GOLD PAPERS

SPOTLIGHTING IMPACTFUL RESEARCH

WINTER 2022

ISSUE 8

CSUGOLDPAPERS.BLOG

about the *Gold Papers*

From deep within the belly of the Food Science and Human Nutrition department at Colorado State University, came the idea for this project. A motley group of graduate students decided to clarify some of the confusion surrounding "health" while honing their scientific communication skills. This gave rise to the birth of the *Gold Papers*–a CSU flavored spinoff to White Papers, which aims to summarize current research and perspectives in their fields of expertise.

Achieving Gender Equity in Academic Seminars

By Chris Rom, Ph.D.

"This is more of a comment than a question, but …" is a phrase that you've probably heard during a presentation, which usually leads to exasperated eyerolls. If you pictured a man saying this phrase, odds are you are correct.

Data show that in STEM fields (science, technology, engineering and/or mathematics), men dominate the conversation during the question-and-answer (Q&A) portion of an academic presentation. Researchers observed that men ask 1.8 to 2.5 times as many questions as women during Q&A sessions. This inequity reduces the ability for women in academia to get noticed, make connections, and advance their careers. In fact, research by Carter et al. proclaimed this pattern "both a symptom of the leaky pipeline and a cause of that same problem", wherein fewer women are represented at the higher ranks of academia. This pattern might hold true for other marginalized groups too, although less research has been done in this area.

When I became aware of this discrepancy, I wondered; does this imbalance persist in my community? Often, even well-intentioned white men like myself assume that inequity is a problem far away. However, as a scientist, I know that data can cut through assumptions. So, during my own PhD, I followed the methods used by Carter et al., making note of the number of men and women in the audience of each talk I attended. I then made note of the number of questions from men and from women during the Q&A portion of the presentations.

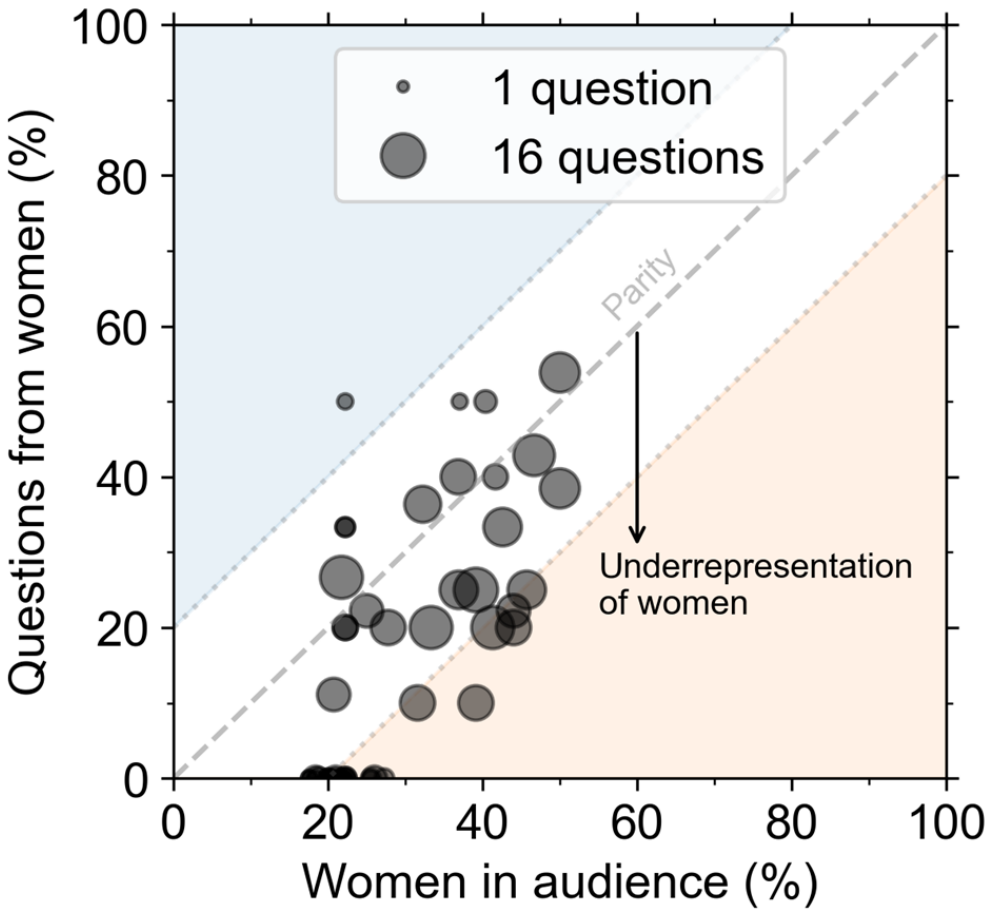
The data show that women were underrepresented in these Q&A sessions (see chart). Not only were women less than 50% of most audiences, women asked fewer questions than their fair share. The diagonal dashed line represents gender parity, where the percentage of questions from women match their percentage of the audience.

