representations have driven a misleading, skewed, and overly negative view of mental illness.

DAMAGING PORTRAYALS

The most damaging media portrayals are of people with mental health challenges as violent or criminal. Over a third of people polled in Great Britain believe that those with mental health problems are violent—this, despite the fact that they're far more likely to be the victims of crime than the perpetrators.

Headlines provide examples of negative coverage. From May 2013, in the *Milwaukee-Wisconsin Journal Sentinel*, comes this: "Triple Homicide Suspect Long Struggled with Mental Illness." From *The Daily News* of Jacksonville, North Carolina, comes: "Officials Say Crime and Mental Illness Go Hand-in-Hand."

Despite that headline, which just about equates mental illness with criminal behavior, the Jacksonville article itself presents a more nuanced picture. Clearly, the people being interviewed are not equating mental illness with crime.

MENTAL ILLNESS IN MOVIES

Not all media portrayals of mental illness are negative. Director Ron Howard did a wonderful and powerfully sympathetic job in his movie *A Beautiful Mind*. The movie is about the life of a Nobel Prize–winning mathematician, John Nash.

His struggles and recovery from paranoid schizophrenia, and especially the way his illness affected his family and career, paint a memorable if not quite literally true picture of mental illness. The movie to some degree also implies that people with mental illness can overcome their struggles if they try hard enough and persistently enough—but that's not necessarily true.

Another memorable portrayal of mental illness occurred in the 1997 romantic comedy *As Good as It Gets*. The male lead, played by Jack Nicholson, had obsessive compulsive disorder, and the movie did a good job showing the effect of his illness on his everyday life and relationships. Somewhat less accurate was the ending of the movie, when, after falling in love, he was able to abandon his compulsive rituals.

SPECULATION

In the real world, whether or not a person has mental illness is often a source of speculation in the media—which will sometimes come to a conclusion before the facts are known. For instance, in March of 2015, Germanwings flight 9525 took off from Barcelona, heading to Dusseldorf. Half an hour after takeoff, the aircraft began a rapid descent. All 150 people on board were killed when the plane crashed into the French Alps.

This much is known: The pilot had left the cockpit and was locked out as the plane crashed. He can be heard on the flight recorder, pounding on the door. We also know that the copilot put the plane on autopilot, set to a very low altitude, and that crashed the plane into the mountains. However, we still don't know exactly why the copilot set the autopilot to crash the aircraft.

Three days after the crash, the BBC declared that the copilot "wanted to destroy" the plane. CNN, too, said that the copilot deliberately crashed the plane, and in a later editorial characterized the tragedy as an "accident waiting to happen."

It was quickly revealed that the copilot had a psychiatric health history, including prior treatment for depression in 2008. *The New York Times* worded it this way: "Luftansa Says Germanwings Pilot Reported Deep Depression."

It was later confirmed that the copilot was being treated for a form of depression. However, it is unclear if that was the singular, main cause of the crash. Depression is very common, and it's likely that people with depression fly planes, drive cars, operate machinery, perform surgery, and serve in the military or as police all the time. Very few of them commit crimes or crash their planes into the mountains.

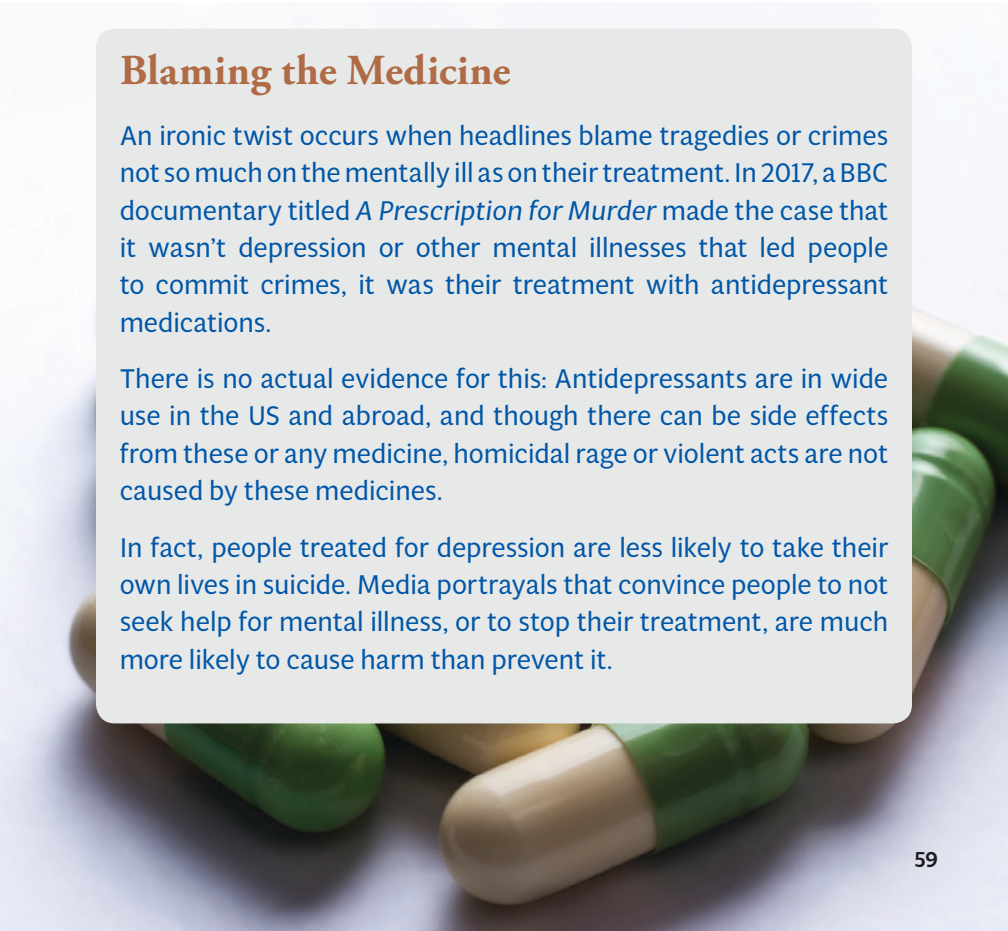
Saying that the copilot had depression really doesn't explain anything, and blanket policies that people with depression shouldn't be allowed to perform certain jobs are unlikely to help improve anyone's safety.

Blaming the Medicine

An ironic twist occurs when headlines blame tragedies or crimes not so much on the mentally ill as on their treatment. In 2017, a BBC documentary titled *A Prescription for Murder* made the case that it wasn't depression or other mental illnesses that led people to commit crimes, it was their treatment with antidepressant medications.

There is no actual evidence for this: Antidepressants are in wide use in the US and abroad, and though there can be side effects from these or any medicine, homicidal rage or violent acts are not caused by these medicines.

In fact, people treated for depression are less likely to take their own lives in suicide. Media portrayals that convince people to not seek help for mental illness, or to stop their treatment, are much more likely to cause harm than prevent it.



STUDIES

There have been several studies looking at the portrayal of mental illness in the media. In 1997, researchers looked at the portrayal of characters with mental illness on television shows and found that they were often shown committing crimes, especially violent crimes.

The mentally ill, in these television roles, were 10 times more violent than other characters in their shows and were 10 to 20 times more violent than real people with mental illness in the United States. Overall, mentally ill people from this TV sample had a negative impact on other characters and a poor personal quality of life.

In 2003, another study looked at articles from about 2000 newspapers, finding that the most common theme for the stories was danger—that is, how the mentally ill are dangerous to both themselves and others. There were relatively few stories about recovery or accomplishment.

Though the ratio of negative to positive stories did decline from 1989 to 1999, negative stories still highly outnumbered stories that portrayed mentally ill people in a positive way.

More recently, Emma McGinty and her team published a study titled "Trends in News Media Coverage of Mental Illness in the United States, 1995–2014." They looked at the content of 400 randomly selected news stories from both television and print media about mental illness culled from that time period.

The researchers didn't find any improvements in these trends over the 20 years when they looked at the stories. If anything, more recent portrayals became more negative, potentially increasing the stigma against people with mental illness. Unfortunately, as the authors point out, this can contribute to reluctance among people with symptoms to seek treatment and to continue with their therapy once diagnosed.

The McGinty study also showed that mental illness is often portrayed as hopeless in the media. Only 47% of the stories reviewed even mentioned treatment, and successful treatment or recovery was only discussed 14% of the time.

The impression one could get is that people with mental illness cannot have a normal, productive life—and that is not true. Most people do recover, often with the help of therapy, medicines, and support from their families and friends.

A COMPLICATED PICTURE

This lecture does not mean to imply that there is never a relationship between mental illness and crime or mental illness and violence. This is a complicated issue. Mental illness has a complex interrelationship with many other influences in a person's life, such as early childhood experiences, poverty, medical problems, upbringing, and genetics.

A far more common correlate with violent behavior than, for example, depression, is substance abuse. Unfortunately, substance abuse itself can either be a cause or a consequence of mental illness. Many people struggling with depression or anxiety turn to the illicit use of drugs to, essentially, self-medicate their pain.

Exactly how all of this comes together is a big and complex question. Regardless, stigmas that drive those with mental health concerns into hiding and away from treatment are unlikely to help.

A Positive Step

In 2013, the Associated Press added a section in their stylebook covering mental illness, intended to encourage journalists to cover these issues more fairly and accurately. However, there is still a long way to go.

CELEBRITIES AND CHANGE

One bright spot in mental health coverage is high-profile celebrities talking frankly about their mental health struggles and how they decided to seek help. *The Boston Globe* discussed some big-name stars, including Kanye West and Adele, in an article titled "Could Celebrities' Stories Destigmatize Mental Illness for the Masses?"

Singer Selena Gomez openly discussed her struggles with anxiety and depression at the American Music Awards, saying, "I was absolutely broken inside." She implored her fans to seek treatment if needed. On Twitter and other social media, the response to these stories has been mostly positive and supportive—and that fits with a possible generational change in attitudes about mental illness for the better.

SOCIAL MEDIA

Intensive use of social media can be seen among people recovering from mental illness, but may also be contributing to mental illness in some cases. There is a correlation between social media use and depression, based on

observations from multiple studies that have documented higher rates of depression among heavy social media users. These kinds of studies, though, don't always make it clear that one thing causes the other.

Perhaps people who are socially isolated are both prone to turn to social media and are at elevated risk for depression. One doesn't necessarily directly cause the other, even if they are related. Similar observations have been made for increased social media use perhaps promoting or being associated with a more distorted body self-image, which is a component of eating disorders.

On the other hand, some web-based interactive services have been shown to be effective in helping to treat certain mental illnesses, especially anxiety disorders. Social media, like other kinds of media, is neither always good nor always bad when it comes to its effect on mental health.

CONCLUSION

In 2015, CNN published an essay cowritten by Republican figure Newt Gingrich and Democratic commentator Van Jones. The essay, titled "Mental Illness Is No Crime," quotes a US Department of Justice study with some chilling statistics: Two out of three people in jail, including three out of four incarcerated women, have symptoms or a history of a mental disorder.

The statistics are similar for federal or state prisons and jails. The estimated number of mental patients incarcerated in criminal institutions outstrips the number of patients in state mental hospitals by a factor of 10 to 1.

Gingrich and Jones conclude that our approach when the mentally ill commit nonviolent crimes—which accounts for the vast majority of these prisoners—is "a solution straight out of the 1800s." The system is locking them up instead of addressing the problem.

Suggested Readings

Centers for Disease Control and Prevention, "Mental Health." Available at https://www.cdc.gov/mentalhealth/index.htm.

Wahl, *Media Madness*.

Questions to Consider

1. Do you think the media is presenting a fair picture of people with mental health problems? If not, what could they do better?

2. Why do you think mental health issues are approached differently from other health problems in news stories?

THE MEDIA AND THE INTERNET

LECTURE 8

The medical media, and especially the internet, is a great way to quickly spread information—but it is not particularly good at separating the fake from the real or the biased from the unbiased. This lecture looks at cases that reiterate that point.

THE BREATHARIAN COUPLE

On June 15, 2017, the *New York Post* published this headline: "'Breatharian' Couple Survives on the Universe's Energy Instead of Food." Headlines like this show that even the mainstream media can sometimes stretch the truth, or just ignore it completely. According to the article, the couple has eaten only three times a week since 2008, and even then only a piece of fruit or vegetable broth.

It is not possible for anyone to survive without nourishment, and as living animals, we are required to get our nourishment from food. This should not be controversial. However, the article presented the story of this so-called Breatharian couple as fact. There wasn't a word of skepticism, or an iota of fact checking, or even a hint that this story wasn't literally true. But it was interesting, and the next day dozens of similar stories about the Breatharian couple appeared in newspapers and internet sites.

The site Snopes.com published a detailed fact check on June 16, one day after the *Post* article.

They pointed out that the *Post* article was widely republished across the web without additional fact checking and without any apparent attempt to verify their dangerous claim that people could live without food or water.

The Snopes article also looked at the founder of the Breatharian movement, an Australian woman named Ellen Greve who calls herself Jasmuheen. Though she espouses not eating, she has freely admitted that she drinks juice regularly, and often enjoys biscuits, tea, honey, and soymilk. A reporter invited into her home found a refrigerator full of food. Additionally, a journalist overheard a hotel clerk confirming that Jasmuheen had ordered a vegetarian meal. It appears she is a fraud.

The *New York Post* found a story that was patently and obviously false—but they published it, and it flew around the globe. The story isn't all discouraging, though: Snopes.com called the claim false and immediately changed the tone of the reporting of this story.

The *New York Post* published two follow-up articles. Four days after the original article, one of their headlines read, "Breatharian No-Food Diet Claims Are a Bunch of Hot Air, Experts Say."

Social Media and False Stories

In the social media world, users tend to surround themselves with people who agree with them and with each other. Stories are shared and spread based on whether someone agrees with them. That may not have anything to do with whether the stories are truthful.

Links on Facebook or other social media sites can be a starting point for your health news, but if you really want accurate information, follow up on those links by looking at well-established articles from major newspapers and articles on truly authoritative health sites. Examples of such sites include CDC.gov, NIH.gov, and sites maintained by health-related nonprofit organizations. (Even on recommended sites, you should still maintain a healthy amount of skepticism.)

SOCIAL AND TRADITIONAL MEDIA

Sometimes, social media and traditional media work together to amplify and broadcast a health story—and sometimes, they're manipulated for commercial gain.

In 2014, news outlets were giddy with headlines like this one, from News.com.au: "Melbourne Mum Belle Gibson Taking the World by Storm with Her App The Whole Pantry, While Fighting Terminal Brain Cancer." The article went on to say, "Gibson is a 26-year-old with [many] labels—young mum, cancer survivor, wellness warrior and social media sensation." Farther down in the article comes the sentence, "When conventional medicine let her down, she turned to alternative therapies and confounded doctors." Dozens of articles with a similarly glowing tone can be found from that year.

This appeared to be a young woman fighting for her life, who, by the way, was quite photogenic. She was a fighter, defying doctors who told her she had months to live, and defeating cancer on her own terms. In interviews dating back to 2009, she said she had malignant cancers of her brain, blood, spleen, uterus, liver, and kidney—and that she treated these not with medicine, but with exercise, various alternative medicine modalities, and colonic irrigations.

The biggest part of her lifestyle change was a special, healthier diet—including recipes she posted on Instagram. These recipes became the basis for what became a wildly popular smartphone app, The Whole Pantry. She even made a deal with Apple to feature her app as a built-in, preloaded part of the new apple watch when it was first introduced. Gibson said that a large part of the proceeds from the app and a pending book deal would be donated to charity.

Then, it all fell apart. In March 2015, multiple media outlets revealed that though Ms. Gibson had claimed to have donated $300,000 to charity in 2014, only $7,000 could be verified. Charities that Ms. Gibson had claimed to be working with said they had never heard of her and did not

receive any donations. Once the news got out that she had not been truthful about her charitable donations, it was quickly revealed that there were holes in her cancer story, too. Her health history, it turned out, was a fraud.

Gibson experienced a very rapid and very negative backlash on social media. Her accounts, blog posts, and Facebook profiles were quickly pared down and then deleted to remove her fraudulent claims, but it was too late—the internet wasn't about to forget what she had said. With her support collapsing, in an April 2015 interview she admitted, "none of it's true."

Many people, bloggers and mainstream media writers alike, have since criticized Gibson for putting people with cancer in danger by suggesting they abandon medical therapy in favor of dietary changes. However, the strongest criticisms were for her betrayal of people's trust.

CLICKBAITING

Another phenomenon that drives especially internet headlines is called clickbaiting. Websites make their revenue by drawing people in—that is, by getting people to click on links to see more pages, which then show advertisements to make the website more money.

The psychology of clickbaiting was evaluated in a 2015 paper called "Breaking the News: First Impressions Matter on Online News." The authors looked at close to 70,000 headlines from four big international media companies. They found that the most popular stories—the ones that got the most clicks—tended to have headlines that were very emotionally extreme, either from a positive or negative side.

That is, stories with scary or very negative headlines (such as "These Things Will Kill You") or stories with very positive emotional headlines (such as "Man Rescued by His Long Lost Dog, and You'll Love What Happened Next") were more popular than stories with more neutral headlines. However, beware of clickbait headlines: They bypass rationality and critical thinking and go straight for the emotional jugular. That is no way to find the kind of information that's likely to improve your health.

Outliers

Popular stories often focus on outliers and make them seem more common than they really are.

A classic example occurred in November 2008, when Ronald Ball bought a Mountain Dew soda from a vending machine at his job. He claimed that he became violently ill after he started to drink it and found a dead mouse in the can. His lawsuit was widely publicized and was eventually settled.

The story made headlines literally all over the world, and it is not an exaggeration to say that millions of people heard about this. However, each day, 1.2 billion cans of soda are consumed worldwide. Even if that one mouse story was true, the chance of finding a mouse in your soda is impossibly, unbelievably small.

CAUSE AND EFFECT

Sometimes, even well-meaning reporters still get it wrong, often because of their own internal biases about the world. One example of this kind of bias is a tendency to attribute cause-and-effect connections to unrelated things.

One example of this in the media comes from a 2015 NBC News headline, "Mom of Goalie Who Died of Cancer Wants Answers on Artificial Turf." The story focuses on June Leahy, whose school-age daughter was a talented soccer goalie. She had played since kindergarten.

In 2008, while playing for the University of Miami, Leahy's daughter developed non-Hodgkin's lymphoma, a cancer of the lymph nodes. She died in 2012. Her mother, devastated, learned that three other soccer goalies had a similar diagnosis.

She is quoted in the article, saying, "I realized, 'Oh my God, the thing that she loved most probably killed her.'" The video that accompanies this story is titled "Why Won't the Government Say Whether This Artificial Turf Is Safe?"

After these quotes and this heartbreaking story, the article goes on to say that no research has linked these kinds of artificial turf surfaces to cancer and quotes a toxicologist as saying, "There's zero reason to be concerned that playing on synthetic turf will put your child at risk for cancer. It's simply not true."

Most people just skim the headlines. And even if a person did read further down, information from actual experts in this area is buried after the emotional appeal from the concerned mother. It is easy to imagine what kind of impact articles like this could have.

Suggested Readings

Quackwatch, www.quackwatch.org.

Washington University, "How to Find Trustworthy Health Information from the Internet." Available at http://agerrtc.washington.edu/info/factsheets/internet/.

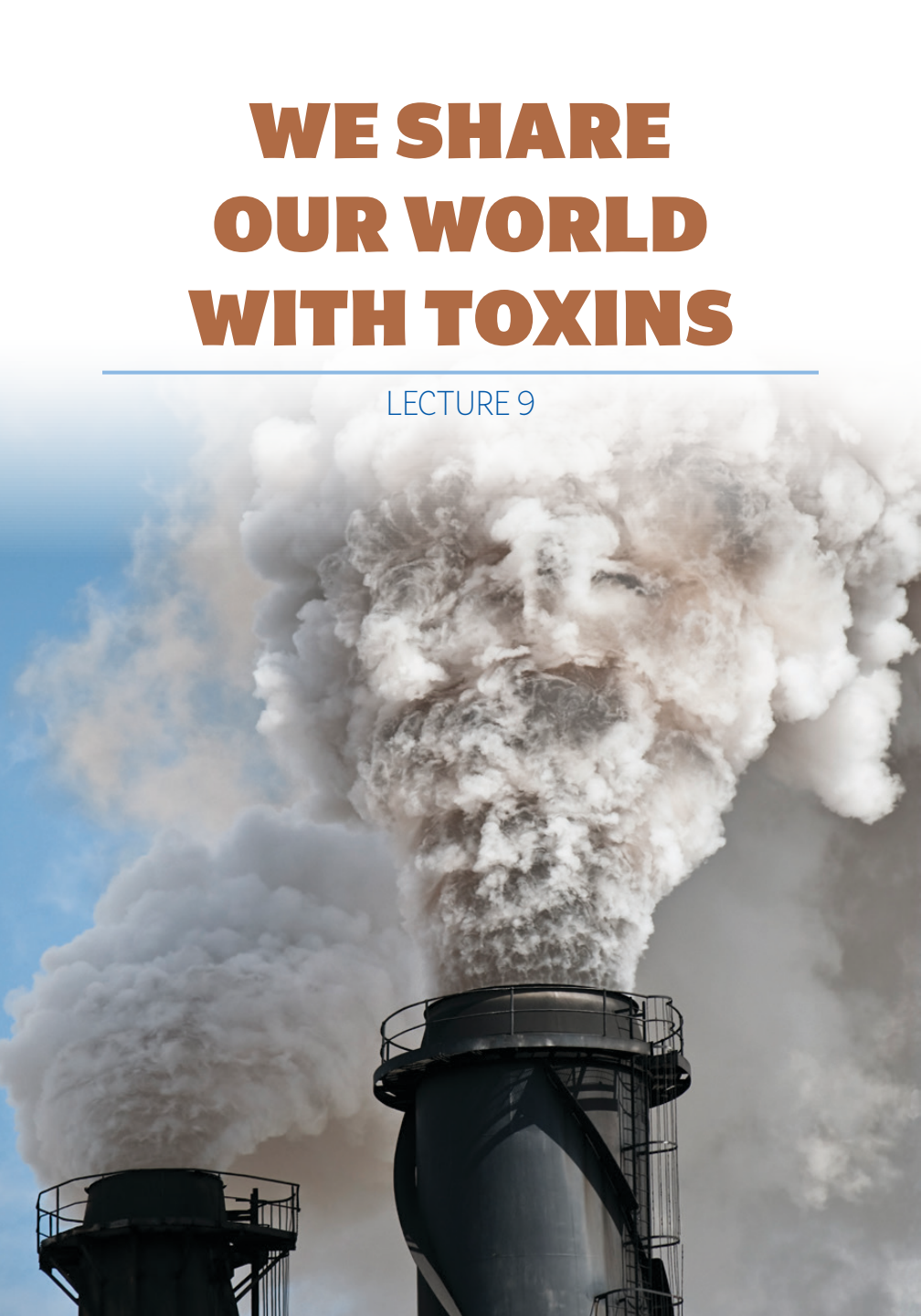
Questions to Consider

1. Is it easier for fake news stories to spread now than in the past? Why?

2. How can you tell if an internet news story is unlikely to be true?

WE SHARE OUR WORLD WITH TOXINS

LECTURE 9



Short, memorable headlines often paint things as far more black and white than they really are. That is especially true in news stories about toxins, the subject of this lecture.

TOXINS, BABY FOOD, AND SOURCES

In 2017, an article from Cleveland's Fox 8 news website relayed information such as "two-thirds of baby food products in the United States test positive for arsenic and other toxins." Arsenic was pointed to as present in 65% of baby food products.

Very similar stories appeared simultaneously at dozens of other sites. The *USA Today* version of the story did give at least a little bit more information. Though *USA Today* provided very similar, alarming text about the number of products that were implicated, they also mentioned that these findings were not published in a peer-reviewed journal.

This entire story was driven by, essentially, a press release—that is, a document released to a large number of media outlets, in this case by a nonprofit organization called the Clean Label Project. This same organization had released a similar report about what they characterized as contaminants in pet food.

The source of a health story is important. Asking yourself what the source is is the first and most important tool in your skeptic's toolkit. Traditional, dependable scientific studies are published in peer-reviewed journals, examples of which include *The New England Journal of Medicine* and the *Journal of The American Medical Association*.

The term *peer reviewed* means that every publication has been vetted, or reviewed for accuracy, by peers—in this case, other physicians and scientists in the field. This doesn't guarantee that the study is perfect, but it's an important step, and it's at least one way that legitimate journals try to make sure that what they're publishing is reliable and accurate.

Every story about this baby food contamination issue should have made clear that the findings weren't from an accredited university or government agency, and were based on a non-published, non-peer-reviewed press release. Of course, stories can refer to press releases, but those should never be the entire source of a story. Material from a press release should always be viewed with at least a little skepticism.

The baby food story gets worse. Not only were many of these news outlets relying entirely on a press release, but the press release itself lacked so much crucial information that it was almost entirely meaningless. The Clean Label Project's release, which they called a white paper, did not include the actual measurements of any of the contaminants they said they measured. Instead, they provided a star rating from one to five stars.

However, they didn't say how they arrived at their star rating system, and they didn't say how the chemicals were analyzed or how accurate their equipment is. One can't possibly judge the quality of their evidence without more information.

Context and Exposition

Along with considering the source of information, also consider the context and exposition—that is, you need to understand what a new finding means. Just because certain chemicals were found does not mean they were found near a level that should cause alarm.

Whenever you read a health story, ask yourself: What does this mean? You can't always rely on the journalist who wrote a story to ask that important question.

ABOUT TOXINS

The word *toxins*, when used in a medical context, refers specifically to poisonous substances that are produced by living cells or organisms. These, by their proper definition, are natural substances, produced by organisms as a result of natural selection, typically to defend themselves against other organisms. For example, plants make their own pesticides so that they can defend themselves.

As for humans, our bodies are remarkably adept at handling toxins, or at least most of them. We have livers and kidneys whose job it is to detoxify our blood—that is, to process these chemicals into less toxic forms, and then excrete them outside in waste. The physiology is truly remarkable.

LEAD

Though the human body does have some toxin-processing powers, there are certainly toxic chemicals in our environment that can have a big impact on human health. One of the best studied is lead, a naturally occurring metal. It is particularly abundant in the soils near factories in industrialized societies, and until recently was used extensively in gasoline and paint.

In the US, one of the major sources of lead poisoning is lead-based paint in homes built before 1978. Ingested or inhaled lead is especially toxic in children and pregnant women. Even relatively low levels of exposure can lead to behavioral and learning problems, plus additional health risks to the kidneys and cardiovascular and reproductive systems.

All of this is well known, and we have good ways to monitor lead levels in food and water, and well-established standards to minimize lead exposures. However, that all fell apart after a fairly routine administrative decision to change the water supply in Flint, Michigan, in 2014.

THE FLINT STORY

The website mLIVE.com combines stories from several of Michigan's city newspapers, including *The Ann Arbor News* and *The Flint Journal*. Their headline from April 25, 2014, tells the beginning of the story: "Closing the Valve on History: Flint Cuts Water Flow from Detroit after Nearly 50 Years." In a cost-cutting move, city officials had decided to stop buying their water from Detroit, which is sourced from Lake Huron and the Detroit River, and instead switched over to a supply from the Flint River.

A month later, stories reported that some people thought the new water had a stronger chlorine smell. However, news stories stressed that the water met all state quality standards.

By January, nine months after the water source change, media coverage was swaying more toward reflecting the concerns of the residents of Flint. Residents had started to bring bottles of cloudy water to city meetings.

Extra chlorine added to the water to fight bacterial contamination had led to an increase in the levels of other organic compounds, and Flint city water had been declared in violation of the federal Safe Drinking Water Act.

Here, the Michigan newspapers deserve praise. They did an excellent job getting timely and accurate information about these water issues to residents. The mechanisms of how the water quality was affected by government decisions were well explained, and many of the articles included step-by-step directions for residents to take to get the safest water. And by March 2015, the Flint story was getting national attention.

A NEW CONCERN FOR FLINT

On July 13, 2015, a new concern about Flint water broke into the news. Michigan Radio's website published a story referring to a memo from the Environmental Protection Agency that documented very high lead levels in one woman's home, associated with documented lead poisoning in her son. The memo was leaked, the story says, before the EPA had had a chance to "verify and assess the extent" of the problem.

As time went on, stories appeared about families whose children had tested positive for high blood lead levels. In September 2015, researchers from Virginia Tech published an online report of their extensive testing, which finally provided some firm answers about what was going on and why it happened.

Corrosion from the new water supply had allowed lead to leach from old pipes into the water that was flowing from the faucets in Flint homes. Previously, the water used in Flint had been treated with compounds that made the water less corrosive to pipes. When city officials switched to Flint River water, they had no corrosion-prevention plan in place. There were no added anti-corrosives. That is a decision that may continue to affect the quality of Flint water for many years to come.

For example, a *Washington Post* article focused on a study looking at fertility and fetal deaths in Flint during the time when pregnant women were exposed to elevated lead levels, and comparing that to neighboring cities. They found a 58% increase in fetal deaths.

Additionally, children exposed to lead can have permanent losses in intelligence and long-term behavioral issues. There is substantial evidence that early lead exposure could be one of the top risk factors for later delinquency, criminal behavior, and incarceration. The story of the lead exposure in Flint is far from over.

MEDIA COVERAGE OF FLUORIDE

Media coverage of the Flint water crisis contrasts with another water story, this one about fluoride. Fluoride is added to many municipal water supplies to combat tooth decay, and there is substantial proof that it's safe and effective.

However, a study in Mexico raised some alarms in 2017. Take this headline from the website of *Reader's Digest*: "If You Drink This Type of Water During Pregnancy, Your Child's IQ Could Suffer." Unfortunately, most of the fluoride headlines overstated what the study showed. To better understand that, we have to look at the study itself.

The study was done in Mexico, on a population quite different from American readers, in a community where fluoride is not added to the water. It was an observational study, not an experimental study, which looked at a single measurement of urinary fluoride during pregnancy and correlated that with measures of intelligence when the children were age 6 to 12 years.

The findings are interesting, but this kind of study cannot prove that it was the fluoride exposure that caused differences in intelligence. Perhaps there were other, more important environmental differences, or differences in the mother's diet, or other factors in different neighborhoods that affected both urinary fluoride concentrations and fetal development.

Observational studies like these aren't meant to look at what causes what. Rather, they simply look at what is associated with what. That is a huge difference, and one that reinforces the point that headlines can be deceiving.

Suggested Readings

Gratzer, *Terrors of the Table*.

Hanna-Attisha, *What the Eyes Don't See*.

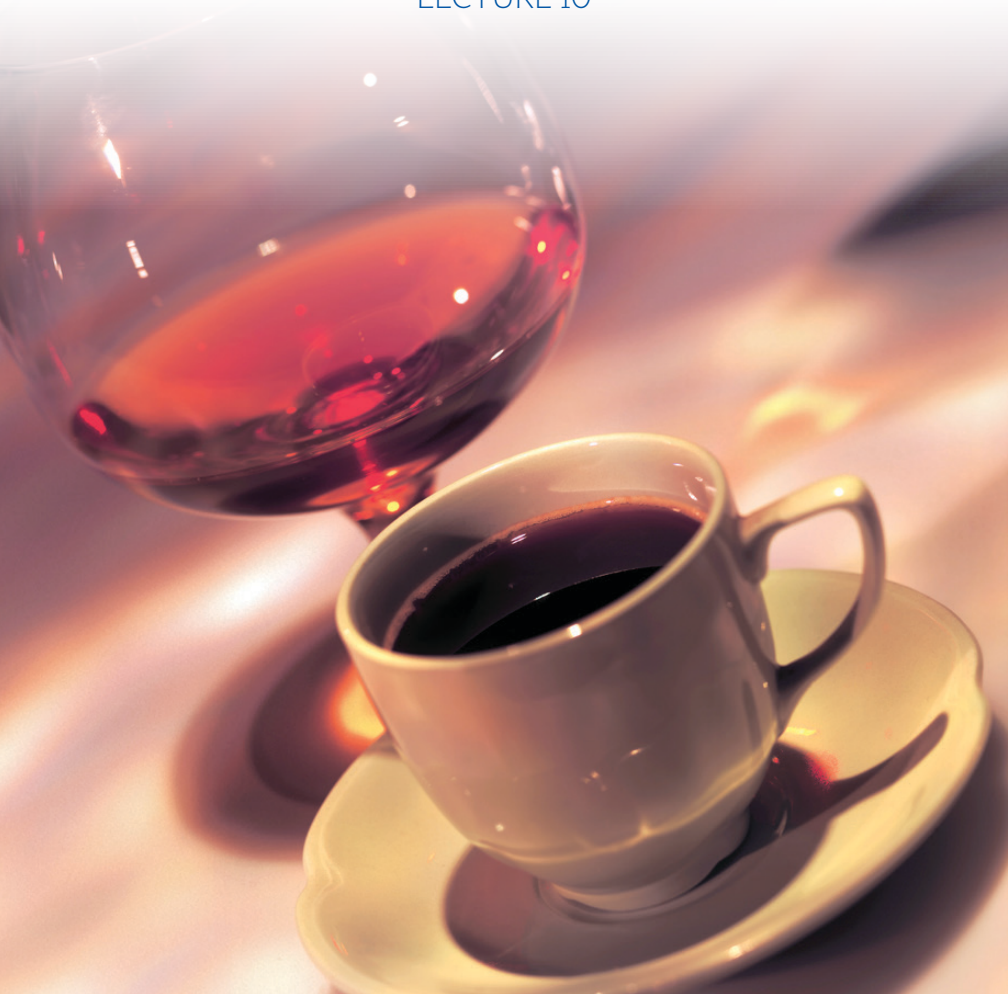
Questions to Consider

1. What is the media's role in protecting public health from lead in water?

2. Almost all dentists and health professionals agree that appropriately fluoridated water is good for our dental health. What are the pros and cons of news stories that focus on people who believe otherwise?

ARE COFFEE AND WINE GOOD FOR YOUR HEART?

LECTURE 10



Cardiovascular disease is the leading cause of mortality in the United States and worldwide, accounting for about one in four deaths. About 610,000 Americans die of heart disease each year. Accurate and timely health reporting on the issues surrounding cardiovascular health should be a crucial part of keeping all of us healthy. This lecture looks at the media's take on cardiovascular health through the lens of coverage on coffee and red wine.

COFFEE AND SURROGATE MARKERS

Though the question of whether coffee is good or bad for your heart seems simple, the answer is complicated. The best answer we can come up with has changed over the last 20 years.

For examples, this lecture now turns to headlines. From 2002, from WebMD.com, comes a headline reading "Is Caffeine Bad for Your Heart?" with a subtitle "New Research Suggests Caffeine Elevates Blood Pressure, Stress." (To their credit, WebMD makes it clear this article was published in 2002. Publication dates are crucial, but some websites leave that off.)

The story itself is about a study that looked at blood pressure and other measurements in 47 adult coffee drinkers. Over three days, the study participants were given either a capsule of caffeine equivalent to about four cups of coffee or a capsule of placebo. On the other day, they received the other capsule.

The researchers found that on the caffeine day, average blood pressures were higher by about three or four points. At the same time, the average heart rate actually decreased by two beats per minute—a finding that was largely ignored in the press, but that reflects decreased stress on the heart.

The article says, "The researchers concluded that the equivalent of four cups of coffee raises blood pressure for many hours. Although the increases appear modest, they are large enough to affect heart attack and stroke risk."

The study was quite small, involving only 47 people. Small studies are not strong studies. And it only documented one day of very modestly increased blood pressure. That is relatively inconsequential: Years of high blood pressure would matter much more, but that is not measured in the study.

Most importantly, this study looked at a surrogate marker rather than a real clinical endpoint. The headline of the story was "Is Caffeine Bad for Your Heart?" However, to be more accurate, the study was actually about measuring blood pressure. They weren't looking at heart damage or heart disease. It may be an important observation that caffeine elevates blood pressure, but showing that is not the same as showing that caffeine raises your risk of heart disease.

Always be wary of studies that look at a surrogate marker, like a lab measurement or a finding like blood pressure. Those might be important, but you really want to know what the effect of the intervention is on health itself. This is crucial, and headlines do not typically make this clear.

COFFEE AND ARTERIES

In 2015, this headline came from Healthday.com: "Love Coffee? Your Heart May, Too." The story begins by saying, "drinking three to five cups of coffee a day may reduce the risk of developing clogged arteries, which in turn might reduce the risk of heart attacks, a new study suggests."

That sentence does a good job of getting the following point across: Coffee reduces the risk of clogged arteries, which in turn might reduce the risk of heart attacks. That is a way of explaining how the surrogate marker (a measurement of clogged arteries) is connected to the real clinical endpoint of importance (heart attacks).

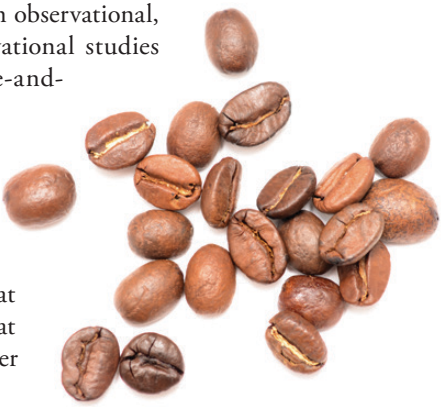
This was a study of over 25,000 men and women in South Korea. A legitimate criticism might be asking: Would the same study in a more ethnically diverse American population show the same thing? We don't know.

All of the subjects participated in an interview about their eating habits and coffee consumption. That possibly presents a problem of accurate recall. Then, they underwent a CT scan to measure calcium deposits near their hearts.

Those CT findings are a surrogate marker, but they are well correlated with cardiovascular risk. There should not be calcium in the lining of your blood vessels; if there is, it is atherosclerotic plaque.

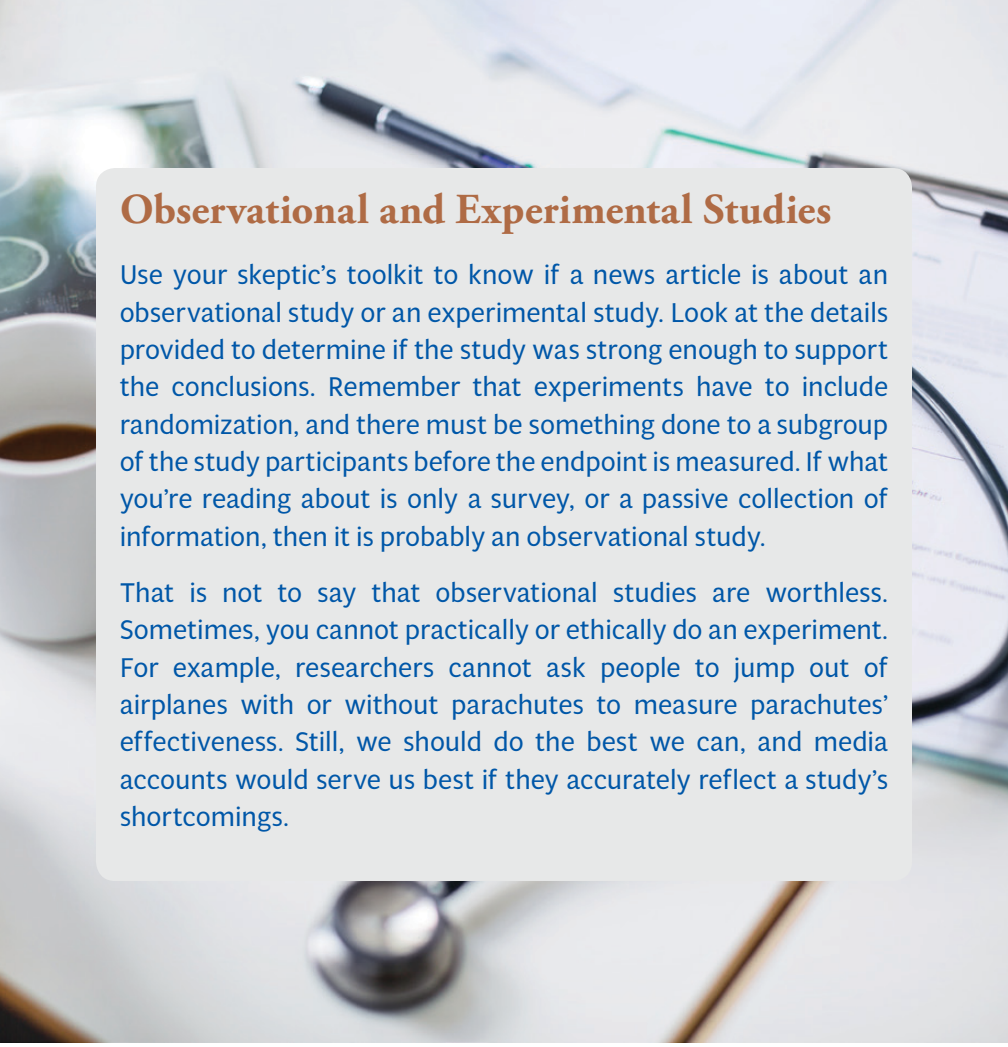
However, not all journalists were enthusiastic about the findings. From *Forbes* came the headline "No, Drinking Coffee Won't Save Your Life or Prevent Heart Attacks." The first line of this story reads, "Once again, the media has swallowed the bait hook, line, and sinker."

This author's main criticism of the media's handling of the Korean study has nothing to do with surrogate markers. Instead, it is about the very nature of this kind of study: It was an observational, not an experimental, study. Observational studies cannot definitively show a cause-and-effect relationship.



An important shortcoming of observational studies is called reverse causality. It could be that people who have had heart disease are less likely to drink coffee. In that case, it would be heart-disease risk that drove drinking less coffee, not the other way around.

The best way to prove causality—that is, to know that one thing causes another—is with an experiment in a clinical trial. A well-done clinical trial provides the strongest evidence for medical decision making.



Observational and Experimental Studies

Use your skeptic's toolkit to know if a news article is about an observational study or an experimental study. Look at the details provided to determine if the study was strong enough to support the conclusions. Remember that experiments have to include randomization, and there must be something done to a subgroup of the study participants before the endpoint is measured. If what you're reading about is only a survey, or a passive collection of information, then it is probably an observational study.

That is not to say that observational studies are worthless. Sometimes, you cannot practically or ethically do an experiment. For example, researchers cannot ask people to jump out of airplanes with or without parachutes to measure parachutes' effectiveness. Still, we should do the best we can, and media accounts would serve us best if they accurately reflect a study's shortcomings.

COFFEE'S STORY, CONTINUED

Coffee-related science has continued to progress. From *The Guardian* in July 2017, a headline read: "Coffee Cuts Risk of Dying from Stroke and Heart Disease, Study Suggests." This is a news article about two newer studies that actually looked at the real endpoints—stroke and heart disease—rather than surrogate markers.

One involved 185,000 people, and the other involved 450,000 people, all of whom were followed for about 16 years. The study assessed their eating and lifestyle habits and tracked their rates of cardiovascular and other diseases.

These are still observational studies, but they're huge, and they cover a long span of years. That makes their conclusions more reliable. Both studies found a decreased risk of serious cardiovascular diseases among the coffee drinkers.

The article also does a great job outlining the shortcomings of these studies. For example, take this passage: "Experts warn that the two studies, both published in the *Annals of Internal Medicine*, do not show that drinking coffee was behind the overall lower risk, pointing out that it could be that coffee drinkers are healthier in various ways or that those who are unwell drink less coffee. In addition, levels of coffee-drinking were self-reported." This is a great example of solid health reporting.

Additionally, Time.com reported in 2017 about a different study looking at decades of data for 15,000 Americans in the Framingham heart study. This study showed a solid dose-response effect of up to six cups of coffee a day, with each cup further decreasing the risk of heart failure, stroke, and coronary artery disease.

The only sure way to prove causality is an experimental study. But sometimes those just cannot be done, so using the weight of the evidence is second best. Big observational studies add weight to the evidence, as do trials done on animals or studies looking at surrogate markers.

Another way to support causality is showing a dose-response relationship. Even though this was only an observational study, the data showed that as more and more coffee was consumed, the effect grew larger and larger.

Biologically, this fits the idea that coffee is causing the endpoint. Again, it is not proof, but this dose-response relationship adds to the evidence that coffee itself is preventing cardiovascular disease.

RED WINE

Red wine is another beverage whose relationship to cardiovascular health has been studied. In the 1990s, enthusiasm for red wine consumption was a common theme in media headlines.

The primary driver of interest in red wine was something that became known as the French paradox. Compared to most other modern industrialized countries, France seemed to have a population that experienced fewer heart attacks and less cardiovascular disease. This was despite the fact that traditional French cuisine includes plenty of butter and rich sauces.

French people, as a population, drink a lot of red wine. This led to a perception that red wine could cause less heart disease.

To their credit, some news agencies sounded a note of caution. From *The New York Times* in 1994 came the article "Wine for the Heart: Overall, Risks May Outweigh Benefits." This article talked about some of the real, known risks of consuming too much wine, such as alcoholism and liver disease. Overall mortality, when they looked at data from several countries, seemed much higher among people who consumed more than two alcoholic beverages a day.

The tone of recent headlines has changed. CNN published an excellent article in 2015 titled "Health Effects of Red Wine: Where Do We Stand?" They provided great context, including a timeline reviewing what was known about wine from ancient times though today. *USA Today* has also become more skeptical of the alcohol-and-heart-prevention bandwagon, with their story "Alcohol Good for Your Heart? Evidence Is Evaporating."