For 47 of the 55 sessions, the percentage of questions from women was lower than the share of women in the audience (below the diagonal). On average, women composed 28% of audience members but asked only 14% of questions. **That means these Q&A sessions were not inclusive.**

Admittedly, my observations have a major limitation: I only included audience members under the men/women binary (as they appeared to me). That 1) runs the risk of mis-gendering people, and 2) excludes non-binary individuals (a non-zero number of individuals who asked a non-zero number of questions). I acknowledge the dark irony of excluding people in an attempt to move towards a more inclusive academic community. Despite these flaws, the data show that these Q&A sessions are not yet equitable, which means we have work to do if we want to make academic presentations and participation in Q&A sessions more inclusive for all.

So, what can we do? Well, paying attention to this issue is a good place to start. A 2019 study found that the simple act of recognizing and engaging with these data has the potential to reduce inequity. Specifically, the researchers from this study collected data through a multi-day conference, presented their findings of gender inequity part-way through, and found that subsequent Q&A sessions were more equitable.

The basic idea highlighted in that study is that mindfulness matters. If we are aware of equity issues, then we might choose to speak less and share the space (for those who are usually comfortable taking up space). Or we might feel inspired to speak more (for those who tend to be quiet). Unfortunately, while acknowledging the problem helped to some degree, full equity was not achieved in that study. That's because individual choices are still heavily influenced by the structure of the session.



Going a step further, the Carter et al. team suggested that the traditional Q&A structure could be tweaked by using a "think-pair-share" format. With this structure, audience members first reflect on the talk individually (think), then converse with their neighbors (pair) before the floor is opened for the public Q&A (share). This method has gained popularity in undergraduate lecture classes as an active-learning strategy. I tried this strategy at my own dissertation defense (with prior assent of my committee), where it was well-received.

However, teachers have been reconsidering the "share" part of the think-pair-share. A 2019 study of an undergraduate math classroom found that, while women would participate actively in the small group conversations, the classroom-wide discussions still skewed towards men. That finding suggests that a think-pair-share approach might help a little, but fail to produce a fully inclusive Q&A culture.

Therefore, some argue that Q&A sessions should be scraped entirely. To quote some of the early advocates of the think-pair-share approach, "While [Q&A] sessions may seem inextricably linked to the culture of science,... this aspect of the culture of science is deeply exclusionary, an impediment to diversifying science, and is likely undercutting our attempts to solve complex problems in the natural world." Following this line of thinking, the seminar structure, and especially the Q&A portion, may need a complete redesign.

One way to restructure Q&A sessions is to replace them with small group conversations. Mathematician Eugenia Cheng describes this solution in her book "X+Y: a Mathematicians Manifesto for Rethinking Gender". At the end of her presentations, she asks audience members to converse with one another. She then circulates through the room to hear what topics sparked interest or confusion. After a few minutes, she returns to the lectern and address those key points. With this approach, the speaker prioritizes questions that multiple people may have, and the audience members get more time to engage with one another, strengthening networks between audience members. Those networks may have more positive impacts on people's careers than the visibility that comes from publicly asking a question in a traditional Q&A.

So, what's the best way to make seminar Q&A sessions equitable and inclusive? The short answer, unfortunately, is that I'm not yet sure.

However, I am sure that we—scientists, academics, researchers of all types—can find creative solutions. Just as we experiment in the lab, so too can we experiment with how we present our research with our communities. So, if you want to join me in finding ways to make academic talks more inclusive, let's get experimenting!

Take Control of Your Death: Understanding Advance Directives

By Jen Felker, MD Student

The ambulance bay doors flew open followed by an unconscious elderly woman lying motionless on the gurney. Her arms flailed intermittently as EMS crunched her ribs with every chest compression. Her distraught son was close in tow as the paramedic barked out: “This is Mary Jones, a 90-year-old female found down, CPR was initiated at the scene with several episodes of spontaneous return of circulation, currently pulseless.” The physician pulled up Mary’s chart to find that she has a “Do Not Resuscitate” (DNR) code status while her son is her “Medical Durable Power of Attorney” (MDPOA). The doctor confirmed the code status with her son at which point the son stated, “No, you need to do everything possible to keep her alive.” The doctor responded, “Are you sure that’s what she would want?” To which he sheepishly replied, “Yes.”