It turns out, according to many studies, that red wine is not superior to other alcoholic drinks. It doesn't confer any specific cardiovascular protection. Any alcoholic beverage, when consumed in moderation, might decrease your risk of cardiovascular disease by a modest amount. It might help prevent diabetes too, though the evidence there is less strong.

However, there are risks. Drinking is associated with a higher risk of several kinds of cancer, death from drunken driving, problems with potential addiction, and so on.

When talking about alcohol, the "in moderation" qualifier means one alcoholic drink a day for women and one or two for men. More than that is not a good idea. Health benefits quickly become health dangers when people drink too much. That is a real problem with headlines that enthusiastically support the heart benefits of alcohol consumption: They may do more harm than good.

Suggested Readings

Mayo Clinic, *Mayo Clinic Healthy Heart for Life!*

The American Heart Association, http://www.heart.org.

Questions to Consider

1 What foods can you think of that have been suggested as heart-healthy in the news? Why does that list keep changing?

2 What kinds of studies are the best way to know if a food is good or bad for your heart?

LIFE EXPECTANCY AND INFANT MORTALITY

LECTURE 11

In the big picture, there is no more important health story than when we and our children can expect to die. This lecture looks at how the media has been reporting on life expectancy and infant mortality. A note on terminology: In this lecture, the term *life expectancy* means how long a person can expect to live from birth.

MEASURING LIFE EXPECTANCY

The best way to know a life expectancy would be to choose a group of babies, born today, and see how long they live. To do that, you would need to watch that cohort of babies until all of them died, and then compute the average. That is not very practical.

Instead, the most common way to calculate what is formally known as a period life expectancy is to use a snapshot of time, looking today at the chance of dying during every year of life. Then, researchers take a hypothetical cohort of babies and mathematically run them through their years of life, looking at how the cohort decreases from year to year as some of them die.

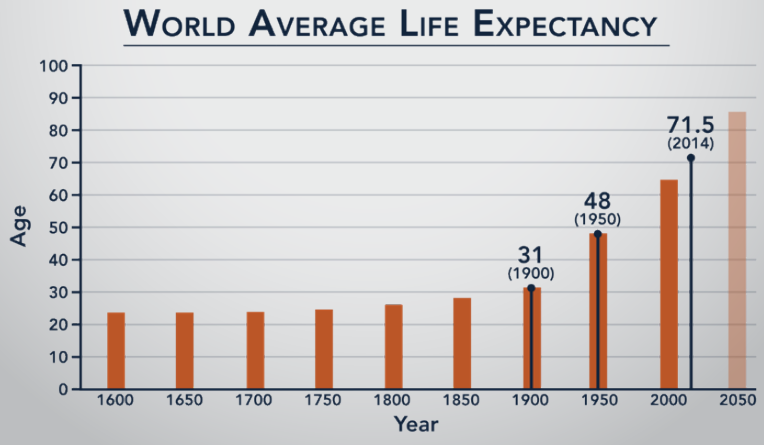
This kind of computation does not take into account how trends in the chance of death are changing, or how they will change over the period of someone's life, but it is the method most commonly used by both US and international health authorities. However, it is not the only method.

In 2017, the UK's *Telegraph* published the article "Statistical Re-Jig Boosts UK Life Expectancy by Three Years." The British government had for the first time reported life expectancy as a median (that is, the age at which half of the population would expect to die) rather than the more traditional average or mean age. That simple change, effectively, increased the lifespan of British citizens by three years.

The *Telegraph* report also talked about another trend: Over the last 100 years, we have gotten used to reports about an increasing lifespan—that is, every generation lives longer than the generation before it. However, those increases are stalling.

Average Life Expectancy

In 1900, the world average life expectancy was estimated at 31. By 2014, the world average life expectancy was 71.5 years. That is a lot of progress in a very short time, but the United States is currently slipping backward on this measure.



OVERDOSES AND CAR CRASHES

In the United States, overdose deaths have now surpassed deaths in car crashes, which had been for years the most common cause of accidental death. But the news about car accident deaths is not good, either. After about 40 years of steady declines in death rates from car crashes, they've shot back up by 7%.

These statistics can't tell us the underlying reasons, but authorities suspect both substance abuse and distracted driving are playing a role. The cars continue to get safer, but drivers are becoming more reckless.

The Washington Post stressed another observation from these statistics in their article "US Life Expectancy Varies by More Than 20 Years from County to County." It is a chilling story. Health disparities in terms of differences in life expectancy are widening, with the gap between different areas of the country varying by 20 years.

FRAMING A STORY

How a story is framed has a lot of do with how the reader digests, absorbs, and remembers the information. CBS News covered the story of varying life expectancy in the US in 2017, under a headline titled "Longer Life Expectancy? It Depends Where You Live." They referenced a study showing that 74% of that 20-year variation in life expectancy by geography was explained by differences in key health risk factors: obesity, lack of exercise, smoking, high blood pressure, and diabetes.

Social factors like poverty, education, and access to health care "played a role," but all of these are interconnected. For example, depending on where you live, you may or may not have access to a supermarket with ready availability of fresh vegetables and healthy food. It is difficult to separate out these factors.

DIFFERENT COMPARISONS

Many articles about life expectancy stress the comparison between the US and other countries, especially to countries that are considered poorer. Take this example from FOX News affiliate KCPQ in Tacoma, Washington: "Life Expectancy Is Expected to Soar—Except in US.

Another interesting point from these articles about life expectancy projections: The traditional gap between women's and men's lifespans seems to be shrinking. It is not because men are living in healthier ways. It is because women, worldwide, may be starting to act more and more like men—that is, more drinking, smoking, road accidents, and homicides. As lifestyles become more similar between men and women, so does their longevity.

We can also compare countries by looking at life expectancy versus per capita health care spending. NPR took a look at these statistics in a graph that accompanied their article "What Country Spends the Most (and Least) on Health Care per Person?"

At the bottom was Somalia, spending $33 per year per person, with a resulting life expectancy of about 55 years. Lesotho, spending about $319 per person per year, was not getting any better: Their life expectancy was about 45 years, the lowest on the chart. The United States spends far more on health care per person per year than any other country, at over $9,000 a year—but it was far from the top in life expectancy.

The Maximum Lifespan?

The longest documented lifespan was that of Jeanne Calment, a French woman who lived over 122 years, from 1875–1997. According to one story published in *Nature*, it may be impossible to extend life much farther than that of Calment. By the study's calculations, the maximum average lifespan is 115 years, and the absolute maximum lifespan is probably 125 years.

INFANT MORTALITY

Another vital statistic is infant mortality. A prototypical news article about this starts with a headline like this one, from *The Washington Post*: "Our Infant Mortality Rate Is a National Embarrassment." An important takeaway is that the US ranks last among the wealthy countries of the world. Over 6 of every 1000 live births in the US will not survive infancy.

The text of this and many similar articles use multiple comparisons meant to shock away any sense of complacency. A baby born in the US is about three times as likely to die as one born in Japan and about twice as likely to die as one born in Korea. There are some states in the US that are doing an especially poor job, too: If Mississippi were a country, its infant mortality rate of 9.6 would put it between Botswana and Bahrain.

EXPLAINING THE GAP

In the eighth paragraph of the *Post* article, the reader learns that the US actually has a very similar neonatal mortality rate to other wealthy countries—that is, when babies are born, they are about as healthy as anywhere else.

The big difference in the infant mortality rate starts after birth, and it is truly a difference in post-neonatal mortality, or death rates in the first year of life. As infants grow older in the first year, a substantial gap opens up in their mortality compared to other countries, and that gap increases as babies approach their first birthday.

The article also reveals that "babies born to poor moms in the US are significantly more likely to die in their first year than babies born to wealthier moms." That is because almost all babies in the US are born in hospitals. Hospitals in the US take good care of babies. In fact, US obstetric and neonatal care is in many ways the best in the world.

The disparity begins when the baby and mother go home. Poor American families have less access to quality care. The infant mortality rate—the rate of death over the whole first year of a baby's life—is dramatically higher among families who are poorer, have less education, and among unmarried mothers and mothers of color.

LOOKING FOR ANSWERS

CNN's coverage on infant mortality in 2012 included the story "Infant Deaths: Searching for Answers in Mississippi." Mississippi has long had the highest infant mortality of any US state. The article points out that there are multiple, overlapping factors contributing.

One is obesity, which contributes to gestational diabetes and hypertension, which both can contribute to premature birth and other complications. There is also a high incidence of poverty and low educational background in Mississippi and other southern states. Those problems, though certainly difficult to tackle, at least have some strategies and hope for progress, but there are more intractable issues at play, too.

African American women, all else being equal, still have a higher rate of premature and low birth weight. The risk of SIDS, or sudden infant death syndrome, is about double in black infants born in the USA. Progress can be made, but it is not going to be easy to tackle these overlapping and additive issues.

CONCLUSION

The biggest contributors to both infant mortality and a falling life expectancy in the US are too much obesity, not enough exercise, poor control of chronic conditions like high blood pressure and diabetes, and negative social determinants of health. Playing into these issues are factors like poverty and poor access to healthful food and a good education.

These are not simple problems. But if we are going to move forward, we need to listen to what the media is trying to tell us: We are making ourselves and our children and babies sick, and we can do better.

Suggested Readings

National Center for Health Statistics, "Mortality Data." Available at https://www.cdc.gov/nchs/nvss/deaths.htm.

World Health Organization, "Global Health Observatory (GHO) Data." Available at http://www.who.int/gho/en/.

Questions to Consider

1 Should the news use population life expectancy as a good measure of our overall health?

2 How can news reports that compare infant mortality across different countries be misleading?

IS IT REALLY OK TO STOP FLOSSING?

LECTURE 12

In August 2016, headlines blared a huge change in medical thinking. Several headlines announced that flossing was no longer recommended, with one example being the *New York Post*'s "Flossing Is a Complete Waste of Time." This lecture looks at how a common-sense teeth-cleaning ritual went from universally recommended to decried as well as at other stories of media influence and misunderstandings.

THE BEGINNING OF THE FLOSSING STORY

The flossing story started with one news organization, the Associated Press. In 2015, they formally asked the US government for the evidence used to justify the official US government recommendation on dental floss. That recommendation was first published in 1979 in "Healthy People: The Surgeon General's Report on Health Promotion and Disease Prevention."

The surgeon general, the nation's top government health authority, said, "Careful and thorough daily brushing and flossing to remove bacterial plaque is effective in preventing and retarding progression of periodontal disease." Since then, flossing has been recommended in the *Dietary Guidelines for Americans*, which is jointly updated and published every five years, under federal law, by the US Department of Agriculture and Department of Health and Human Services.

That federal law, the one that requires these overlapping departments to come up with the dietary guidelines, also requires that the guidelines be based on solid scientific evidence. When the AP asked the federal government for the scientific evidence supporting the recommendation that Americans floss their teeth daily, the government had to comply. This was a huge media organization insisting on the information. Additionally, the Freedom of Information Act requires government agencies to share this information with any interested party.

About the Associated Press

The AP is a nonprofit organization and a cooperative venture co-owned by contributing newspapers and radio and television stations all over the US. Articles written using AP resources are published and republished through over 7000 news outlets, and the AP operates over 200 news bureaus in 100 countries all over the world.

THE STORY CONTINUES

The story the AP told was reprinted in hundreds of news outlets. For instance, *The Salt Lake Tribune*'s copy started out with these lines: "It's one of the most universal recommendations in all of public health: Floss daily to prevent gum disease and cavities. Except there's little proof that flossing works."

The story then mentions that flossing has been recommended by the federal government, dental organizations, and floss manufacturers for decades. After the AP asked the government for their evidence, the response, as quoted in the story, was, "In a letter to the AP, the government acknowledged the effectiveness of flossing had never been researched as required."

The 2016 edition of the *Dietary Guidelines for Americans*, without specific notice, had quietly removed the flossing recommendation that had been there, unsupported by evidence, for over 30 years. The AP asked for the proof; the government admitted they did not have any. The US agencies modified their advice to drop the issue of flossing altogether.

The AP story then highlighted two other aspects of their investigation, and here they may have treaded in somewhat murky waters themselves. First, they said that they looked at the "most rigorous research conducted over the past decade," focusing on 25 studies that compared the use of a toothbrush to using a combination of flossing and brushing.

They said that these studies were of shaky quality, that they had a "moderate to large potential for bias," and the majority of these studies failed to show that flossing was effective.

Perhaps these studies did not show effectiveness because they were poorly done studies to begin with. That does not sound like a good reason to change recommendations. Another important point is that the AP story included quotes from studies and study abstracts, but it did not specifically attach the quotes to the studies. That makes it very difficult to a critical reader to go back and verify what was said and where the quotes came from. It is sloppy reporting and serves only to further muddy this part of the story.

OTHER OUTLETS

Though many news outlets copied the AP report verbatim, others did not. *The New York Times*, after crediting the AP report, looked at two reviews of flossing published by Cochrane—a nonprofit, multinational health organization that critically appraises the state of health information. The *Times* reported that though the evidence quality was poor, people who brushed and flossed had less gum bleeding than people who brushed alone, and that there was some evidence that flossing did reduce dental plaque.

CNN's report, published a day after the AP's story, was headlined "Stopped Flossing? Teeth Still Vital to Overall Health." Though they also referred to the questionable evidence for routine flossing, the CNN story put dental health into a bigger context, discussing the overall health consequences of poor dental hygiene and the huge societal costs of poor dental care.

The American Dental Association did not take all of this lightly. In their official response, they pointed out some of the difficulties in obtaining a perfect study of flossing, such as poor flossing technique and people not being fully truthful about their flossing habits.

They also pointed out that even in the absence of strong evidence, flossing is very safe and has a minimal cost, and that periodontal disease is so common that even an intervention that was only marginally helpful in prevention would still benefit a lot of people. They concluded that flossing is an essential part of taking care of your teeth. The Canadian Dental Association agreed.

SOURCES OF RECOMMENDATIONS

A variety of government, private, and professional organizations make recommendations, and they don't always agree. For example, in November 2017, NBC News ran the headline "New Blood Pressure Guidelines Mean Yours Might Be Too High Now." They, like many other news outlets that week, were reporting on a new guideline about the recognition and treatment of hypertension, or high blood pressure, which was written or endorsed by 11 professional health organizations, including the American Heart Association and the American College of Cardiology.

Though these new guidelines are extensive, news stories focused on one big change: lowering the upper limit of normal blood pressure so that anyone with blood pressure higher than 130/80 would now be considered

hypertensive. Under the prior guideline, about 32% of US adults were considered to have high blood pressure; under the new guideline, that percentage increased to about 46%. The point of the change was to help identify people at risk for the consequences of high blood pressure so they could make changes in their health.

PUSHBACK ON BLOOD PRESSURE RECOMMENDATIONS

Not all of the coverage was as positive about the change. *The New York Times* ran a story under the headline "Why New Blood Pressure Guidelines Could Lead to Harm." The article pointed out that press coverage "made it sound as if something drastic had happened overnight," with so many more Americans suddenly being classified as hypertensive.

The *Times* article pointed out that the revised guideline itself seemed to rely very heavily on the so-called Sprint study, published in the *New England Journal of Medicine* in 2015. However, as strong as that study was, it is not clear that its findings apply to everyone.

The Sprint study randomized over 9300 people with high blood pressure into two groups, one receiving standard care to achieve a systolic blood pressure of 140 or less, and the other receiving more intense care to keep their systolic blood pressure under 120. The study showed a significant difference: The more intensely treated group stayed healthier and lived longer, with a 25% relative reduction in their combined rates of serious cardiovascular disease and death. In fact, the findings were so dramatic that the study was halted early, so both groups could get the more helpful, intense therapy.

However, it is important to look at who was recruited to participate in the study. They were required to be people who were already at extra-high risk of disease. Therefore, even though the Sprint study was important, its findings do not apply to the majority of people in the US with high blood pressure, most of whom do not have multiple additive risk factors. In other words, it was not a salient study, at least not to most people.

The Sprint study means that people who have high blood pressure plus other risk factors should be treated quite aggressively. That is not really what the news reports of the guideline were focusing on.

The *Times* article raised another important point. The redefinition of high blood pressure pushed the lower limit downward, which would then catch a new group of people with relatively mild elevations at the bottom of the scale. For almost all of these new patients, therapy would be lifestyle based—that is, measures like eating healthy, exercising more, and stopping smoking. Doctors should be recommending those measures anyway, which begs the question: What was the point of changing the guideline?

THE AAFP

One month after these new guidelines were published, the American Academy of Family Physicians (AAFP) announced it did not support them. They were sticking with the prior guideline, with the higher blood pressure targets.

The AAFP represents about 130,000 physicians, almost all of whom practice primary care general medicine. These are the doctors on the front lines of identifying and treating high blood pressure.

Their press release focused on three areas of disagreement. They thought the Sprint study was given too much weight in the deliberations and that contradictory studies were ignored. They thought the new guideline didn't properly address potential harms from lowering the threshold, including more medication side effects and more people being reclassified as having a condition requiring medical intervention.

Most ominously, the AAFP expressed concern about potential conflicts of interest among the authors of the new guideline. Specifically, the principal investigator of the Sprint study was chosen as the chairman of the committee writing the new guidelines. It is striking how much attention the initial guideline attracted, and it also striking how little attention the AAFP news received. Perhaps the media had simply moved on by the time of their announcement.

FAKE ORGANIZATIONS

In the case of the blood pressure guidelines, there is a genuine difference of opinion between legitimate professional organizations. However, sometimes a guideline is authored by, essentially, an organization that is trying to masquerade as a legitimate professional organization.

In March of 2010, as reported by *The New York Times*, 14,000 school superintendents nationwide received an official-looking letter from the American College of Pediatricians (ACP), outlining that organization's stances on homosexuality and gender issues. It was not clear from the letter that this organization is a fringe group representing about 200 physicians.

They are not the organization that represents almost all American pediatricians. That would be the American Academy of Pediatrics, with its 60,000 member physicians. The names are similar, and it is not a stretch to imagine that the people who formed the ACP chose the name to confuse and mislead the press and the public. The ACP has been labeled a hate group by the Southern Poverty Law Center.

Nonetheless, widely read sites such as Breitbart.com and The National Catholic Register present information from the ACP as if it is an organization representing mainstream pediatricians. The new media landscape, including the quick and inexpensive distribution of press releases, has made it very easy for anyone to pretend to be what they are not. It is important to be skeptical of these kinds of sources and to be wary of official-sounding names.

Suggested Readings

Agency for Healthcare Research and Quality, "Guidelines and Measures." Available at https://www.ahrq.gov/research/findings/factsheets/errors-safety/index.html.

American Dental Association, https://www.ada.org/.

Questions to Consider

1. How should we get news about new and changing recommendations from health authorities?

2. Why do some recommendations get wider exposure in the media than others?

QUIZ 2

Is each statement true or false?

13 Most violent crimes are committed by people who have received a diagnosis of mental illness at some point in the past.

14 Most mental illnesses, including depression, are treatable, and people can often get better and go on to live normal lives.

15 The echo-chamber effect of social media means that we surround ourselves with those who agree with us and rarely challenge our beliefs.

16 Clickbait involves a catchy, emotionally charged, and usually misleading headline used by websites to lure you in and increase their advertising revenue.

17 You should never eat food that contains any amount of a toxin in it.

18 The media were largely to blame for the drinking water issue in Flint, Michigan, that started in 2014.

19 A surrogate marker is a lab result (like cholesterol level) or vital sign (like blood pressure) used in place of an actual change in health (like incidence of heart attack or death).

20 A correlation between drinking coffee and decreased risk of stroke and heart disease indicates that drinking coffee is the cause of the decreased risk.

21 The recent decrease in life expectancy in the US can be attributed to increases in drug overdoses, car crashes, shootings, and obesity.

22 Where you live in the US may impact your life expectancy by as much as 20 years.

23 Multiple research studies have shown that flossing is critical to your dental health.

24 Relative risk is usually a much higher number than absolute risk, even though both apply to the same data, and can misrepresent the significance of a research finding.

Answers on page 209

DOES CANCER SCREENING WORK?

LECTURE 13

Cancer screening is a complicated topic. As shown by the cases of prostate and breast cancer screening, the media has not always done a good job explaining the process in a way that truly helps keep people healthy.

OLD AND NEW MODELS

In 2006, CNN reported that the American Cancer Society recommended discussing the pros and cons of a prostate screening called PSA starting at age 50 for men. Even at age 50, it was not a firm recommendation. CNN quoted their chief medical officer as saying of PSA, "They sometimes miss cancer that needs to be found, and they find cancer that doesn't need to be found."

The first part of the quote asserts that the PSA test does not identify all prostate cancers, even ones that are large or dangerous. That is reasonable. However, the second part of the quote—that PSA testing might "find cancer that doesn't need to be found"—likely raised more eyebrows.

The old view of cancer was simple. Once an organ developed cancer, it was going to grow, spread, and kill the person. However, there is a newer view present in Dr. H. Gilbert Welch's influential book *Less Medicine, More Health*. He talked about cancer as not being one kind of thing—a disease that inevitably grew and killed—but rather like a barnyard filled with three different animals: birds, rabbits, and turtles.

The goal of early detection would be to fence that barnyard in, but you cannot fence in a bird. Birds represent the most aggressive cancers—that is, the ones that have inevitably spread before possible detection. Fencing cannot help keep birds in a barnyard, and screening can have no role for some kinds of aggressive cancers.

Rabbits, in this metaphor, are good candidates for screening. It is possible to trap rabbits before they leave the barnyard.

Turtles represent slow-growing cancers. The cells, technically, have the characteristics of cancer, but they are like turtles in a barnyard—they will not spread, at least not for many years, and they will not cause any harm.

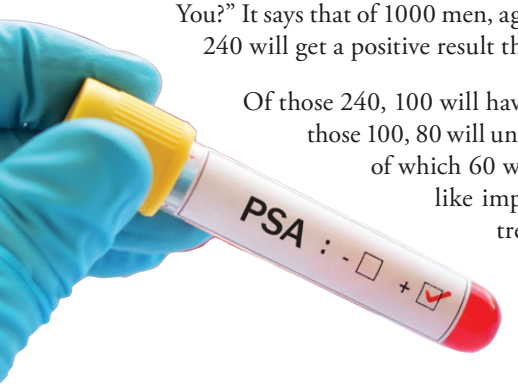
Unfortunately, many screening methods are much better at finding turtles than finding rabbits. Additionally, sometimes what looks like a turtle might manage to escape anyway and make a person sick.

CHANGING PERSPECTIVES

This lecture now turns to look at changing perspectives and recommendations about PSA screening. In 2012, the US Preventative Services Task Force (USPSTF) released an official, final recommendation. The exact wording of that 2012 USPSTF recommendation was brief and straightforward. Their recommendation was "against prostate-specific antigen (PSA)–based screening for prostate cancer."

Though there was general agreement that PSA testing had significant drawbacks, many physicians continued to use the screen. In 2017, NPR ran the headline, "Federal Task Force Softens Opposition to Routine Prostate Cancer Screening." The USPSTF released a proposed revision to their guidelines, breaking down their recommendation by age. Men aged 55 to 69 are encouraged to decide individually with their doctors, weighing the pros and cons, while men older than this should not be screened.

The USPSTF developed a summary graphic to help physicians and patients understand the statistics, titled "Is Prostate Cancer Screening Right for You?" It says that of 1000 men, aged 55–69, screened with a PSA test, 240 will get a positive result that may indicate cancer.



Of those 240, 100 will have a biopsy that confirms cancer. Of those 100, 80 will undergo surgery or radiation treatment, of which 60 will experience serious complications like impotence or incontinence. Of the 80 treated, three will avoid having the cancer spread to other organs (the other 77 would not have spread anyway). One or two will avoid death from prostate cancer.

The Prostate Pep Talk

The prostate cancer screening issue is nuanced, which can be difficulty to convey. That is the case with the so-called prostate pep talk, which was promoted in September 2017. It depicts a locker room in which a coach asks his players what they are going to do about prostate cancer. A player screams back, "Get screened, coach!"

There is nothing wrong with a little motivation to encourage healthy behavior. However, the video does not convey anything close to the nuances of the recommendations. In fact, they push men to schedule a free screening, where men are not going to hear about the pros and cons and cannot possibly make an informed decision.

MAMMOGRAMS AND BREAST CANCER

Another type of cancer screening is the use of mammograms to detect breast cancer in its early stages. Breast cancer, like prostate cancer, is terribly common. These are the most common invasive cancers in women and men. The question is not if mammograms find breast cancer early; rather, it is if they can find the right breast cancers early—that is, the ones that would go on to cause grave harm.

It is important to examine what the guidelines say, the science behind the guidelines, and how the media has played their role in improving women's health. From *The New York Times* in November 2009, a headline read, "In Reversal, Panel Urges Mammograms at 50, not 40." NBC said, "New Mammogram Advice Raises Worries."

The NBC article went on to read, "A government task force said Monday that most women don't need mammograms in their 40s and should get one every two years starting at 50—a stunning reversal and a break from the American Cancer Society's longstanding position." That previous stance had been a universal recommendation for yearly mammograms starting at age 40.

These media stories all stressed the newness of the recommendations and that they were stunning, shocking, or unexpected. They often included quotes from disbelieving physicians or from representatives of advocacy groups.

One of the best, most levelheaded assessments of these 2009 recommendations was from *The Atlantic*, in a long-form article titled "Rethinking the Mammogram Guidelines." They make the important point that though it seemed like the change in recommendations was abrupt, research supporting changing the recommendations had been accumulating over years. Some very large international studies had been published to illustrate the impact of mass screening of women at different ages.

THE STUDIES

One of the most influential studies was a truly huge combination of independent trials published by a Swedish group in 2002, seven years before the recommendations changed. *The Atlantic*'s article presented some good numerical comparisons to help even casual readers make sense of the reasons behind the change.

For instance, screening advocates had been quoting a 9% reduction in cancer for screened women in their 40s. However, that 9% was a relative benefit, not an absolute change, and it was statistically insignificant—meaning it was such a small difference that it could have occurred by chance.

One of the authors calculated that, on average, yearly mammograms for a woman in her 40s would statistically increase her lifespan by five days. Additionally, in Sweden, where mammography has been widely used since 1990, the national breast cancer death rate had fallen by less than one death per 100,000 women.

As with prostate cancer screenings, there is genuine harm caused by mammography screening. One problem is false positives: 80% of women who undergo a breast biopsy based on mammography findings find out that they do not, in fact, have cancer. The bigger problem is that cancers detected via mammography are, for the most part, slow-growing cancers that probably would not have caused any harm.

COMBINED DATA

Combined data from eight studies with 600,000 participants provides some interesting insights. For 1000 regularly screened women aged 50 or older, four will die of breast cancer over the next 11 years. Twenty-two of them will die of any kind of cancer. About 100 will have a false alarm—that is, an abnormal mammogram requiring biopsies or other measures.

Finally, five of them will undergo intensive treatment for a breast cancer that never would have hurt them, including surgery, chemo, and radiation therapy. This is invasive, expensive, and undeniably life-altering therapy that was not in fact needed.

If that same group of 1000 women did not receive regular mammograms starting at 50, there would be five deaths from breast cancer. However, combining all types of cancer, the total deaths remain the same at 22. That means that even if the screening saves one life, the overall cancer mortality has not changed.

A 2012 study showed that even while there has been a doubling in the rate of diagnosis of early breast cancer since mammography screening has become commonplace, there has not been much of a decrease in the rate of advanced cancers found and treated. Additionally, a study involving 25 years of monitoring the effects of mammography on mortality from breast cancer showed no improvement at all.

Overdiagnosis is the name of this phenomenon—a potential drawback of screening for hidden disease. Overdiagnosing is different from misdiagnosing or incorrectly diagnosing. The five women in the example of 1000 screened women did, based on their biopsies, have cancer. But they did not have the kind of cancer that doctors want to find. These cancers were the slow-moving ones—the turtles that will not cause harm. It is better to not know about them.

CONCLUSION

Unfortunately, with both breast cancer screening by mammography and prostate cancer screening by PSA blood tests, doctors find and treat far more turtles than scary cancers that would have killed the patient.

That is not to say that all cancer screening is unjustified. Colon, cervical, and skin cancer screening programs can be effective. And decisions about screening should consider other risk factors. For example, if you are a woman who has had two sisters with breast cancer, or someone who smokes cigarettes, your decision to get screened should consider your own individual risk factors.

However, for breast and prostate cancer, population-based screening of everyone, regardless of their individual risks, is unlikely to have a big positive impact on overall survival, at least using current technologies. The media needs to reinforce this message.

Suggested Readings

American Cancer Society, http://www.cancer.org/.

Weinberg, *The Biology of Cancer*.

Welch, *Less Medicine, More Health*.

Questions to Consider

1. What is the minimum information that ought to be included in a news story about a cancer screening test?

2. Why do recommendations about cancer screening tests change? What kind of evidence for a screening test would you find the most believable?

DRUG PRICES IN THE NEWS

LECTURE 14

This lecture focuses on the costs of prescription drugs. The marketplace for prescription medications is unique and a bit strange, and this lecture looks at how the media has helped to bring clarity to the outlandish world of prescription drug prices.

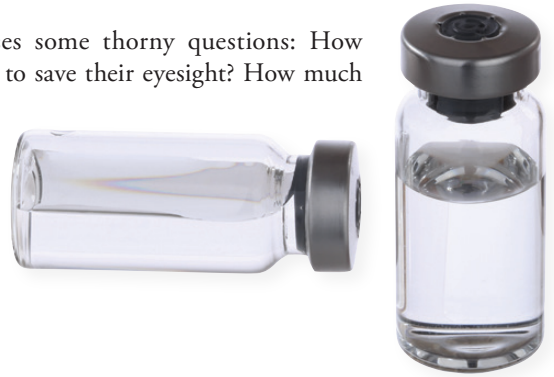
LUXTURNA

A particularly expensive drug is Luxturna, used to treat a rare form of blindness that strikes about 10–20 people in the US each year. Forbes.com reported on the controversy over its pricing in their article titled "Non-Profit Says $850,000 Gene Therapy Is At Least Twice As Expensive As It Should Be." According to the article, "the price was below the $1 million-plus price tag many had expected."

However, the nonprofit Institute for Clinical Evaluation and Review was not buying that argument. Per the article, their analysis of the economic benefits of Luxturna shows that the price is two to four times what it should be.

There is some complicated math here, looking at the duration of benefit and both the direct and indirect financial impacts of preserving vision. The dollar figures from the drug company have little relation to what an insurance company, the government, or a private citizen might actually pay for the drug.

The Luxturna story raises some thorny questions: How much would a person pay to save their eyesight? How much would they expect their insurance company to pay? These are difficult questions, and media stories about costs cannot help but dance around them.



List Prices and Actual Prices

Almost no one pays list prices for drugs: The actual prices are set by negotiations held behind closed doors by insurance companies. Even those negotiated amounts do not reflect out-of-pocket expenses, owing to factors like copays and coinsurance, deductibles and denials, and complex documents and explanations. These factors can make purchasing and paying for medicines frustrating, if not infuriating.

GENERIC DRUGS

Most people will never have to take a medication that costs hundreds of thousands of dollars. Far more commonly, older medications are prescribed. Those medications are often off patent, meaning their patent protection has expired and competing companies are free to make generic versions. That dramatically lowers the cost.

That is the idea, at least. Still, market forces can create unexpected or even outlandish results when it comes to prescription drug spending. Headlines like this one, from *The Wall Street Journal*, have become common: "Cancer Drug Price Rises 1400% with No Generic to Challenge It." The article focuses on a 40-year-old medication called lomustine used to treat several kinds of life-threatening cancer.

As the article explains, for many years, this medicine was sold by Bristol-Myers Squibb for about $50 a capsule. In 2013, Bristol-Myers sold manufacturing rights to CordenPharma, who made a deal with a small Miami startup called NextSource to supply the drug to hospitals and pharmacies. That is when the price increases began. Over the next few years, the price of a single capsule rose to $768.

A company representative said in the article that NextSource bases its pricing on three items: regulatory fees, product development costs, and the benefit the treatment delivers to the patient. However, regulatory fees are fixed, and are no more than what the original company paid. The original developer, not NextSource, paid the product development costs.

A neuro-oncologist quoted in the story offered a different point of view: "This is simply price gouging, period." The problem here is that though lomustine is off patent, and hypothetically, any generic company can manufacture it, only one company is making and selling the drug. Generic availability only lowers prices through competition if there is competition. The article points out that there are at least 319 drugs in use in the US that are off patent but still have no generic copies available.

BARRIERS

The lomustine example raises the question: If there is so much money to be made by selling off-patent medications, why aren't more copies coming to market? The simplest part of the answer is that there are significant barriers in place. That sounds reasonable: We do need regulations to ensure the safety and purity of the medicines we buy. However, there is more to the story.

A valuable review of this issue, titled "How Big Pharma Sandbags Generic Competition," comes from *The Wall Street Journal*. While most news stories concentrate on one news item, essays that bring together related stories to create context are vital and illustrate the power of media to inform past the headlines. Here is the first paragraph in full:

> Drug companies are always figuring out creative ways to sustain high prices on brand-name medications. In the latest twist, Allergan *this fall transferred the patents covering its eyedrop Restasis to the sovereign St. Regis Mohawk Tribe,* admitting outright *that its goal was to prevent the patents from being overturned.*

The article went on to outline several other "anticompetitive abuses that lead to higher prices." For example, one involves preventing a potential generic company from selling their version by making it impossible for them to prove that the generic is equivalent.

Another trick is that brand-name makers can legally pay generic companies to delay their entry into the market, essentially twisting a provision intended to encourage competition into a way to maintain market exclusivity far beyond what patent law intended. These so-called pay-for-delay agreements cost US consumers another $3.5 billion a year.

NEGOTIATED RATES

Most often, patients pay a negotiated rate for medication. On one side is the payer, usually either a private insurance company or the federal or state government. On the other side is either a drug's manufacturer or, more likely, a pharmacy benefit manager. The patient has to trust that the payer is there to negotiate the best price for patients, since that will save them money too.

However, that might not be what is happening. *The New York Times* reported a story headlined "Prescription Drugs May Cost More with Insurance Than without It." The article begins, "Having health insurance is supposed to save you money on your prescriptions. But increasingly, consumers are finding that isn't the case."

An example follows from someone who found that with his Medicare prescription drug card, his cholesterol drug cost $84. Without using his prescription benefit at all, he was able to find the same medication for $46. The article points out that buying a bottle of pills involves several behind-the-scenes players: the drug company, the pharmacy, the insurer, and the pharmacy benefit manager. They all take a cut of the profits, and consumers "are left to fend for themselves."

Later, the article offers an important clarification. The article points out that negotiated rates often save money on more expensive, brand-name drugs, and that one industry expert estimates that consumers can get a better deal on their own only about 10% of the time. Though it would be nice to see evidence for that last claim, overall, the article did a good job explaining these complexities and probably inspired some readers to try to save some money by going it alone. That is good reporting and good advocacy.

CONFLICTS OF INTEREST

Most patients purchase prescription medications based on the advice of their physicians. The system, when it works, should prevent an important conflict of interest. The doctor prescribes the medication, but the doctor does not typically sell it. In a perfect world, physicians should recommend the best drug for the circumstance without the influence of any personal profit motive for the physician.

In practice, circumstances can differ, as revealed in *The New York Times* story titled "The More Lavish the Gifts to Doctors, the Costlier the Drugs They Prescribe." The *Times* story reviews a study published in 2017 that looked at how gifts given to physicians by pharmaceutical companies influence their prescribing habits.

It is not illegal for drug companies to pay doctors, either as consultants or speakers, or to give them gifts. It is required by so-called sunshine laws that the drug companies report those gifts to public databases. Researchers used data from those sources, plus data from companies that track prescribing habits, to correlate the gifts reported with the prescriptions brought to pharmacies.

About 60% of physicians received no gifts. However, the 40% who did accept gifts wrote, on average, twice as many prescriptions. Their prescriptions cost the patients, on average, about 60% more. Physicians who received the largest gifts had the biggest increase in the costs of their prescriptions.

ADVERTISING

Another aspect of drugs costs and the media is the role of media advertising directly to consumers. In 2015, about $5.5 billion was spent on this kind of advertising for brand-name drugs, and another half-billion was spent on generic advertising. These kinds of campaigns get people thinking about their health, but more importantly, as the line goes, they're told to "ask your doctor" about the latest medication.

There are tight regulations about these ads. That is why they include long lists of side effects and very specific verbiage about the FDA-approved usage of the drug. However, even with these rules in place, pharmaceutical companies work around those regulations to sell more of their products.

An example comes from as far back as 1986, as reported on NPR in their article "Selling Sickness: How Drug Ads Changed Health Care." A large drug advertising company was working with a client to increase sales of Seldane, an allergy medication.

They wanted to run ads on television, but Seldane had a lot of potential side effects. Listing or reading through all of them would not make for a compelling ad. As a workaround, the agency decided to run an ad about allergies and allergy relief, but they did not mention the name of the drug at all.

The ad simply said, "Your doctor now has a treatment that won't make you drowsy. See your doctor." Because the ad did not mention the drug by name, they did not have to list the side effects. At the same time, drug reps were targeting physicians with material so that they would know exactly what allergy medicine to recommend when asked by patients.

Sales of Seldane went from $34 million a year up to $800 million. That is quite a result for an ad that did not even name the product.

Suggested Readings

Brill, *Bitter Pill*.

Goldacre, *Bad Pharma*.

Rosenthal, "Those Indecipherable Medical Bills?"

Questions to Consider

1 Should all news stories about new drugs include information about the price?

2 How would you know if a new drug's price were fair?

SELLING DISEASE

LECTURE 15

So far, this course has covered several questions in the skeptic's toolkit. The toolkit's questions are meant to help to you evaluate the trustworthiness and usefulness of a story. This lecture focuses on the salesmanship toolkit question, which asks whether an article is trying to sell you something.

SELLING DRY EYES

There are clever, sneaky ways to sell people on the need for a drug—and that means selling them on a disease or condition that needs treatment. For example, in October 2016, Fox News featured a story titled "Marisa Tomei Opens Up about Her Struggle with Chronic Dry Eye." To raise awareness about the condition, the news story says, Tomei had "teamed up" with pharmaceutical company Allergan.

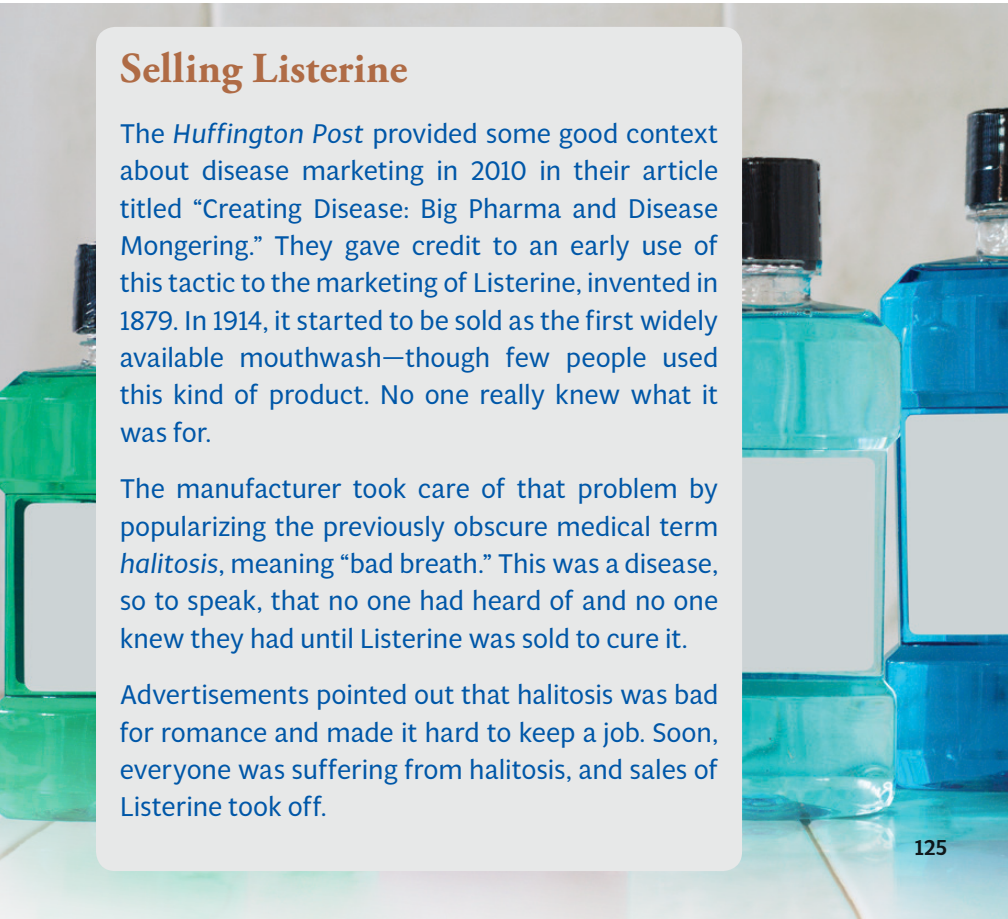
The next few paragraphs recount Tomei's discussion with her doctor about her symptoms. She says she didn't want to "keep worrying about constantly using eye drops." She found a solution, recommended by her doctor, to use Allergan's Restasis—a prescription product that is, ironically, an eye drop. (The article also mentions that Tomei, an actor, has a new movie coming out, adding a dash of celebrity news.)

The entire story is about a health condition, chronic dry eye, which is claimed to afflict up to 5 million Americans. However, dry eye can be caused by a number of things, including aging, using certain medications, allergies, or a dry environment. Most of the 5 million people with dry eyes find easy, safe, inexpensive, and effective relief with ordinary moisturizing drops.

Restasis, the drug pushed in this article, is only FDA approved to treat one medical cause of dry eye, an inflammatory condition called conjunctivitis sicca that is actually quite rare. The story is making the case that people with chronic dry eyes should ask their doctor for a prescription that most of them clearly do not need.

Referring back to the skeptic's toolkit, this story fails the salience test: If you don't have the specific condition Restastis is FDA approved to treat, the story is not salient to your health. It also fails the source test (Tomei is a spokesperson for the company) and the strength-of-evidence test (the article just says the medication helped Tomei). Additionally, there is no discussion of pros and cons, meaning the story also fails the sides of the scale test.

This article is an advertisement posing as a health news story. That is what selling disease is all about.



Selling Listerine

The *Huffington Post* provided some good context about disease marketing in 2010 in their article titled "Creating Disease: Big Pharma and Disease Mongering." They gave credit to an early use of this tactic to the marketing of Listerine, invented in 1879. In 1914, it started to be sold as the first widely available mouthwash—though few people used this kind of product. No one really knew what it was for.

The manufacturer took care of that problem by popularizing the previously obscure medical term *halitosis*, meaning "bad breath." This was a disease, so to speak, that no one had heard of and no one knew they had until Listerine was sold to cure it.

Advertisements pointed out that halitosis was bad for romance and made it hard to keep a job. Soon, everyone was suffering from halitosis, and sales of Listerine took off.

PROZAC AND SARAFEM

One clever marketing trick was mentioned in an *Atlantic* article in 2012, titled "Legal Drug-Pushing: How Disease Mongers Keep Us All Doped Up." The authors here pointed out that "entirely new diseases can be, and have been, invented to extend a manufacturer's patent on a highly profitable drug." The example given involves the antidepressant Prozac, which had become a huge sales juggernaut for pharmaceutical company Eli Lilly since its introduction in 1987, reaching $2.6 billion a year in 2001.

In the first quarter after Prozac's patent expired, sales dropped 66%. Eli Lilly in turn sought and received approval for Sarafem, which is essentially the same drug as Prozac. They positioned it as a treatment for premenstrual dysphoric disorder. Combined with a marketing effort to physicians to prescribe brand-name Sarafem, Lilly's effort effectively allowed them to sell a generic drug at brand name prices.

Some women really do have very bothersome, severe premenstrual symptoms. However, these could have just as easily been treated with a cheap generic medicine. It was only when Lilly could sell a high-priced drug that they began an effort to market both that drug and the disease it treated.

SELLING IN MEDICAL LITERATURE

There has been some attention to the marketing of diseases in the medical literature itself. In 2006, the online journal *PLOS Medicine* published a study titled "Giving Legs to Restless Legs: A Case Study of How the Media Helps Make People Sick."

In the introduction, the authors make a simple but important distinction between raising awareness of disease to help people and raising awareness to sell to people. The remainder of this study is about the marketing of a medication, ropinirole, for a relatively new disease entity called restless legs syndrome (RLS).

The authors review the timeline, starting in 2003 when GlaxoSmithKline launched an awareness campaign about RLS. They released a press release about a company-funded study that stated that a "new survey reveals common yet under-recognized disorder—restless legs syndrome—is keeping Americans awake at night."

Two years later, the FDA approved ropinirole as the only FDA-sanctioned treatment for RLS. After that approval, RLS, according to these authors, "developed into a multimillion dollar international effort to push restless legs syndrome into the consciousness of doctors and consumers alike."

The *PLOS* study then looked objectively at news accounts and articles about RLS and found good illustrations of exactly what effective disease marketing looks like. For example, most of the articles found covered three key marketing areas: exaggerating the prevalence of the disease, encouraging doctors to diagnose it more, and suggesting that people with these symptoms need treatment.

The authors of the *PLOS* report closed with suggestions for journalists on how to report health issues without committing disease mongering. These suggestions are just as valid for readers. Here is a summary:

> Be wary when confronted with news about a new or expanded disease that allegedly affects many people. If something were that common, you probably would have noticed it before.
>
> Just because a treatment exists doesn't mean it makes sense for everyone to use it—some symptoms are mild, and some side effects or costs are more problematic than the disease they're trying to solve.