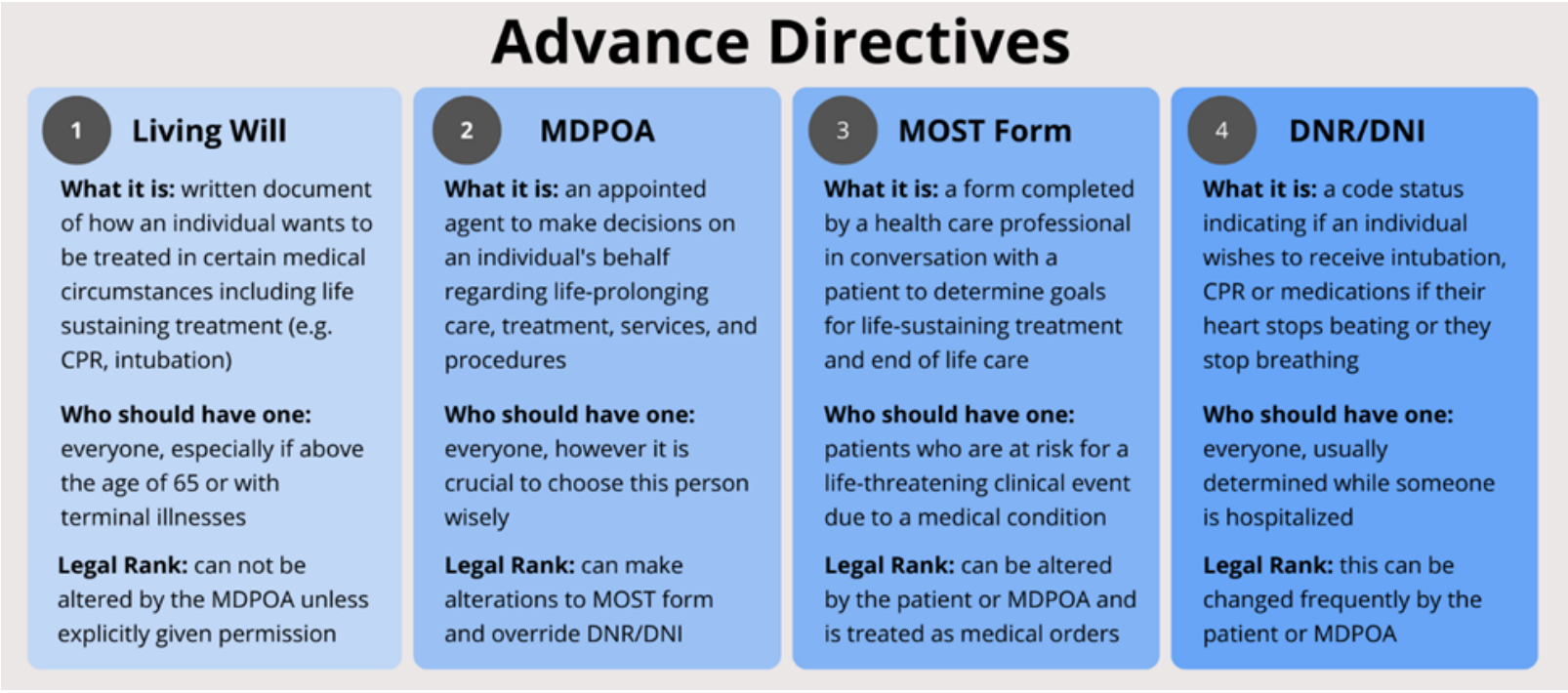
If you are confused by the medical jargon of DNRs and MDPOAs, you aren’t alone. To better understand why Mary and many others in the same position are at the mercy of medical interventions they never wanted, we must explore the different types of advance directives and the legality surrounding them. An advance directive is a legal document that states a person's wishes about receiving medical care even when they are no longer able to make medical decisions because of a serious illness or injury. Having one in place can help prevent what happened to Mary. The details vary slightly by state, but the main types of advance directives are outlined below and in the graphic. For simplicity, let’s use Mary and her son as examples.

- MDPOA: The patient (i.e., Mary) appoints an “agent” (i.e., her son) to make decisions about life-prolonging care, treatment, services, and procedures for them if they are unable to make such decisions themselves. This is a legal document that must be signed by the patient (Mary) and the MDPOA (her son).

- Living Will: A written expression of how an individual (i.e., Mary) wants to be treated in certain medical circumstances. This permits the individual to express whether they wish to be given life-sustaining treatments in the event of a terminal illness or injury, to be provided food and water via intravenous devices ("tube feeding"), and to give permission on other medical directions that impact medical care and care at the end of life.

- Medical Orders for Scope of Treatment (MOST): Intended for patients who are at risk for a life-threatening clinical event because they have a serious life-limiting medical condition. It is completed by a healthcare professional in conversation with a patient (i.e., Mary), then signed by the patient and a physician. The physician's signature translates patient preferences into medical orders.