ATTENTION DEFICIT DISORDER

Rates of diagnosis of attention deficit disorder (ADD)—and rates of the use of medicines to treat ADD—are heading up much quicker that can be explained by genetics and the school environment. *The New York Times* covered this issue in 2013, in an article called "The Selling of Attention Deficit Disorder." They note that about 15% of high-school-age children in the US have this diagnosis (three times the number expected). In 1990, about 600,000 prescriptions were written each year in the US to treat ADD. Now, the number is closer to 3.5 million and growing quickly.

The *Times* article quoted Dr. Keith Conners—a psychologist who developed one of the most commonly used tools to help diagnose ADD—who said, "The numbers make it look like an epidemic. Well, it's not. It's preposterous. This is a concoction to justify the giving out of medication at unprecedented and unjustifiable levels."

The *Times* article points out that the rise in ADD diagnoses and prescription parallels a 20-year effort by pharmaceutical companies to publicize ADD and its treatment. Ads in popular magazines and on television suggested forgetfulness and poor grades as reasons to medicate.

Today, 1 in 7 children receives a diagnosis of ADD by age 18. As these children become adults, drug companies want to keep their business. New diagnoses among adults who had not been diagnosed as children are a big focus of ADD marketing.

CONCLUSION

From the viewpoint of the for-profit drug companies, disease awareness campaigns make perfect sense as a marketing tool. But they can't work without the complicit help of the media. There are other stakeholders, too: Advocacy groups, government regulatory agencies, and researchers all play a role in what sometimes becomes a marketing circus.

But whatever they say, remember that you have a part to play in this, too. Before you are swayed by a news story, keep in mind that some stories are there to sell you something—and you do not need to buy it.

Suggested Readings

Moynihan, et al., "Selling Sickness."

Payer, *Disease-Mongers.*

Questions to Consider

1. How can you tell if a news story is fear mongering about a disease?
2. A new nonprofit organization has just formed to raise awareness of a new disease. How can you make sure they are conveying accurate information?

THE OPIOID CRISIS

LECTURE 16

Most of the overdoses in the United States involve a class of drugs derived from opium, an extract of the opium poppy. Drugs in this class all have identical effects on the human body. They relieve pain and can induce a state of relaxation. When taken in a manner that makes a lot of the drug hit the brain quickly, they produce a euphoric high.

The negative effects include drowsiness, constipation, nausea, and vomiting. They also induce respiratory depression—that is, users breathe less, and that effect increases with an increasing dose. These drugs, with continued use, always cause tolerance, meaning users need to take a higher and higher dose to get the same effect.

They are called, as a group, opioids. Technically, natural derivatives are called opiates, though the distinction between an opioid and opiate is sometimes unclear unless you're a chemist. Because media stories usually call all of these drugs opioids, both when used medically or recreationally, this lecture will do the same.

OVERDOSES AND DEATH

In 2012, paramedics in the city of Pittsburgh responded to about 900 overdose calls. In 2016, it was 2300. The sheer volume is taking its toll not only on the people of Pittsburgh and their families, but on the first responders, too.

In 2017, *The Post-Gazette* published a story on the opioid crisis in the city. Two sentences explain how overdoses lead to death: "When patients overdose on opioids, their breathing slows, they fall unconscious and then stop breathing altogether. The heart continues to beat for a few minutes, but the body soon runs out of oxygen, which leads to cardiac arrest."

From there, death is inevitable in minutes, unless the victim's breathing can be restored and the heart starts beating again. The medication Narcan has to be given almost immediately, and the emergency crews are getting used to all of these calls. Narcan contains naloxone, the drug that reverses the effects of an opioid overdose.

As the story says, nine times out of 10, patients given Narcan are not happy to be saved. They are suddenly torn from their high and find themselves disoriented, in tremendous physical and mental pain. They lash out at the paramedics.

THE BIG PICTURE

Drug overdoses, most of which are from opioids, are now the leading cause of death of American adults under the age of 50. About 64,000 Americans died of drug overdose in 2016, up from 52,000 in 2015. It is likely that the worst is yet to come.

To understand the problem, it is important to understand substance dependence versus substance abuse. Substance dependence refers to the physiologic and psychologic need to keep taking a drug. Dependence itself may not be a problem. People dependent on medications like opioids (or any other medicine) can go about their lives without harming themselves or anyone else. Though dependence can be a risk factor for developing abuse, dependence and abuse are not the same thing.

In contrast to dependence, substance abuse refers not to the reaction of the user's body and mind, but to the manner of use. A typical definition of substance abuse is using a drug in a manner outside of societal norms.

A drug used as a doctor ordered it isn't considered abuse, and smoking cigarettes is not considered abuse. However, taking prescription drugs that weren't prescribed or smoking crack cocaine are examples of substance abuse.

Addiction is substance abuse taken a step further. It is defined by the social impact of abuse. An addict will continue using despite clear negative consequences, like losing a job or needing to be resuscitated by an ambulance crew.

These definitions are to some degree in flux, but the important thing to remember is that not everyone who is chemically dependent on a drug is a substance abuser, and not every person who is a substance abuser develops an addiction. Though they are interrelated, it is not helpful for news stories to lump all of these conditions together, as their consequences are vastly different.

OXYCODONE AND OXYCONTIN

The Guardian's story "America's Opioid Crisis" provides some chilling details on the rise of opioids. The substance oxycodone had been developed in the early 1900s. It had traditionally been used to treat cancer pain. In the 1990s, the drug company Purdue Pharma branded and marketed the compound under the name Oxycontin to treat all kinds of chronic pain, like back pain after a car accident.

From 1996 to 2001, the story says, dozens of "pain management symposia" at picturesque locations across the country were held to host thousands of doctors, nurses, and pharmacists. Purdue doubled its sales force and offered coupons for a free 30-day supply.

Over those six years, sales of Oxycontin rose 1000%, to over 6 million prescriptions written in 2001. A bulletin from the American Public Health Association from 2009 sums up the story in its title: "The Promotion and Marketing of Oxycontin: Commercial Triumph, Public Health Tragedy." That report also outlines how Purdue minimized the risks, claiming in its promotional material for doctors and patients that the risk of addiction was very small, which is not true.

The *Guardian* story also points out that though Purdue was fined $600 million for their misleading advertising in a 2006 case, that figure is dwarfed by the billions made by the owners of Purdue.

Efforts to expand sales of opioids was sometimes masked by funneling marketing dollars to influential nonprofits. As *The Wall Street Journal* reported in 2018, millions of dollars of support money has been paid to patient advocacy groups and other nonprofits by opioid manufacturers, many of whom have been involved with influential lobbying of both laws and medical guidelines.

AVAILABILITY

The ready availability of prescription opioids in the US has sometimes bordered on the absurd. NPR reported a story in January 2018 titled "Drug Distributors Shipped 20.8 Million Painkillers to West Virginia Town of 3000."

Between 2008 and 2015, the article says, two pharmacies just four blocks apart in Williamson, West Virginia, dispensed 20.8 million painkiller pills. Over just two days in 2007, 39,000 hydrocodone tablets were delivered. Areas like this are known as pill mills.

In 2016, 884 people died of drug overdoses in sparsely populated West Virginia, the highest rate in the country. Eventually, the state of West Virginia collected settlements totaling $6 million from the pill distributors who supplied the pharmacies, a mere drop in the bucket.

A COMPLICATED PICTURE

The story is more complicated than simply being about drug companies pushing pills. *Vice*, a print magazine and website out of Canada, ran a long-form article under their Tonic brand in 2017 titled "Prescribed Painkillers Didn't Cause the Opioid Crisis."

These kinds of long-form articles frequently appear in news magazines like *The Atlantic* and sometimes in newspapers like *The New York Times*. They often present a more nuanced, detailed account of news stories.

The article starts out with this summation of the problem: "The idea is that the overdose epidemic was caused by evil drug companies *pushing greedy doctors to prescribe unnecessary drugs, which turned innocent pain patients into people with* heroin *addiction, who are now overdosing on street* fentanyl. That, however, is not exactly what happened."

The article says, yes, drug companies irresponsibly marketed these medications, and made inaccurate claims about addiction risk, and hired salespeople to pressure doctors into prescribing more. However, in recent years, addiction is much more commonly occurring in friends, relatives, and others to whom legitimate opioid prescriptions have been diverted.

Less than a quarter of people who start abusing these drugs get them from doctors. Over half start getting them from friends or relatives. Though the pills share blame, it is not usually the doctors who are prescribing them, at least not directly. Still, doctors are guilty of simply prescribing too many pills. The spare ones sit in medicine cabinets to be shared, borrowed, or stolen.

In sum, the idea that the crisis is being driven mostly by pain patients who took prescribed pills as directed and got hooked is false. Medical use has unintentionally led to easy access to these pills, but it is not the people taking the pills for pain that are the main problem. That leads to a tragic observation: Efforts to curtail addiction by forcing doctors to prescribe fewer of them for pain patients may not work.

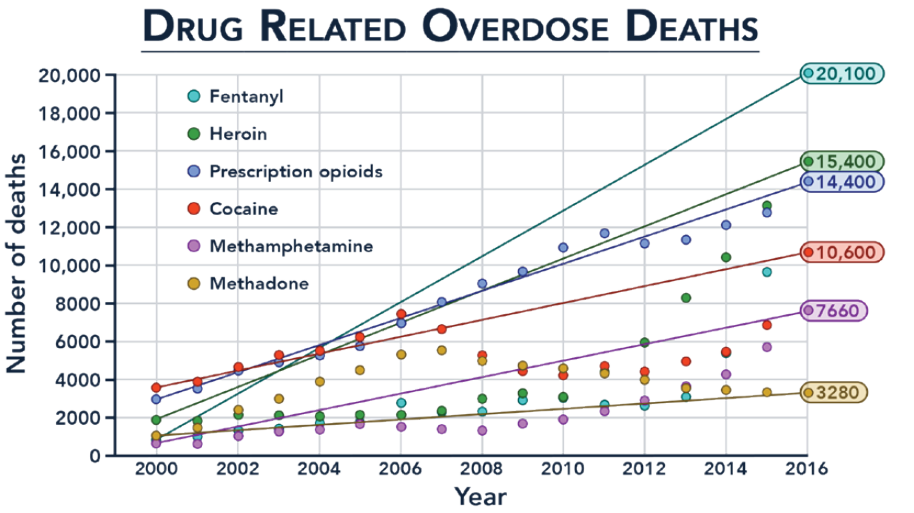
SUBSTITUTES

The current crackdown on physician prescribing may be contributing to deaths. When people who are dependent cannot get those pills (which, at the very least, are pure and consistent), they sometimes turn to substitutes, like heroin or, unknowingly, heroin cut with fentanyl.

In 2010, Purdue altered the composition of Oxycontin, making the pills difficult to crush, and therefore reducing their abuse potential. Since then, deaths directly caused by opioid pills have dropped. However, deaths related to heroin, and more recently fentanyl, have shot up. Fentanyl is now responsible for most of the opioid deaths.

Fentanyl is especially lethal not only because it is so strong, but also because it acts very quickly. It can trigger a deadly overdose and complete cessation of breathing in seconds. Because it is cheap, fentanyl is mixed with other drugs in varying amounts, and users have no idea what kind of a dose they will be getting.

It is believed that most victims of fentanyl overdose were exposed unintentionally. The power and hidden nature of Fentanyl has led to headlines like this, from *The New York Times*: "The First Count of Fentanyl Deaths in 2016: Up 540% in Three Years."



OBSERVATIONS FROM OVERSEAS

An article from the BBC titled "Why Opioids Are Such an American Problem" took a look at the crisis from an outsider's point of view. The article points out that in the US, most insurance companies will cover a pill to treat pain, but they won't often cover other modalities, like massage or physical therapy. The US and New Zealand, alone in the world, allow prescription drugs to be advertised on television, driving up usage.

There is another subtle influence. In the late 1990s the Veterans Health Administration pushed to have a pain score included as a so-called fifth vital sign, along with measures like blood pressure and heart rate. Then, in 2001, the organization that certifies almost all US health systems and hospitals followed suit.

During those years, the message was that doctors always, immediately, had to ask about and treat pain, right away, relying entirely on the patient's report. Treating pain is a good idea, and doctors do not want patients to suffer, but these administrative pronouncements put pain front and center, as the first thing to focus on.

This occurred at the same time strong opioid pills were being marketed as non-addictive. Add that to a culture of using medications to solve problems, and the seeds of a disaster were planted.

FIXING THE PROBLEM

Though reasonable steps to prescribe fewer opioids can help, the threat of addiction comes mostly from diversion—that is, opioids used by people other than the prescribed patient. Tackling that problem can start with prescribing fewer pills, and especially fewer pills to people who won't need them.

We need to empty out our medicine cabinets, too, and safely get rid of these pills. Pill mills and prescription-happy doctors who are clearly prescribing outside of the practices of good medical care need to be shut down.

Doctors also need to step back and make sure they are treating pain correctly. That means that especially chronic pain should not typically be treated with opioids at all, or at least not in isolation.

Medical care providers also need to identify and treat the mental illnesses that commonly contribute to pain or make pain very difficult to deal with. That includes issues like depression, anxiety disorders, and alcoholism, all of which contribute to chronic pain. These are not conditions best treated with opioids.

Addiction requires treatment as well. The best, most effective treatment is by using medically prescribed, long-lasting opioids and other medications to gradually taper off addictive drugs. Another benefit is to get people with addiction off the far more dangerous street drugs.

Addiction therapy carries a stigma, and some people feel uncomfortable with the idea that people with addiction will be getting their drugs from a doctor. Still, when medicines are used properly, they can reduce cravings safely and allow a person to work and live their lives, without constantly worrying about withdrawal. Meanwhile, it is essential to make Narcan easily available.

Suggested Readings

Adams, *Opiate Addiction*.

Fletcher, *Inside Rehab*.

Questions to Consider

1 According to the news reports you've seen, what's the "cause" of the opioid crisis? Did the media play a part?

2 How can the media help solve the problem of opioid addiction?

INFECTIONS IN THE HEADLINES

LECTURE 17

Headlines are what most people read. However, headlines are written not typically by the journalists who write the articles, but by editors who want a punchy headline that fits a space and will attract readers. As stories about infections show, those headlines do not necessarily tell an honest story, and they sometimes misrepresent the very article they are introducing.

EBOLA

In 2014, world news was dominated by a worsening epidemic in West Africa caused by the Ebola virus. Ebola is somewhat difficult to catch. Your mucous membranes or broken skin must touch a victim's body fluids directly. People do not become infectious until they are ill.

However, in the developing world, the Ebola outbreak was devastating. Beginning in 2013, it was the most widespread, sustained outbreak of Ebola in history, causing a total of at least 29,000 cases and at least 11,000 deaths over about three years. Almost all of the cases occurred in three impoverished nations in West Africa, where the overall case fatality rate was about 70%.

Still, as horrible as Ebola was in West Africa, health authorities in developed countries knew that the outbreak was unlikely to spread, even if cases were imported to the UK or USA. That was because we have medical facilities that can isolate a patient as well as plenty of gloves, masks, and gowns that could be incinerated after use.

Regardless, there was a panic, which reached its peak in August 2014. Then, CNN reported under a headline "Two Americans Infected with Ebola in Liberia Coming to Atlanta Hospital." Though the Emory physicians in charge of care were confident of the safety of the hospital staff and the impossibility of the disease spreading here, the article also discussed how "many Americans reacted on social media with fear and trepidation."

The article contrasted reassuring quotes from the Emory doctors with those from a conspiracy theorist, speculating that the Centers for Disease Control and Prevention could deliberately unleash an epidemic so the government could institute authoritarian rule. It is unclear why CNN published this irrelevant viewpoint alongside that of legitimate scientists.

A far better article was written by author Max Brooks and published by Reuters. Brooks is the author of the book *World War Z*, where a plague turns people into zombies, causing a global pandemic catastrophe. The title of his Reuters article was "Is Ebola the Real 'World War Z'? (Spoiler, It's Not.)"

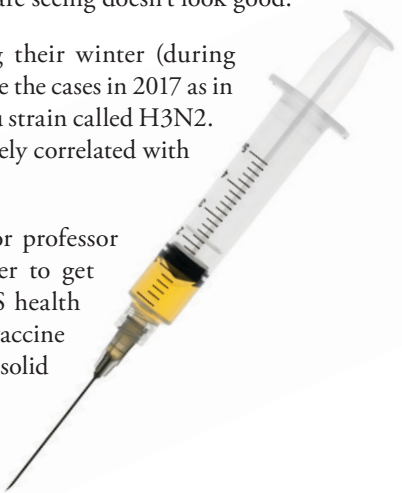
Brooks does a great job explaining how the international response to Ebola has been effective and that Ebola is not poised to become a worldwide problem. He was right. As horrible as Ebola was to the lives and economies of West Africa, it did not spread. There were a total of 11 cases in the United States. Nine of the patients caught it in Africa and then traveled here. Several other countries had a small number of imported cases, but there was never more than very rare transmission of Ebola outside of the three countries at the center of the crisis.

INFLUENZA

This lecture now turns to examine how the media portrays one of America's deadliest diseases, influenza. It focuses on the 2017–2018 flu season. The headlines varied from reasonable and informative to simply wrong.

A fall 2017 article from Today.com was titled "Australia's Tough Flu Season May Be Bad News for U.S." A section of the article read, "Experts usually look to the southern hemisphere's flu season to predict what might start happening here in the fall, and what they are seeing doesn't look good."

Australia had a rough flu season during their winter (during summer in America), reporting about double the cases in 2017 as in the previous year and with a more severe flu strain called H3N2. Australia's experience, in the past, has loosely correlated with America's.



The article includes quotes from a Baylor professor exhorting everyone six months and older to get their flu vaccine, as recommended by US health authorities. He acknowledges that the flu vaccine is imperfect, but that it is beneficial. This is solid journalism with actionable information.

FLU COVERAGE, CONTINUED

By November, flu season was starting to heat up. CNN ran an article titled "Flu Season: It's Early, but Experts Are Concerned." The article reviewed the early experience with flu that year and encouraged readers to get the vaccine. But there was a new shift in tone: "Last year's seasonal flu vaccine effectiveness was just 42%."

This article emphasized the shortcomings of vaccines. It used true statements, but that seed of doubt, once planted, can affect vaccine uptake. The fewer people who get a vaccine, the less effective it will be.

In a way, news articles that discourage vaccination create a self-fulfilling prophecy. If people in a community don't get vaccinated, it won't work. In November 2017, the tide continued to turn against vaccines. NBC News featured this headline: "Here's One Reason Flu Vaccines Are So Lousy: They're Grown in Eggs." That title implies there are many reasons flu vaccines are lousy.

The article talks about how flu vaccines are made using older technology that is time-consuming and far from perfect. However, the article also quotes a medical expert who says, "It's much better to get the vaccine than not to get the vaccine."

By December in the US, the media panic was in full swing. CBS News ran the headline "This Year's Flu Vaccine May Only Be 10% Effective, Experts Warn." This story was based on the Australian experience from their winter, which showed a low vaccine effectiveness against the strain they saw most commonly in Australia. It was too early to tell if that would be the dominant strain in the US.

By January 2018, it was clear that the US was having, as predicted by many, a bad flu season. Headlines that month were dominated by the stories, especially stories of young people struck down by flu.

THE CDC PRESS RELEASE

A simple press release, reported by the CDC, spawned widely disparate headlines. The information was released at a press conference on February 15 and published in print for the general public one day later.

The publication from the CDC had a wordy title: "Interim Estimates of 2017–18 Seasonal Influenza Vaccine Effectiveness, February 2018." This is CDC-collected data from five study sites across the US, with the first preliminary estimate of overall vaccine effectiveness against the flu virus. The bottom line was this: Flu vaccine effectiveness was 36%. Its effectiveness specifically among children was better, at 59%.

All of the following headlines are from February 15, 2018, and all are reporting on the same material released to the press.

From the *Wall Street Journal* came "Flu Vaccine Less Effective Than Earlier Estimates." That doesn't sound right, since the low end of earlier estimates was the widely reported 10% seen in Australia.

Newsweek had this headline: "Was Getting the Flu Shot Worthwhile? Vaccine Only 25 Percent Effective against the Most Common Strain." It is true that the vaccine was only that effective against one strain, but when considering the combination of what was circulating, the effectiveness was 36%.

Besides the numbers, these authors got something else critically wrong, as shown in the quote, "if you are vaccinated and you run into a flu virus, you have a 64% chance of getting sick." That is not what these figures mean.

Vaccine effectiveness is a comparison between vaccinated and unvaccinated people, expressed as a relative risk. It does not reveal an individual's chances of catching flu.

Time magazine got it right with their simple headline, "CDC Estimates This Year's Flu Vaccine Is Only 36 Percent Effective." The Associated Press agreed with the figure, though missed the mark on the blame with their headline, "Flu Shot Only 36% Effective, Making Bad Year Worse." A better vaccine would be great, but it was mostly bad luck that made this a bad flu season. If more people received the vaccine, it could have delivered much better protection overall.

A few news outlets covered the same announcement from a more positive light. *The New York Times* said in a headline, "The Flu Vaccine Is Working Better than Expected, CDC finds." Compare that headline to the one from *The Wall Street Journal*. These were two well-respected news organizations reporting on the same data released on the same day at the same press conference. Their headlines are the opposite of each other, and a reader's impression of the usefulness of flu vaccination is going to be colored by the editorial slant of the headline.

That *New York Times* article also compared flu vaccine effectiveness (estimated at 36%) to overall seatbelt effectiveness. Studies dating back to the 1970s show seatbelts prevent injuries 40% of the time. However, that is not to say you shouldn't wear a seatbelt: 40% is much better than nothing.

Seatbelts also help make major injuries more minor, much in the same way that flu vaccinations, even when not effective in preventing flu completely, do make people less sick if they do catch the flu. It is a very apt comparison. That comparison, the positive tone, and good in-depth reporting of the issue all deserve praise.

Suggested Readings

Barry, *The Great Influenza*.

Centers for Disease Control and Prevention, http://cdc.gov.

Offit, *Vaccines and Your Child*.

Questions to Consider

1. Looking back, what do you recall about the media coverage of the Ebola epidemic that started in West Africa in 2013? Do you think they did a good job?

2. What's the information you need most in a news report about a new infection?

HEALTH RISKS IN OUR ENVIRONMENT

LECTURE 18

Health news is often about risk: This food is risky to eat, or that sport is risky to play. There are risks in the air we breathe, and there are risks associated with the medicines we take. All of these statements are literally true—everything we do has some risk, and there is no way to avoid all of the many risks we face each day. This lecture focuses on media portrayals of risk, and it highlights some examples of good reporting—that is, news stories that paint an accurate picture, useful for making decisions to help avoid or mitigate risk.

Two tools from the skeptic's toolkit—strength and salience—are especially relevant to stories discussed in this lecture. When considering these stories, and those in the rest of this lecture, ask yourself: What's the strength of the evidence? Also ask: Is this information salient to me?

Strong evidence is based on large, well-planned and-executed studies, and salient evidence is based on studies on people who are very much like you. If the subjects in a study aren't people like you, the study is less salient and less worth worrying about.

CELL PHONES

In 2016, several news outlets reported on preliminary results from a government-funded study on the health effects of cell phones. A CBS News headline read, "Study Reignites Concerns about Cellphones and Cancer," and the *Wall Street Journal* said, "Cellphone-Cancer Link Found in Government Study." However, the studies were done on rats. Health risks to a rodent aren't necessarily salient to people.

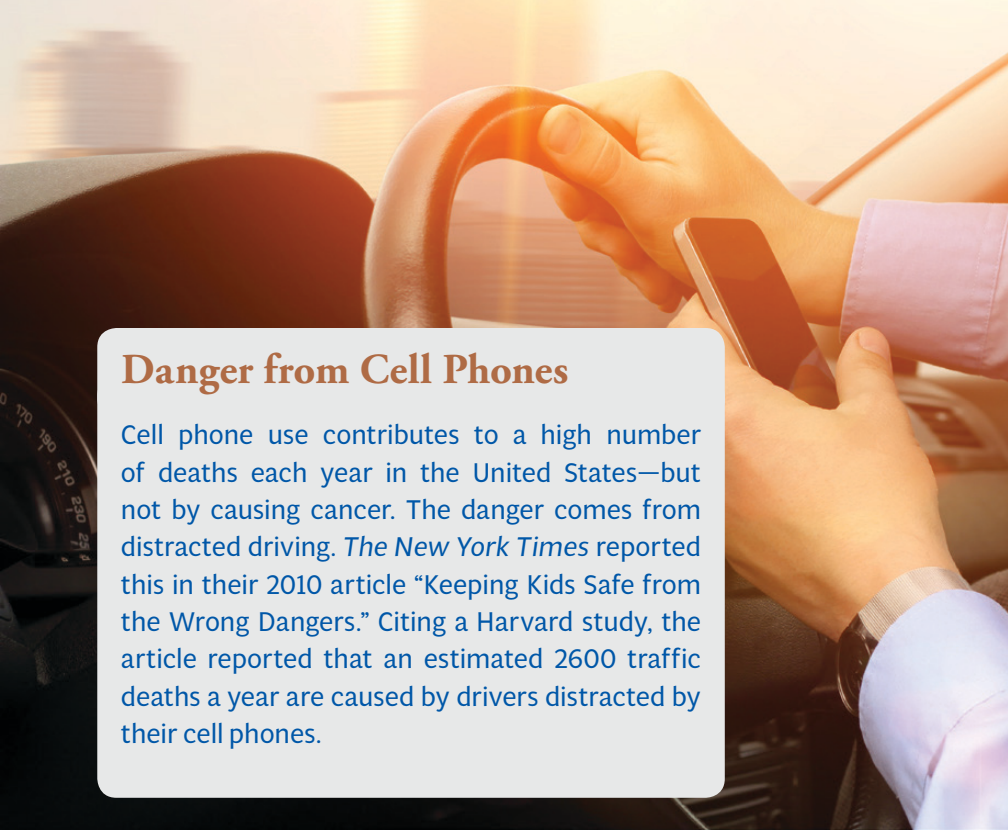
The strength of the study is also questionable. Ars Technica, a science-oriented website, ran an article about the shortcomings of the study that was headlined, "Study That Found Cell Phones Cause Cancer in Rats Is Riddled with Red Flags." One problem was that another set of data, this one on mice, was not released. (The data analysis on mice came out later and showed no cancer risk.) Additionally, none of the findings had been published in peer-reviewed literature.

Another odd point was that zero of the control rats developed any cancers at all. The study was done on a special species of rat developed for lab use that had a very high chance of developing cancers, and that none of the control rats did was an unexplainable surprise. Also, on average, the control rats who were not exposed to cell phone radiation died younger than the cell phone–exposed rats. That didn't make sense, and raised the idea that since the control rats died so young, they didn't have time to develop the cancers seen in the exposed rats.

That cell phone radiation exposure was associated with an overall longer lifespan—which was exactly what the data showed from this rat study—could have been highlighted in the headlines. However, the observation was largely ignored, as was another odd point: The association with cancer was only observed in male rats.

Ironically, in the same month, another cell phone study was released. This one was published in the journal *Cancer Epidemiology* and received very little media attention. The study looked at about 35,000 people in Australia diagnosed with brain cancer between 1982 and 2012, across the years where cell phone use became widespread.

If cell phone use were a cause of cancers, one would expect to see a rise in cancer, especially starting 5–10 years after cell phone use became common. However, that wasn't seen. The age-adjusted brain cancer rates didn't change. This was a much stronger study—it was on humans with a large number of participants—but it received much less media attention than the study on rats.



Danger from Cell Phones

Cell phone use contributes to a high number of deaths each year in the United States—but not by causing cancer. The danger comes from distracted driving. *The New York Times* reported this in their 2010 article "Keeping Kids Safe from the Wrong Dangers." Citing a Harvard study, the article reported that an estimated 2600 traffic deaths a year are caused by drivers distracted by their cell phones.

CLEANING PRODUCTS

Journalism sometimes goes astray, as shown by coverage of a 2018 study on cleaning products. The UK's *Independent* reported on the study under this headline: "Cleaning Products As Bad for Lungs As Smoking 20 Cigarettes a Day, Scientists Warn." Headlines like that were unjustified by the study that was being reported and grossly overstated the risk.

The study itself looked at cohorts, or groups of people, over 20 years, tracking who was and who was not exposed either occupationally or at home to cleaning products. There were over 6000 participants who had repeated lung function testing across the study years. The data showed that women, but not men, exposed to cleaning products had a gradual but significant decrease in lung function over the time of the study.

That the finding was only in women raises important questions about the validity of the data. Perhaps there genuinely is a different effect of these chemicals on the lungs of women versus men, but the big point of the headlines was that exposure to these products was comparable to smoking cigarettes. This is good for an eye-catching headline, but it's not actually true.

Smoking has many deleterious health effects, including increasing the risks of many kinds of cancers, heart attacks, and stroke. None of that was measured in this study, which only looked at declining lung function. That can be caused by smoking, too, but because smoking causes so many other ill effects, comparing the health effects of cleaning products to cigarette use is an exaggeration.

THREE REPORTS

Three news reports on the same study show an interesting contrast in approaches. The articles were about a study published in the *New England Journal of Medicine* in 2017, looking prospectively at the breast cancer risk associated with the use of hormonal contraceptives, including birth control pills.

This study certainly passes the tests for strength and salience. It involves 1.8 million women, followed for an average of 11 years, using a health database in Denmark that's designed to accurately capture both prescriptions filled for these medicines and diagnoses of breast cancer. The study concluded that:

> The risk of breast cancer was higher among women who currently or recently used contemporary hormonal contraceptives than among women who had never used hormonal contraceptives, and this risk increased with longer durations of use; however, absolute increases in risk were small.

The key phrase is "absolute increases in risk were small," which is important to keep in mind when assessing articles about the study.

REPORT 1: *THE NEW YORK TIMES*

The New York Times article "Birth Control Pills Still Linked to Breast Cancer, Study Finds" did a good job covering the study, highlighting what kind of study was done and why it was important. It presented the risk of hormonal contraceptives, way up at the top of the article, in absolute terms. The first sentence presented the big picture, stating that women who rely on these products face a "small but significant" increase in the risk of cancer.

A few sentences later, they presented the absolute numbers: For every 100,000 women, hormonal contraceptives cause an additional 13 breast cancer cases a year. Thirteen additional cases per 100,000 is a small number, but it's a real number, and it's an apt comparison that women can use to consider their choices.

REPORT 2: CNN

Sometimes, though, risk is expressed in a different way that's misleading. Take, for example, the CNN article titled "Birth Control Is Still Linked to Increased Risk of Breast Cancer." The article's opening sentence reported that "birth control can increase a woman's risk of breast cancer by up to 38%, depending on how long she has taken it, a new study finds."

Though 38% sounds like a huge increase, it is a relative increase, not an absolute increase. Health stories about risk should always focus on absolute risks, which are numbers that are useful and meaningful, rather than relative risks, which are more eye-popping.

In a group of 100,000 women, the increased risk of one year of contraceptive use was 13 additional cases of breast cancer, or an increase from 55 to 68. The relative increase, which is 13 divided by 55, is about 24%, a fairly large number. However, the absolute risk increased from 55 over 100,000 (or 0.06%) to 68 out of 100,000 (or 0.07%). The absolute risk increase is the difference between 0.07% and 0.06%, or 0.01%.

The clearest way to present these numbers is the way *The New York Times* did: In a group of 100,000 women, 13 more may develop cancer. These numbers are all quite literally true, but reporting the relative numbers, especially in headlines, exaggerates the findings of this study of risk.

REPORT 3: *NEWSWEEK*

Newsweek's story on the study was headlined "Breast Cancer: Birth Control May Increase Risk by up to 38%." They hammered the relative risk angle in their headline. They also further scared readers in their second paragraph, stating that "nearly a quarter of American women are doing something that might increase their risk of developing breast cancer by a third."

The story also has a tangential and poorly referenced statement about an increased risk of suicide, after which it wanders from more reassuring statistics to a brief sentence about the cost of unwanted pregnancies. Overall, the article is riddled with problems.

FAKE NEWS STORIES

Newsweek finds some redemption in their 2018 article titled "Facebook Spreads Viral Fake News Story about Vaccines." The fake article included references to a CDC doctor who said the year's flu outbreak was being caused by the flu vaccine. That statement, along with almost the entirety of the article, was false.

Fake news stories have been around a long time, but the *Newsweek* coverage highlighted a new twist: Popular sites like Facebook are allowing these fake stories to reach far more people than ever before. Over 60,000 people had shared that article on Facebook, making it one of the top four articles of the week, and it was entirely fabricated. The takeaway point is something is not necessarily true just because it looks like news.

That adds another question for your skeptic's toolkit. When reading a story, ask yourself: Is this story sensible? In this case, does it make sense that flu vaccines, which have been in worldwide use for decades and are recommended by every major health authority on the planet, are actually causing flu outbreaks? The answer is no. It is not sensible. If you read a health story that doesn't make sense, you should pause and think before you take it seriously.

Suggested Readings

Kahneman, *Thinking, Fast and Slow*.

Levitt and Dubner, *Freakonomics*.

Questions to Consider

1. What is the best way for a news report to clearly communicate how risky a new drug's side effects might be?

2. Does the news sometimes exaggerate or minimize risks? Think of some examples.

QUIZ 3

Is each statement true or false?

25 Cancers of all kinds should be treated as aggressively as possible to avoid metastases and premature death.

26 Screening for prostate cancer and breast cancer are the two safest and most effective cancer screening procedures.

27 Drug company representatives targeting busy doctors is an effective way to raise sales of a drug.

28 If you do not want to pay full price for an expensive brand-name drug, you can always get a generic version.

29 Drug companies can boost drug sales by marketing disease awareness. For example, they might exaggerate the prevalence of a disease (like ADD or dry eyes) or persuade us that something that did not use to require medical treatment now does (like baldness or having a double chin).

30 Celebrity endorsements sell drugs the same way they sell soft drinks and cars.

31 Naloxone is a drug that quickly reverses the effects of opioids, including trouble breathing and the opiate high.

32 Deaths from drug overdose will likely decline from their 2016 peak of 64,000.

33 It was sheer luck that the Ebola virus didn't become a worldwide plague.

34 Unless you are very young, very old, or have cancer, you are probably better off skipping the flu shot.

35 The media can be a force for good in dispelling myths about health and medicine.

36 The latest research shows that power lines, cell phones, and asparagus all cause cancer in humans.

Answers on page 210

BAD SCIENCE

LECTURE 19

The methods of science aren't perfect, and scientists don't always follow the rules. Scientific studies can be skewed by fraud, shoddy design, and bias. This lecture provides examples of each in turn.

FRAUD

In 1995, a researcher from South Africa, Dr. Werner Bezwoda, published a groundbreaking paper in the prestigious *Journal of Clinical Oncology*. Bezwoda had shown that a dangerous and expensive therapy was remarkably effective against advanced breast cancer.

His statistics showed that 51% of women given his protocol, including high, almost lethal doses of chemotherapy followed by a bone marrow transplant, achieved remission of their cancer. That contrasted with a dismal 2% of women using conventional therapy.

A team of oncologists became suspicious of his work, traveling to South Africa in 2000 to review his data after the paper was published. What they found was a tangled mess of poor documentation, deceptive study enrollment, and some outright lies.

Bezwoda's paper was published in 1995, and he continued to present data from the paper and from subsequent patients at meetings over the next several years, even while skepticism and calls for more transparency grew. The story broke in the press in February 2000, with stories like this one from *The New York Times*: "Breast Cancer Researcher Admits Falsifying Data."

After Bezwoda admitted to fraud, it didn't take long to change how the therapy could be used. One of the US's top insurers, Aetna, announced that they would no longer cover the astronomical costs of this therapy unless the patient was enrolled in a legitimate study. In June 2001, about six years after it was published, the study was formally retracted from the *Journal of Clinical Oncology*.

SHODDY DESIGN

Even if a study isn't outright fraud, sometimes studies cut corners or otherwise bypass good scientific methods to produce results that shouldn't be taken seriously. For example, in September 2012, French researcher Gilles-Éric Séralini published a paper in the journal *Food and Chemical Toxicology* showing that rats fed GMO corn and exposed to a common herbicide developed cancers and other health problems.

The study made a huge media splash. But even the first few news reports on the study contained some red flags. As reported by the BBC in their piece "French GM-Fed Rat Study Triggers Furore," the authors insisted journalists given access to the story sign an unusual non-disclosure agreement, preventing them from reviewing the study with any outside experts prior to publishing their reports.

Additionally, photos of the rats with tumors implied that tumors like that only happened in exposed rats, but they occurred in control rats, too. The study rats used were a special breed with a very high baseline incidence of tumors and cancer.

Skepticism mounted quickly. By November 2012, about two months after the study was made public, the European Food Safety Authority weighed in with a summary of their assessment of the paper. They said the author's conclusions "cannot be regarded as scientifically sound because of inadequacies in the design, analysis, and reporting of the study."

About a year after the Séralini study was published, it was formally retracted by the journal. This story illustrates the crucial role of the media in conveying health information, though this time with a twist. Remember, the study authors insisted in this case that traditional journalistic practices were bypassed.

Reporters given early access to the study so they could write their stories were not allowed to discuss the study with outside experts, so the initial reporting was only from the author's perspective. The required non-disclosure agreements sabotaged the idea that good health journalism should present both sides of the scale, meaning articles should include multiple viewpoints.

Selling Subscriptions

Journals need to sell subscriptions, so editors favor studies that will be noticed—that is, new things, exciting things, and positive results. Studies that repeat experiments or refute the effectiveness of a new drug are very important, but they're not thought to be as effective for selling subscriptions.

BIAS

Another problem that can hamstring studies is pervasive bias. It affects every stakeholder in the chain, from the scientists designing and performing studies, to nonprofits and government agencies that provide grants to pay for studies, to the editors who choose which studies to publish, to the journalists who choose which published studies make headlines.

The website HealthNewsReview.org reviewed the problem in their essay "Null but Not Void." They looked at the broad coverage of initial studies that seemed to show something works. In one example, the many headlines claimed that, based on an observational study, a class of drugs called statins could help prevent cancer. However, subsequent, much better experimental studies don't get the same kind of coverage. If they're negative, meaning that the latest drug in fact does not help prevent cancer, they're likely to not get any coverage at all.

In one quoted study, two-thirds of the time after an initial positive study was widely reported in the media, subsequent research refuted the initial findings. That subsequent research was seldom covered. There is a strong international effort underway to ensure that all studies—positive and negative, complete or incomplete, and published or not—are all registered on websites that allow public access.

However, for now, we are only likely to hear about studies with positive findings. That is not an accurate reflection of what research is actually showing. If what we hear is not the complete picture, that is bad science.

Suggested Readings

Goldacre, *Bad Science.*

Reinhart, *Statistics Done Wrong.*

Questions to Consider

1. What should a good reporter do before reporting a science story to make sure it's true?

2. How can scientists and universities more quickly identify fraudulent or shoddy science?

DIET, HEALTH, AND THE POWER OF WORDS

LECTURE 20

Words have power. The words we use to describe and discuss things carry their own weight and connotations, and they shape the messages we remember most. This lecture looks at how several headlines and articles use words to deliver messages.

SUPERFOODS

The term *superfoods* refers to foods that have properties that seem almost magical. The term has no medical meaning, and physicians, dieticians, and nutrition scientists do not use the term. It is a marketing word that's been applied to many foods that are supposed to have special health-giving properties.

The first widespread use of the term superfood occurred in the 1920s, as part of a campaign by the United Fruit Company to sell more bananas. The word really took off around 1990, when it was popularized in several books and articles featuring lists of these so-called superfoods. Blueberries, kale, ginger, turmeric, seaweed, chickpeas, and many other foods have been given the superfood moniker, and their superfood status has led to big spikes in sales.

ACAI

A specific example of the superfood phenomenon is acai. It is a fruit with a single pit surrounded by edible flesh. It was essentially unknown outside of South America until about the year 2000, when two brothers and a friend from Southern California started exporting it to the US.

At one point, acai was one of the fastest growing foods in history, billed as a cure for (among many other things) ADD, autism, arthritis, Alzheimer's disease, erectile dysfunction, and obesity. Both the rise and the fall of acai was driven by, of course, fickle media attention.

Many stories from the late 2000s were about acai's meteoric ascent. The *Los Angeles Times* reported the phenomenon in 2008 under their headline "Acai Has Gone from Staple of the Amazon to Global Wonder-Berry." But some articles were already questioning whether the craze was justified, like ABC's story "Superfood Acai May Not Be Worth the Price."

ABC pointed out total US sales had gone from $500,000 to $13.5 million over the prior two years, fueled in part by discussions on *The Oprah Winfrey Show*. Though the two brothers who first brought acai to the US continued to import and sell the fruit, huge multinational food and cosmetic companies like the Coca-Cola Company and Procter & Gamble were also paying attention, and started including acai in their beverages and cosmetic products.

The ABC News story even quoted an owner of a GNC franchise, saying that his store doesn't promote acai for weight loss, but that many customers were looking for weight loss. That skeptical ABC News story, though, pointed out that there was zero evidence for acai's role in weight management. In 2009, *The New York Times* also questioned acai's health claims in their "Pressing Acai for Answers" article.

THE ACAI STORY, CONTINUED

Nevertheless, in the year preceding this story, sales had continued to boom from about $13 million to $106 million, including foods, beverages, and cosmetics. By then, it was clear that there was some shady business going on in the selling of acai products. Lawyers for Oprah Winfrey and her on-show physician, Dr. Oz, were fighting to get their names removed from marketing materials, and the FTC was suing acai marketers for their extravagant and unjustified claims.

Stories like "Acai Berry Scam: You'll Lose Money, Not Weight" from NBC in 2010 warned consumers against both exaggerated claims and against shady sales practices, like repeatedly charging credit cards for shipments of acai that couldn't be cancelled. In 2011, *Fox News Health* published an article titled "The Truth about Acai Berries," calling the fruit a "bloodied and wounded survivor of American marketing gone wild."

Acai is just one of a number of so-called superfoods that have captured media attention and marketing resources. Other examples include sacha inchi seeds, maca, and natto. They're exotic, adding to their appeal. They're all nutritious, many with high protein and a good amount of vitamins. But none of them, in any way, are magical or super, and none of them have been shown to cure or prevent any disease.

UK's *The Telegraph* provided some good perspective in their 2014 article "The Myth of the Superfood."

> The trouble is, no one knows what a superfood is, and there's no good evidence that any of the things we call superfoods are actually any better for us than the normal fruit and veg we should be eating as part of a balanced diet anyway.

Sometimes, the media can go too far in the other direction. Though extravagant claims for the benefits of superfood are unjustified, extravagant claims about purported dangers of superfoods have been equally exaggerated.

From the UK's *Daily Mail* in 2014, a headline read "Why so-called 'superfoods' could be bad for you: nutritionist says kale can send your thyroid haywire and quinoa irritates the gut." These scary claims were backed up by essentially no evidence, but that shouldn't surprise anyone who's been critically reading about other superfood claims.

PINK SLIME

A negative word or phrase can bring up a connotation of something unappetizing or even disgusting. For example, according to an article from *Slate*, "processed beef trimmings got rebranded, again and again." That product was long known as finely textured beef, but in March of 2012, ABC News ran several reports about what they characterized as lax rules from the US Department of Agriculture (USDA).

They said these rules allowed meatpackers to sell what was implied to be an unsanitary, poorly nutritious, noxious mush—so-called pink slime—as ground beef. That memorable nickname seems to have been coined by a USDA microbiologist in an email in 2002. After the 2012 news reports, pink slime quickly became the widely used name for the product, and that phrase dominated news coverage.

Several billion pounds of the product had been sold since 1993 under the name lean finely textured beef. However, once it was essentially renamed pink slime by the media, sales plummeted.

In June of 2017, *The Wall Street Journal* ran the story "ABC News Settles 'Pink Slime' Food Libel Lawsuit." The article revealed that "ABC News has reached a settlement with the maker of a processed-meat product that critics dubbed 'pink slime,' bringing an end to a defamation lawsuit that threatened the network with billions of dollars in damages."

The beef company's attorney, in a quoted remark in the story, said, "It took ABC 30 days to destroy" the product line by "rebranding the product as pink slime." Rebranding, here, refers to changing its name, which completely changed its public perception. The product was the same, but the words describing it changed, and that had the power to stop people from consuming a food they'd been eating for over 20 years.

CLEAN EATING

Clean eating has become very popular over the last decade or so. The first, more moderate version of clean eating started in 2007, with a book called *The Eat-Clean Diet*. It was written by Tosca Reno, a Canadian fitness model. She wrote about her own loss of 75 pounds while transforming her health by avoiding processed foods, especially refined flour and sugar.

In 2009, Uruguayan-born Alejandro Junger, a cardiologist, published a best seller, *Clean: The Revolutionary Program to Restore the Body's Natural Ability to Heal Itself*. His fundamental argument, as reported by NPR, was that our bodies are full of toxins that slow us down and make us sick.

The way to fix this, he claimed, is to both avoid a long list of toxin-laden foods and to go on periodic, restrictive dietary breaks to "detox" the body—that is, subsisting for a few weeks on liquid shakes, juices, and soups.

Banned foods, according to this newer version of clean eating, included dairy, sugar, red meat, alcohol, caffeine, wheat, soy, peanuts, and many vegetables including potatoes, tomatoes, eggplants, and peppers. Also recommended was the purchase of very expensive kits of dietary supplements and other products to further enhance the cleansing effect of this diet.

After Reno and Junger laid the groundwork, social media, especially Instagram, Facebook, and dozens of influential blog sites, made eating clean a highly influential and widespread phenomenon.

The driver all of that attention was not researchers or scientists or dieticians. It was a series of internet stars who wrote endlessly and passionately about how clean eating made them healthy and changed their lives. What began on the internet soon bled back into traditional media and influenced traditional dietary advice.

Backlash began about as soon as clean eating became widespread. Some early proponents turned their back on the term, pointing out that it had become too restrictive and judgmental, a form of body fascism. Many pointed out that eating clean had become a faddish, cult-like avenue that could lead to eating disorders.

A new, though not-yet-formalized medical diagnosis has been proposed to refer to a new kind of eating disorder inspired by the kind of super-restrictive and moralistic diet to which some clean eaters aspire. It's called orthorexia, meaning an obsession with eating foods that one considers healthy. It has become one of the most common reasons for referral to eating disorder specialists. Despite the backlash, the clean eating trend continues to be influential.

Suggested Readings

Gavura, "A Closer Look at Dr. Oz's 15 Superfoods."

Medlin, "'Clean Eating' Debunked."

Questions to Consider

1 Do you think you've been swayed to purchase superfoods by the media?

2 How can a news story be sure to present a balanced viewpoint on the health impact of specific foods?

GENETICS AND THE MEDIA

LECTURE 21

It is the nature of the scientific process to experiment and re-experiment, and to not hold steadfast to seemingly established facts. By questioning, researchers will find the mistakes and draw ever closer to elusive truth. This lecture looks at that process—and media coverage of it—through the topic of genetics.

OBESITY

There have been some mistaken conclusions about genetics along the way. A *Newsweek* article, published on September 9, 2009, concluded in a simple, three-world title: "Obesity Is Genetic." The article claims that the genetic code we carry in our cells is by far the single most important factor in determining our weight. Many genes have been discovered that regulate body weight. Together, they essentially force us to weigh what we weigh and make it very difficult for us to lose weight by, for example, eating fewer calories.

One specific example was given of a boy from England with a specific genetic mutation in a gene that produces the hormone leptin. He and a similarly affected cousin both became massively overweight in early childhood. Given injections of the hormone his body couldn't make, his weight dropped into the normal range by the time he was six years old.

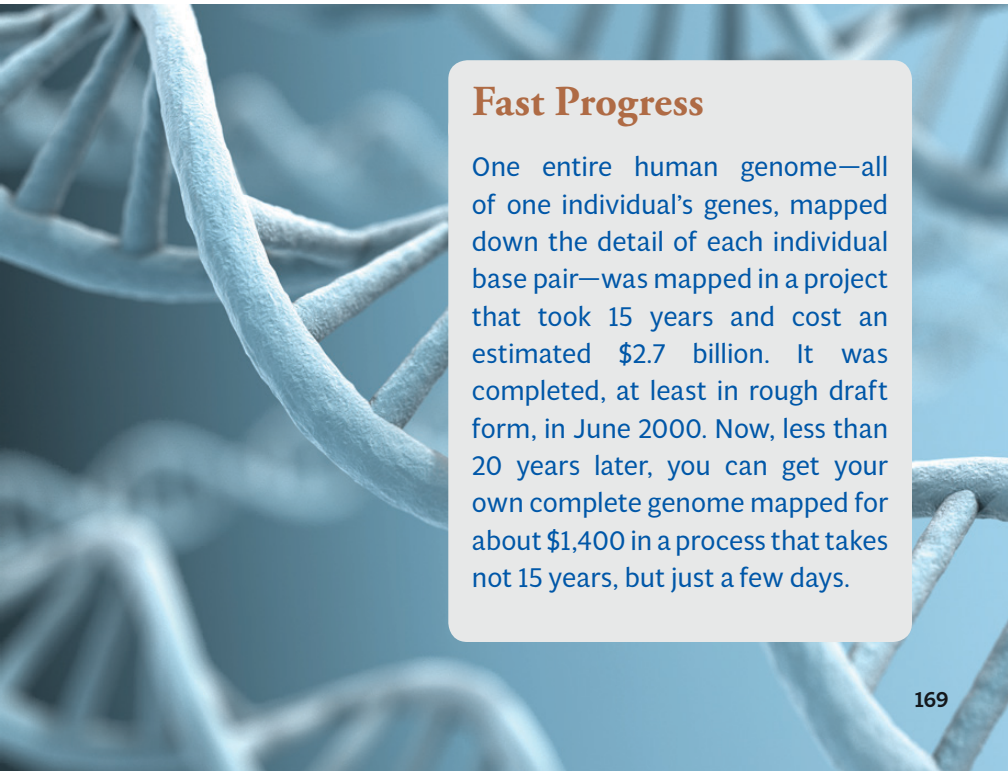
The *Newsweek* article acknowledges that defects in that leptin gene are very rare. It also says that than 10% of people with morbid obesity have a defect in genes controlling food intake and metabolism. That brings up the question of whether the title's conclusion that obesity is genetic is justified.

From September 2010, about a year later, a *Telegraph* headline said, "Genetic Excuse for Obesity Is a Myth." Their story was largely about a Cambridge University study of 20,000 adults, looking at 12 separate genetic markers for obesity. They found that even people who were the most genetically susceptible to obesity could work off 40% of their extra weight.

Therefore, genetics contribute to obesity, but there are some environmental influences, too. *Time* magazine covered this issue in 2016 under their headline "If You Can't Lose Weight, Don't Blame Your Genes." This article claimed that obesity-related genes contribute to only 3% of the differences among people's body mass index, or BMI—a commonly used statistical measure of overall body fat proportion.

The New York Times came back swinging a few months later in 2016, with "Americans Blame Obesity on Willpower, Despite Evidence It's Genetic." That leaves us with four headlines, two of which firmly state obesity is genetic and two of which firmly declare that it is not.

Science may be self-correcting, and hopefully we will eventually arrive at a good understanding of the role of genetics in obesity. For now, it is certain that we have more to learn.



Fast Progress

One entire human genome—all of one individual's genes, mapped down the detail of each individual base pair—was mapped in a project that took 15 years and cost an estimated $2.7 billion. It was completed, at least in rough draft form, in June 2000. Now, less than 20 years later, you can get your own complete genome mapped for about $1,400 in a process that takes not 15 years, but just a few days.

GENETIC TESTING

Certain conditions, such as cystic fibrosis and Down syndrome, have a simple genetic basis. These are testable. However, many more conditions do not have a direct, causal, one-to-one connection to genes. Certain genes may raise or lower risk, but knowing about them does not reveal if a person will have the disease.

There is a growing industry that uses broad genetic screening tests to look at hundreds or even thousands of genetic health risk factors. Other, similar tests are being marketed to look at genetic markers that are claimed to reveal your ancestry or heritage. At least one company offers a test that allegedly reveals a child's athletic potential. But are these tests accurate?

From *The New York Times* in October 2017, a story was headlined "Personal Genetic Testing Is Here. Do We Need It?" The tone of the article was set by the subheading: "Jody Christ, in her home in Elysberg, PA, says genetic testing saved her life, though experts warn such tests require caution."

This article begins with a personal story about a 62-year-old woman who struggled unsuccessfully for years to control her high cholesterol. A genetic test revealed she had an inherited condition, familial hypercholesterolemia, which put her at high risk for atherosclerotic heart disease. She underwent triple-bypass heart surgery and credits the genetic testing to saving her life.

However, this example, which so dramatically starts and therefore frames the rest of the article, is not a realistic example of the kind of genetic testing that the rest of this article talks about. Ms. Christ had a specific, known health issue—intractably high cholesterol—and testing revealed a known, definite, causal diagnosis.

The remainder of the article discusses a far more common kind of genetic testing: testing on asymptomatic people, or people who aren't having any health problems. That kind of testing is very different. According to the article, "Experts say many people are using a growing stream of genetic data to help them make better health decisions. But they also warn that some consumers may be led astray by genetic findings that are overblown or irrelevant."

That cautious sentiment is followed by a paragraph about a company offering testing for genetic variants "linked to" several kinds of cancer, or another test for heart problems. They then present a glowing quote from the medical officer of one of these companies.

From a scientific standpoint, this article moves quickly from measures that have some scientific support to those that have little. Quoting a professor of genetics, the article says, "There's this mixture of some that have real solid footing and then some that have zero footing."

PERSONAL TESTING

The *Times* article, though beginning with a personal endorsement, did at least superficially cover the shortcomings inherent in the interpretation of these tests. A 2017 *Huffington Post* article focused on a different caveat that ought to be considered before testing. Titled "What to Consider Before Taking a 23andMe Test," the article revealed its thesis in the subhead: "You might not want to know all of your health results."

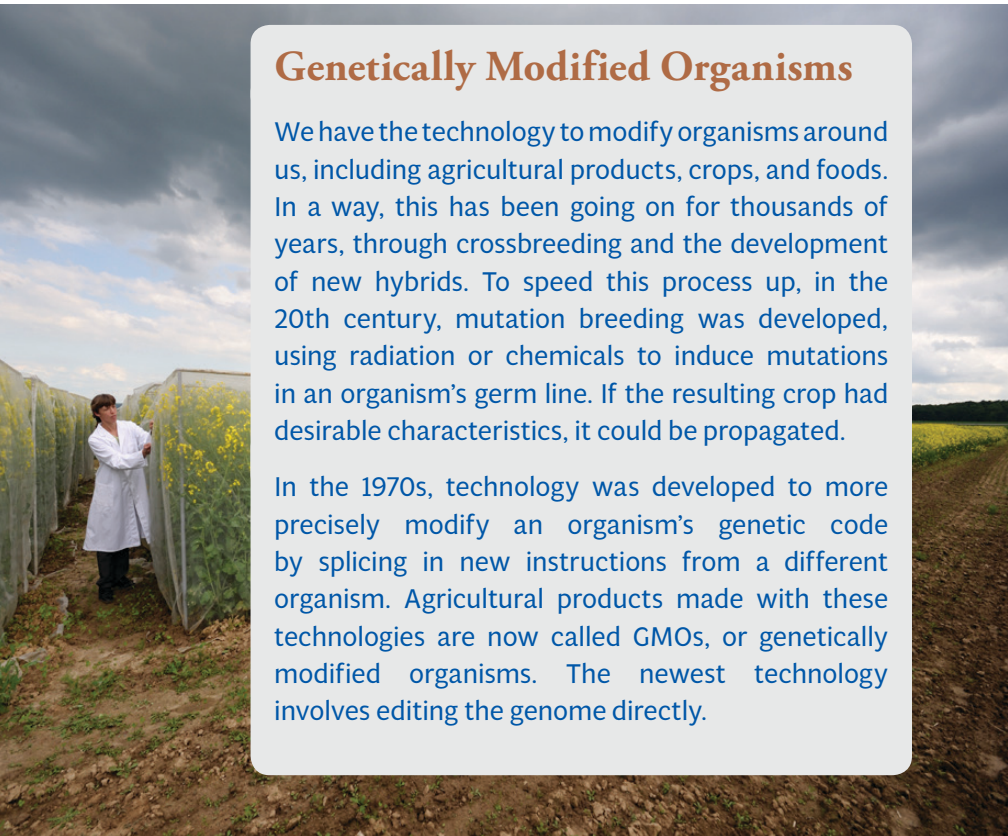
The title refers to testing by a specific company, 23andMe, which is one of the largest direct-to-consumer genetic testing companies. The author of this article claims this company alone has tested over 3 million people.

The article starts from the first person, which is ordinarily taboo in traditional journalism, but gives the article a more personal touch. It begins:

> I stared at the email announcing "Your 23andMe results are ready" for several minutes before I had the courage to uncover my genetic health and ancestry secrets. I was excited to discover whether I was predisposed to be lactose intolerant or consume more caffeine than the average person. However, I was nervous about learning of more serious issues like whether my DNA made me more likely to get Parkinson's or Alzheimer's diseases.

The article continues, talking about how more and more of these consumer genetic tests are likely to become available. "Yet experts worry," to quote the article, "that consumers might be psychologically unprepared to handle frightening health information." This is especially likely when it might be revealed we are at risk for diseases that currently have no cure or even a good prevention strategy, like Alzheimer's or Parkinson's disease. In fact, the FDA approval of 23andMe's health tests explicitly requires consumers to opt in to testing for these kinds of conditions.

Other potential pitfalls are mentioned more briefly: Would this kind of information change retirement planning, or whether to buy long-term care insurance? What if employers or insurance companies found out about this kind of testing? Could that lead to discrimination?



Genetically Modified Organisms

We have the technology to modify organisms around us, including agricultural products, crops, and foods. In a way, this has been going on for thousands of years, through crossbreeding and the development of new hybrids. To speed this process up, in the 20th century, mutation breeding was developed, using radiation or chemicals to induce mutations in an organism's germ line. If the resulting crop had desirable characteristics, it could be propagated.

In the 1970s, technology was developed to more precisely modify an organism's genetic code by splicing in new instructions from a different organism. Agricultural products made with these technologies are now called GMOs, or genetically modified organisms. The newest technology involves editing the genome directly.

GENETIC MANIPULATION

Genetic manipulation involves technology that can directly change a person's genetic code. This is now, technically, feasible: It is being done, and newspapers are starting to talk about it.

From the *Los Angeles Times*, in August 2017, an article's headline was "In a First, Scientists Rid Human Embryos of a Potentially Fatal Gene Mutation by Editing Their DNA." The story is about a procedure reported in the journal *Nature*, a landmark that was "the first time that scientists have altered the human genome to erase a disease-causing mutation not only from the DNA of the primary subject but from the genes of his or her progeny as well."

The goal would be to fix disease-causing genes to permanently remove them from a genetic lineage. Such power would be incredible, but would also bring the potential for less high-minded aspirations. To quote the article, "others fret that the technique may be used for less noble purposes, such as creating designer babies with desired traits like green eyes, an athletic build, or an aptitude for mathematics."

As the article points out, in the US germline editing is forbidden outside of a research setting. But technology has a way of crossing borders and escaping from labs, and we should address the implications of this kind of tinkering before it becomes widespread.

The New York Times did a good job providing some reassurance in their article "Gene Editing for 'Designer Babies?' Highly Unlikely, Scientists Say." As the article puts it, science is "highly unlikely to be able" to "genetically predestine a child's Ivy League acceptance letter, front-load a kid with Stephen Colbert's one-liners, or bake Beyoncé's vocal range into a baby."

The takeaway point is this: While there are thousands of examples of diseases that can be linked to a single genetic change, there are far more diseases and characteristics that are related to multiple genes, each contributing something to the final outcome. Fears about designer babies, to quote *The New York Times*, "are closer to science fiction than they are to science."

Suggested Readings

Brooker, *Genetics.*

Genetic Literacy Project, https://geneticliteracyproject.org/.

Mukherjee, *The Gene*.

Questions to Consider

1 Do you think it's likely that we'll have so-called designer babies in your lifetime?

2 Is the news doing a good job explaining complicated topics in genetics? How can they do a better job?

HOW TO STAY YOUNG

LECTURE 22

This lecture focuses on health questions such as: What are the best ways to stay young and healthy? This lecture concentrates on the best way to find answers to such questions in the news sources all around us.

SEARCH ENGINES

Search engines can be a helpful tool for finding health information. Google is the most widely used search engine. You can enter your search term in the form of a question, using plain language. An example would be: What are the best ways to prevent aging and stay young?

At the top of the results page, you'll see just how many answers Google found—millions of results, in the example question. However, you don't have to read or even skim most of those. The most useful results will usually be in the first few pages.

Sometimes, you'll find paid results at the top, marked with a small "AD" icon. These aren't necessarily wrong answers or bad answers, but keep in mind that someone paid for you to see them up at the top.

The best, most reliable answers come from authoritative government sites. Ones from the US government, like those of the Centers for Disease Control and Prevention, end with a .gov extension.

Additionally, look for large, legitimate professional societies and nonprofits, like the American Academy of Pediatrics or the American Cancer Society. Big media sites, like *The New York Times*, *USA Today*, or many other national news sources are often good starting points.

In the example search asking how to prevent aging, there also appeared a series of articles from a variety of sources that all claim to list things like the secrets of staying young. Three tips appeared on multiple lists: Drink more water, take vitamins, and get more exercise. These all seem like common sense, but next, this lecture will examine them in turn.

DRINKING MORE WATER

From MSN.com's article "25 Secret Tips to Stop the Ageing Process" comes the tip: "Drink lots of water." The article says that though doctors recommend 8 glasses, they recommend 12 (with no specific reason), and they claim this will help you be healthy and look younger. There are no links or citations at all. More trustworthy health news articles will link back to their sources, or sometimes list them at the end.

Health.com's article "The 27 Best Anti-Aging Tips of All Time" cites a dermatologist who recommends we drink half of our weight in ounces per day. Under that advice, a person weighing 180 pounds would drink 90 ounces of water a day. Assuming 8-ounce glasses, that would be 11 glasses, which is in the range the MSN article recommends.

However, a question from the skeptic's toolkit is important here: Is this advice sensible? It is likely impractical for many 180-pound people to drink 11 glasses of water a day. It would be even more difficult for a 300-pound person to drink 19 glasses per day.

In reality, there is no exact amount of water you should drink. It depends on how much fluid you are losing from sweat and in other metabolic activities. You should certainly drink when you feel thirsty, and you should drink more when you're exercising or in a warmer environment. Beyond that, there is no specific scientific evidence that provides any magic number for how much we ought to drink to stay healthy, and even less evidence for how much we ought to drink to prevent aging.

TAKING VITAMINS

The next recommendation is to take vitamins. From the MSN article "25 Secret Tips to Stop the Ageing Process" comes the advice: "Take vitamins daily. Taking a daily supplement of especially vitamins E and C and antioxidants tablets can help a lot." *Health* magazine included separate tips to both "eat your antioxidants" and "load up on vitamin C."

Antioxidants are chemicals that protect our tissues from what are called oxygen radicals. This is a form of oxygen that occurs naturally, and it damages our cells. Damage from oxygen radicals accumulates over time, contributing to aging.

Therefore, it makes sense that vitamins like vitamin C and E, which have antioxidant properties, might help prevent or ameliorate the effects of aging. However, the important consideration is this: Does ingesting more of these vitamins, an extra supplement or more foods that naturally contain them, really prevent us from feeling or looking older?

Antioxidants on the Internet

Keep in mind that many search results regarding antioxidants and aging come from vitamin and supplement sites. They are uniformly positive and glowing. This is salesmanship—something to watch out for.

One useful article on the topic is titled "Effects of Antioxidant Supplementation on the Aging Process – NCBI – NIH." As for the abbreviations in the title: The NCBI is the National Center for Biotechnology Information, and NIH is the National Institutes of Health. Articles like these are usually distributed freely after publication in scientific journals, and they are often the most authoritative reviews on a specific subject.

This article features 126 citations, summarizing the best evidence for and against the positive effect of antioxidant supplementation to fight the aging process. The article itself is long and not written for a lay audience. However, you can usually scroll down to the final paragraph of an article like this to find a simple summary. In this case, to paraphrase, the summary states that there is not enough evidence to recommend these supplements to help slow aging.

SEARCHING FOR ANSWERS ON VITAMINS

The question remains: Can multivitamins help us live longer, healthier lives? If you want to find out the answer, you can start again with a computer search, asking: Should I take a multivitamin? Concentrate on the top results from sites and locations that you have heard of.

One example of a good source comes from Healthline.com in an article titled "Do You Need to Take Vitamins?" They reached the conclusion that most people don't benefit from multivitamins, unless they have a diet that is lacking. Healthline deserves extra praise for providing multiple citations linked directly from the text of their article, many of which point right to the original published research.

The takeaway lessons from looking at the vitamin issue are look for articles that are well referenced, and ones that avoid hyperbole and salesmanship.

EXERCISE

Exercise is a lifestyle choice that really can help fight the effect of aging. It often appears on internet articles. For example, one tip from Health.com's article "The 27 Best Anti-Aging Tips of All Time" is to "make exercise a priority." The article continues to say, "regular workouts can help you look and feel younger than your years, according to research. A recent study of older adults published in *The Journal of Physiology* discovered that the more active participants functioned physiologically similar to younger adults."

The second quote does not include a direct link to the journal article they claim supports it. However, with a computer search, you can find it. Entering the quote "A recent study of older adults published in *The Journal of Physiology* discovered that the more active participants functioned physiologically similar to younger adults" into a search engine will likely pull it up.

That article is titled "A Review of the Effects of Physical Activity and Exercise on Cognitive and Brain Functions in Older Adults." It is a long paper, with over 80 references to other journal articles. The last sentence of the abstract, a summary written by the study authors, is this: "These findings suggest that physical exercise is a promising nonpharmaceutical intervention to prevent age-related cognitive decline and neurodegenerative diseases."

The article itself goes into far more detail and includes some important caveats: We don't know how much exercise is needed or what kind of exercise is ideal. It is also unclear exactly how exercise itself is beneficial. However, the benefits of exercise to help keep our bodies and minds younger are real and substantial.

Suggested Readings

Gifford, *Spring Chicken*.

Medline Plus, "Healthy Aging." Access at https://medlineplus.gov/healthyaging.html.

Questions to Consider

1. What kinds of therapies have been suggested to you by news stories to help you stay young?
2. How can you tell if those suggestions are believable?

CURES FOR THE COMMON COLD

LECTURE 23

Medical history is littered with hundreds of promising leads on cures for the common cold that didn't pan out. This lecture looks at some of these leads, including some ideas that were met with great optimism and enthusiasm in the press.

VITAMIN C

From *Men's Journal*, a 2017 headline read "Down Vitamin C Like a Crazy Person to Keep Colds Short and Sweet." The article says that a study from the University of Helsinki reexamined the results from two previous trials that had examined the effect of massive doses of vitamin C taken at the start of a cold. In the highest doses studied, six or eight grams a day, there was a documented drop in the duration of colds by 17 to 19%.

This article passes the test for being a legitimate source: The study was done at a university and published in a legitimate journal, *Nutrients*. There is also no obvious attempt at salesmanship, so the article passes that test as well.

However, it fails the other four tests. Regarding sides of the scale, there is no mention of any potential downside to taking such large amounts of vitamin C, which can include negative effects such as nausea, diarrhea, and abdominal pain.

The strength of the study is a problem because we have no idea how many people were involved. Salience is a problem as well: We don't know the makeup of the study group.

Finally, this article fails the final test, sensibility. It is not sensible to take potentially harmful doses for such a meager response. Shortening a cold by less than 20% hardly makes it, to quote the headline, "short and sweet."

ECHINACEA

Echinacea is an herbal product that has been used as a cold remedy. In 2016, a *Wall Street Journal* article referred to a four-month-long study on one specific brand of echinacea, made by the company Bioforce. The study subjects, over four months while on placebo, had 188 colds, versus 149 colds among those taking echinacea. This difference, the article says, was not statistically significant.

However, the next paragraph says "the report also found placebo participants suffered 26% more days with colds, a difference that was statistically significant, says study co-author Roland Schoop, a medical adviser at Bioforce, which funded the study." There are two glaring problems here.

First, the sentence right before that one said that the primary results of the study, looking at the number of colds occurring among those on echinacea versus placebo, were not statistically significant. That means this was a negative study. It did not show any difference in the primary endpoint in the study versus placebo groups, so echinacea was not shown to be effective. But the next paragraph says that if the same data were counted differently (percentages of days versus number of colds), there was a statistical difference. That is suspicious. If the primary endpoint doesn't show a difference, there is no difference, and restating of the findings to squeeze out positive results is misleading.

The second problem is that the company that makes the product paid for the study. That does not automatically invalidate it, but it does mean added skepticism is necessary. Moreover, it was the company spokesman who restated the study results as if they showed that the product worked. According to the primary results of the study, it did not.

CHICKEN SOUP

Chicken soup has also been examined as a cold remedy. In 2017, the UK's *Daily Mail* ran the article "Does Chicken Soup Really Help Fight a Cold? Yes!" The article references two studies to support its claim.

The first study, from 2010, is not salient. It looked at the movement of neutrophils, a white blood cell involved in fighting infections, and how that movement changed with exposure to chicken soup. It is not salient because it did not look at people, or people with colds, or even cold symptoms at all. Seeing how neutrophils move differently when exposed to chicken soup really does not reveal how chicken soup might help a cold.

The second study is summarized this way: "Another study conducted nearly 40 years ago found that chicken soup's aroma, heat and spices could help to clear sinuses and congestion by breaking up mucus and opening airways." That is all the detail the article provides—hardly enough to even apply the skeptic's toolkit.

Keep in mind that a lack of evidence does not mean that chicken soup is ineffective. No one has shown it does not work to fight the common cold. There just are not many studies that have looked into it.

ZINC

In 2011, *The Telegraph* ran an article with the headline "Take Zinc to Fight a Cold, Say Scientists." The article goes on to say, "a review of 15 clinical trials published since 1984 has concluded that taking supplements can reduce the length of a cold and help ward one off in the first place."

Their source is the Cochrane collaboration, a nonprofit, non-industry-sponsored group that looks objectively at published studies, often combining them into reviews to get the best overall assessment of a medical intervention. This is a solid source, so the article is off to a good start.

The article reports that "the latest *Cochrane Review* found that people who took a zinc syrup solution or lozenge every two hours while they had a cold were twice as likely to have shed it within a week as those who took a placebo. Children who took a zinc tablet once a day for at least five months were also a third less likely to get colds as those who took a placebo." These sound like good, meaningful endpoints, and they're referencing studies on human volunteers, not white blood cells.

The article also provides balance, passing the sides of the scale test: It brings up that "the scientists cautioned that they did not yet know what dose was best, and said some zinc formulations had side effects including nausea, bad taste and diarrhea."

For an article of this length, there are plenty of solid details, and the article correctly paints a promising picture of the potential use of zinc to fight off common colds. Zinc does sound promising, perhaps not as a cure, but at least something worth trying to drive cold symptoms away faster.

VITAMIN D

Vitamin D hasn't received as much attention as vitamin C as an infection fighter, but it might be more promising. For example, in 2017, NPR ran the article "A Bit More Vitamin D Might Help Prevent Colds and Flu." According to the article:

> An analysis … suggests the sunshine vitamin can help reduce the risk of respiratory infections, including colds and flu—especially among people who don't get enough of the vitamin from diet or exposure to sunlight. Researchers pooled data from 25 studies that included more than 10,000 participants. The studies looked at whether vitamin D supplements cut the number of infections.

That is a large number of studies and participants. This supports the idea that this is a strong analysis. It is also salient: The analysis looked at both adults and children and found similar results. The study also has a reliable source: It was published in the *British Medical Journal*, and the NPR story provided a direct link.

The article also features balance, addressing the sides of the scale. Other researchers and physicians are quoted, ones who weren't involved in this study. They point out that people who have a good diet shouldn't be deficient in vitamin D, and the study showed that they may not benefit; still, as others point out, many people just don't get enough vitamin D.

The biggest downside in this otherwise strong article was in this sentence: "Vitamin D supplements seemed to reduce the risk of infection about 10 percent." That is a modest change, and it is unclear whether it is measured as an absolute or relative change.

Either way, the effect size of vitamin D to prevent colds is not large. However, vitamin D supplements are safe when taken in reasonable doses, as discussed in the article. Vitamin D might not be a cure for everyone, but it might help, and this article covered the medical issues well.

Suggested Readings

Centers for Disease Control and Prevention, "Common Colds." Access at https://www.cdc.gov/features/rhinoviruses/index.html.

Novella, "Treating the Common Cold."

Questions to Consider

1. A friend suggests an herbal remedy for the common cold. How can you tell if it is likely to be effective?

2. What websites do you visit most often for health information, and why?

THE MEDIA'S ROLE IN IMPROVING HEALTH

LECTURE 24

This lecture looks at the media's role in a particular large health story: smoking. It then concludes the course with some takeaway points to keep in mind.

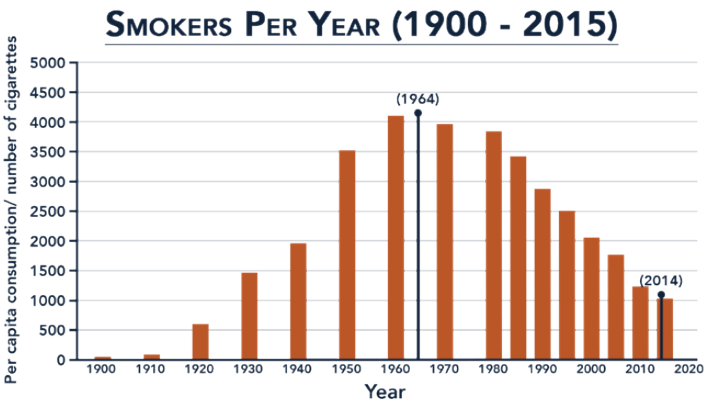
THE 1960S AND SMOKING

January 11, 1964, was a turning point in one of the most significant public health challenges of the last millennium. On that day, the United States government published a report. A Saturday was chosen to minimize the immediate impact on the American stock market and to help get maximal attention in widely circulated Sunday newspapers.

The title of the publication was "Smoking and Health: Report of the Advisory Committee to the Surgeon General of the United States." It was 387 pages long and cowritten by a group of 10 experts, including big names from medical, scientific, and statistical fields. With the help of 150 additional consultants, 7000 scientific publications were reviewed to distill and summarize what was known about the effects of smoking on health.

The report was very careful not to overstate what published studies could support. There were only two causative inferences—that is, only two health outcomes that the authors felt were positively shown to have been directly caused by smoking: chronic bronchitis and lung cancer. Correlations were also found between smoking and four other outcomes: a 70% increase in age-adjusted mortality, emphysema, heart disease, and decreased birth weights in babies born to mothers who smoked during pregnancy.

The impact of the report was huge. A graph of smoking rates in the US hits its peak right around 1964, when half of men and a third of women were current smokers. In 2014, the smoking rate had dropped to about 17% overall, with a continued drop in the percentage of youth smokers, which means that the source of all future smokers continues to dry up. Corresponding to this change has been a dramatic shift in the public's perception of the health effects and social acceptance of smoking.

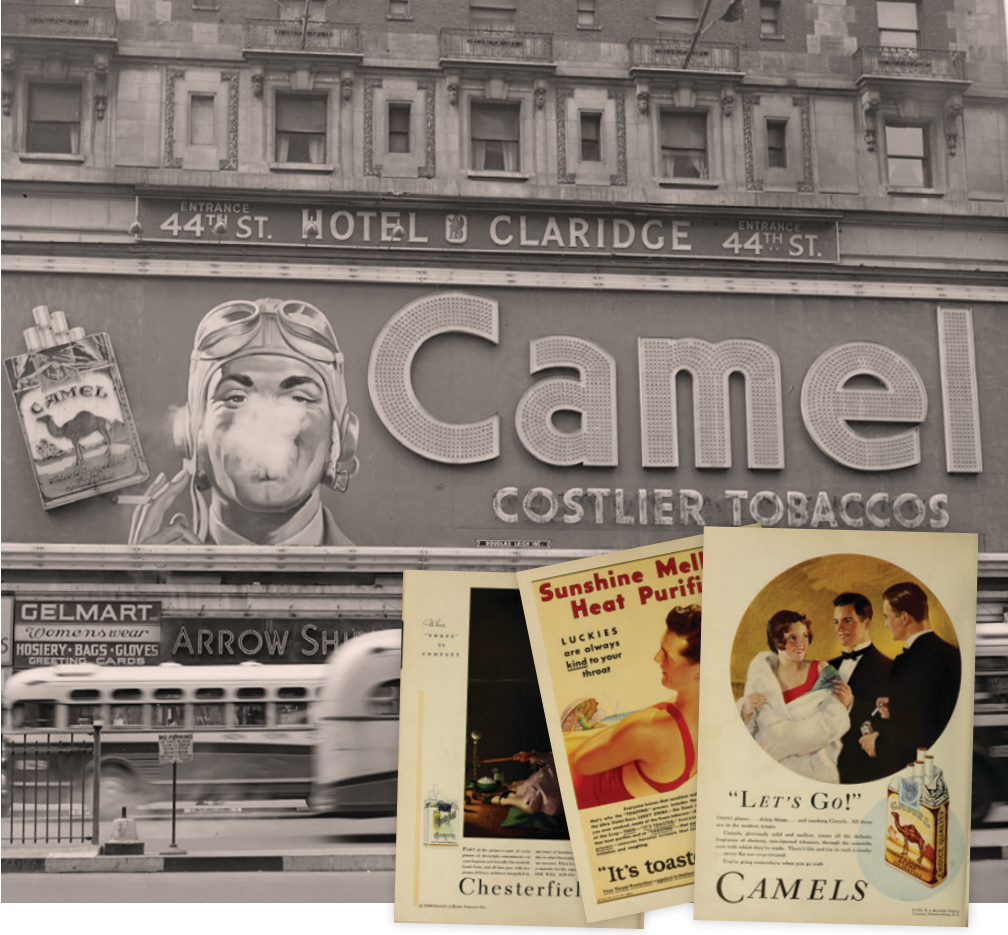


Earlier reports had been met by public skepticism or indifference. It took decades to change the perception of smoking. Credit for that change goes mostly to the media and to how its messages shifted with an evolving understanding of the health effects of smoking. Paradoxically, the media deserves a lot of the blame, too, for encouraging smoking for so many years.

THE RISE OF SMOKING

Smoking, both its rise and its fall, is a great example of the power of media to shape our minds and our lives. Cigarette smoking took off in the early 20th century, with the development of automatic cigarette rollers and the rise of unprecedented advertising and promotional efforts.

There was some token opposition from temperance advocates, but neither the general public nor physician leaders recognized that there was much of a health threat from smoking.



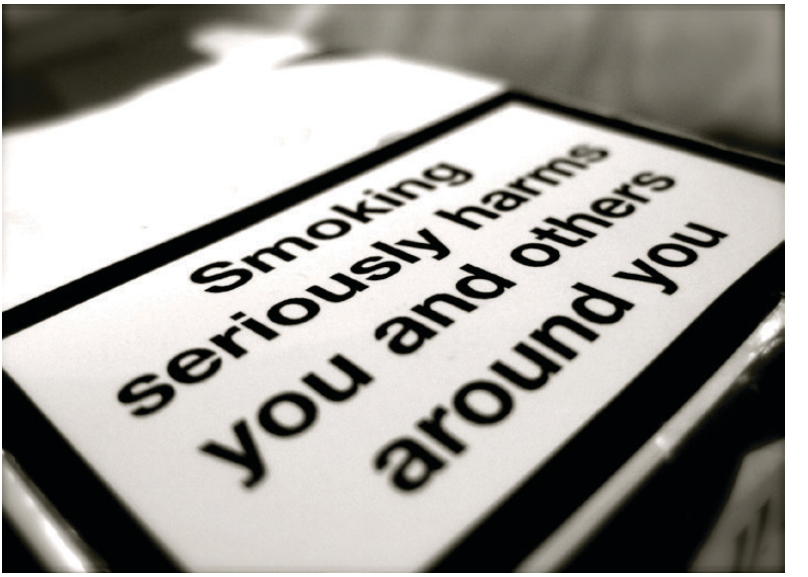
By 1950, evidence for smoking's negative effect on health was strong, with rigorous observational studies linking smoking with death and disease. That year, the Federal Trade Commission, charged with preventing false advertising, declared that cigarette ads highlighting the health benefits of smoking were deceptive.

In 1953 cigarette sales, for the first time, dipped slightly—this in the wake of increased press coverage of published studies linking smoking with lung cancer. The response of the tobacco industry was to introduce filtered cigarettes, which quickly gained most of the market, despite there being no evidence whatsoever that these were less dangerous or led to fewer cancers.

By 1954, sales had rebounded and continued to increase for another decade. The year 1953 marked another shift from the cigarette manufacturers, when public relations firms were brought on board to begin a massive campaign challenging the evidence that smoking was harmful. Over the next 40 years or so, hired physicians and academics wrote papers, presented at conferences, and made media appearances to cast doubt and sow confusion about the extent of the scientific evidence.

CHANGING PERCEPTIONS

In 1966, the US Congress passed the Federal Cigarette Labeling and Advertising Act, which required packages to include a cautionary label stating, "Caution: Cigarette smoking may be hazardous to your health." A few years later, that warning was strengthened from "may be hazardous" to "cigarette smoking is dangerous to your health." Television and radio ads and most sponsorships were banned completely, though print and billboard ads remained pervasive.



As the public perception of smoking shifted, political winds started to change, too. In the 1970s a growing number of communities began to restrict smoking. Antismoking advocacy gained even more momentum as evidence for the ill effects of second-hand smoke began to accumulate.

The 1988 surgeon general's report for the first time declared that smoking was truly addictive, and this chemical addiction was driven by nicotine. Public support for smoking dwindled.

By the 1990s, higher tobacco excise taxes along with further restrictions on smoking both in public and at many businesses continued to make smoking more and more inconvenient. That added to declining social acceptance of smoking and continued the downward pressure on smoking rates.

The true difference maker was a change in the public acceptance of smoking. Once that began to erode, initiatives like increased taxes, mass media campaigns, and smoke-free policies were not only more palatable to the public—they became inevitable, and they all reinforced smoking's decline.

THE MEDIA'S ROLE

From 1964 to 2012, an estimated 8 million premature deaths were prevented by the drop in smoking rates. That illustrates the power of an effective health media. That includes not only the traditional health news media, but also the influence of television commercials, movies, and TV shows.

In 1961, a review of the 30 most-watched prime time programs counted nearly five episodes of tobacco use per hour. A similar study done in 2011 showed that number had dropped to about one episode per three hours of prime time television. Cigarette use was featured in 80% of PG-13 movies released in 2002, a figure that dropped to 38% by 2013.

There is still work to be done: 38 million Americans still smoke, causing 440,000 premature deaths a year. Smokers die, on average, 14 years earlier than nonsmokers. And there is far more smoking in many other countries, who have lagged behind in both public perceptions of smoking and in laws and policies that support anti-smoking efforts.

Seatbelts, Nils Bohlin, and the Media

In 1958, a Volvo engineer named Nils Bohlin invented what is essentially still in use worldwide: the modern three-point seat belt that includes a diagonal strap across the chest. When Bohlin died in 2002, Volvo estimated that his seat belt design had saved over 1 million lives. Media campaigns such as Vince and Larry, a pair of crash-test dummies that appeared in commercials, helped fuel the success of seatbelts. However, problems such as distracted driving and driving under the influence remain a serious problem.

CONCLUSION

This course has looked at both the highs and the lows of health media coverage. Headlines can be deceiving, and journalists can get stories completely wrong. However, the media can also be a powerful tool to teach us and to guide us to making better decisions.

That applies not only to us as individuals but to our communities and our laws. Perceptions and attitudes change, guided by not just what we know, but what we feel about what we know, the stories and faces that we remember, and the ones that have the most impact.

You can't believe everything you read, especially on social media sites where posts from questionable sources appear. But you can believe the best of journalism: stories that are based on strong evidence, that are well sourced, and that present both sides of an evolving story.

Most of the time, you can tell which stories are the ones to believe, and even if you cannot, you can read a few more stories from other sources before you make up your mind. Also remember that knowledge can change with time, as newer research refines or even replaces what we thought we knew. That is not a weakness; it is a strength.

Suggested Readings

Lerner, *One for the Road*.

Mothers Against Drunk Driving, https://www.madd.org.

Questions to Consider

1. What single issue do you wish the news could cover in a way that would help more people?

2. What is the biggest issue in health media reporting that you can remember? Why is it so memorable?

QUIZ 4

Is each statement true or false?

37 Bone marrow transplants have been established as an effective treatment for breast cancer.

38 Journals that publish articles for a fee from the author may not be as reputable or reliable as peer-reviewed journals that do not charge a fee.

39 There is good scientific evidence that acai berries promote weight loss and cleanse the body of toxins.

40 Pink slime was a name used for lean, finely textured beef that destroyed the market for that product.

41 One of the great weaknesses of science is that its hypotheses frequently turn out to be wrong.

42 Modern gene testing can predict most of the major diseases you are likely to contract in your lifetime.

43 Good sources for health news include government organizations like the CDC and national news sources like *The New York Times*.

44 Some of the tools in your skeptic's toolkit include knowing the source of the data, judging the strength of the data, and being aware of salesmanship.

45 Vitamin C, echinacea, and chicken soup have all been proven to be effective in curing or drastically reducing the seriousness of the common cold.

46 The salience of a study is whether it applies to you and people like you.

47 Three areas where the media had a big impact on public awareness of and response to a health issue are smoking, seatbelt use, and drunken driving.

48 Texting or using a cellphone while driving may be against the law, but it is probably not all that dangerous.

Answers on page 211

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QUIZ ANSWERS

1 The name Premarin for the hormone replacement drug comes from "pregnant mare urine." **(true)**

2 For the average healthy male, testosterone supplementation improves sexual function, mood, and behavior, and decreases risk of heart attacks. **(false)**

3 Chronic traumatic encephalopathy, or CTE, is a danger for American football players but not for soccer players. **(false)**

4 CTE can be caused not only by major head trauma, but also by repeated minor head injuries. **(true)**

5 A person's condition never improves when taking a placebo. **(false)**

6 A double-blind study means neither the patient nor the health professional giving the medication knows whether the study medication is real or a placebo. **(true)**

7 A large confidence interval means the results are very accurate. **(false)**

8 The findings of a research study may show a true difference between study aims even if they are not statistically significant. **(false)**

9 Drugs that help mice lose weight do not necessarily translate to efficacy in humans. **(true)**

10 If two-thirds of Americans are now overweight, maybe that is the new normal, and we should not worry so much about an extra 20 pounds. **(false)**

11 The benefits of drugs hailed as "wonder drugs," "magic bullets," and "life-saving miracles," as well as drugs claiming to cure a wide range of illnesses, are almost certainly exaggerated. **(true)**

12 The term *p-hacking* refers to looking at multiple sets of study outcomes to find a positive result. **(true)**

13 Most violent crimes are committed by people who have received a diagnosis of mental illness at some point in the past. **(false)**

14 Most mental illnesses, including depression, are treatable, and people can often get better and go on to live normal lives. **(true)**

15 The echo-chamber effect of social media means that we surround ourselves with those who agree with us and rarely challenge our beliefs. **(true)**

16 Clickbait involves a catchy, emotionally charged, and usually misleading headline used by websites to lure you in and increase their advertising revenue. **(true)**

17 You should never eat food that contains any amount of a toxin in it. **(false)**

18 The media were largely to blame for the drinking water issue in Flint, Michigan, that started in 2014. **(false)**

19 A surrogate marker is a lab result (like cholesterol level) or vital sign (like blood pressure) used in place of an actual change in health (like incidence of heart attack or death). **(true)**

20 A correlation between drinking coffee and decreased risk of stroke and heart disease indicates that drinking coffee is the cause of the decreased risk. **(false)**

21 The recent decrease in life expectancy in the US can be attributed to increases in drug overdoses, car crashes, shootings, and obesity. **(true)**

22 Where you live in the US may impact your life expectancy by as much as 20 years. **(true)**

23 Multiple research studies have shown that flossing is critical to your dental health. **(false)**

24 Relative risk is usually a much higher number than absolute risk, even though both apply to the same data, and can misrepresent the significance of a research finding. **(true)**

25 Cancers of all kinds should be treated as aggressively as possible to avoid metastases and premature death. **(false)**

26 Screening for prostate cancer and breast cancer are the two safest and most effective cancer screening procedures. **(false)**

27 Drug company representatives targeting busy doctors is an effective way to raise sales of a drug. **(true)**

28 If you do not want to pay full price for an expensive brand-name drug, you can always get a generic version. **(false)**

29 Drug companies can boost drug sales by marketing disease awareness. For example, they might exaggerate the prevalence of a disease (like ADD or dry eyes) or persuade us that something that did not use to require medical treatment now does (like baldness or having a double chin). **(true)**

30 Celebrity endorsements sell drugs the same way they sell soft drinks and cars. **(true)**

31 Naloxone is a drug that quickly reverses the effects of opioids, including trouble breathing and the opiate high.

32 Deaths from drug overdose will likely decline from their 2016 peak of 64,000. **(false)**

33 It was sheer luck that the Ebola virus didn't become a worldwide plague. **(false)**

34 Unless you are very young, very old, or have cancer, you are probably better off skipping the flu shot. **(false)**

35 The media can be a force for good in dispelling myths about health and medicine. **(true)**

36 The latest research shows that power lines, cell phones, and asparagus all cause cancer in humans. **(false)**

37 Bone marrow transplants have been established as an effective treatment for breast cancer. **(false)**

38 Journals that publish articles for a fee from the author may not be as reputable or reliable as peer-reviewed journals that do not charge a fee. **(true)**

39 There is good scientific evidence that acai berries promote weight loss and cleanse the body of toxins. **(false)**

40 Pink slime was a name used for lean, finely textured beef that destroyed the market for that product. **(true)**

41 One of the great weaknesses of science is that its hypotheses frequently turn out to be wrong. **(false)**

42 Modern gene testing can predict most of the major diseases you are likely to contract in your lifetime. **(false)**

43 Good sources for health news include government organizations like the CDC and national news sources like *The New York Times*. **(true)**

44 Some of the tools in your skeptic's toolkit include knowing the source of the data, judging the strength of the data, and being aware of salesmanship. **(true)**

45 Vitamin C, echinacea, and chicken soup have all been proven to be effective in curing or drastically reducing the seriousness of the common cold. **(false)**

46 The salience of a study is whether it applies to you and people like you. **(true)**

47 Three areas where the media had a big impact on public awareness of and response to a health issue are smoking, seatbelt use, and drunken driving. **(true)**

48 Texting or using a cellphone while driving may be against the law, but it is probably not all that dangerous. **(false)**