- DNR/DNI: Instructs medical personnel not to use cardiopulmonary resuscitation (CPR), electric shock to the heart, artificial breathing devices, or other invasive procedures to revive an individual (i.e., Mary), even if they stop breathing or if their heart stops beating.



Why is it so critical to understand advance directives BEFORE a serious illness or injury? Unfortunately, situations like Mary's are common in medicine. When needing to decide about a loved one's health, emotions tend to take the place of rationale and standing legal obligations guide medical actions regardless of the ethical implications. For example, in the scenario involving Mary, one might think that Mary's DNR status should trump what her son requested of the physician, but that isn't the case. The physician must go off what Mary's son, the MDPOA, said at the time of the incident. In Mary's case, that means continuing CPR on an already disintegrated chest cavity most likely followed by intubation with no chance for a meaningful recovery - interventions she most likely never wanted.

Additionally, it isn't uncommon for patients to have multiple advance directives in place, which calls into question which directive takes precedence. The simplified legal hierarchy of these advance directives is as follows: Living Will > MDPOA > MOST > DNR/DNI. However, the implementation of these directives is not always this clear-cut. For example, if the Living Will states that the MDPOA can make changes to the patient's previously stated wishes, then the MDPOA's wishes take precedence. Similarly, if the MOST form contradicts the Living Will but was filled out more recently by the patient, then the MOST form takes precedence. The complexities of advance directives are confusing for anyone, which is why it is critically important to take the time to understand them so you know what medical decisions will be made on your behalf. After all, when it comes to determining these critical, often end-of-life, decisions, nothing is simple and time is usually limited.

All of the legalities aside, when the MDPOA is the primary source of decision-making for the patient, they are only bound by an ethical obligation to make decisions based on what they truly believe the patient would want. However, maintenance of an *ethical* obligation when emotions are high is easier said than done, especially when each decision being made has the potential to end or extend the patient's life. This begs the question if we should have MDPOAs at all. How could anyone face the task of withdrawing life support, refusing CPR, or allowing for the progression of respiratory failure in their loved one? Does anyone have the full mental and emotional capacity at that moment to make the decision based on what the patient truly wants? It is only natural to be swayed by personal biases and desires and it may be easy for an MDPOA to think, "when in doubt just do everything". However, life-saving measures are not benign, and everyone has a right to die with comfort and dignity.

Ultimately, the best thing a patient can do to avoid being placed in an impossibly difficult situation, a similar position to Mary Jones, and to ensure that their wishes are honored, is to have a legal and updated Living Will on file. This way, the MDPOA cannot directly influence the patient's medical care unless the patient explicitly allows it in their Living Will. Furthermore, it is crucial to choose an appropriate MDPOA who will advocate for your medical wishes even if it contradicts their own desires. For many people, healthy or otherwise, taking the time to get advance directives in order isn't high on their priority list. However, death is one inevitability that we can all count on – take the time to plan for it.

If You Snooze You Lose … *Weight*

By Sophie Seward, Ph.D. Candidate

Over one billion Americans will watch the ball drop in Times Square, signifying the end of one chapter and the start of the next one. Many Americans will create a New Year's resolution to start a positive change for the new chapter. Losing weight is a common New Year's resolution. In fact, data released by the Centers for Disease Control found that nearly half of adults in the US try to lose weight over the course of a year.

Historically, people alter their diets and implement new exercise regimens at the start of the new year to lose weight. According to an online interview, 42% of people make a New Year's resolution to change their eating and/or drinking habits. However, by February, only half of people will still be adhering to their diet changes. Similarly, according to the Global Health and Fitness Association, 11% of gym memberships start in January. However, by April, over half of people will stop using their gym memberships. Traditional approaches to weight loss, including dieting and exercising, have been largely unsuccessful.

Unfortunately, despite Americans' best efforts to lose weight, obesity is still a public health concern. Since the 1960s, obesity has continued to increase in the US, from around 10% to over 40% today. This trend is expected to continue, with 50% of the US population projected to be obese by 2030. Consequentially, people with obesity are at heightened risk for heart disease and stroke, type 2 diabetes, cancer and sleep apnea compared to people with normal weight.

Evidence suggests that diet and exercise are not the only important factors that modify the risk of obesity. Many experts now recognize sleep as an important mediator of weight gain and obesity. Sleeping <7 or >9 hours each night is associated with weight gain and a heightened risk of developing obesity. Shockingly, every hour of sleep lost is associated with a 9% greater risk of developing obesity; in other words, a person who sleeps 6 hours a night instead of 7 hours a night has a 9% greater risk of becoming obese. Along with getting too little sleep, getting too much sleep (>9 hours) is associated with similar outcomes. Sleeping between 7 to 9 hours each night is key for avoiding unwanted weight gain.

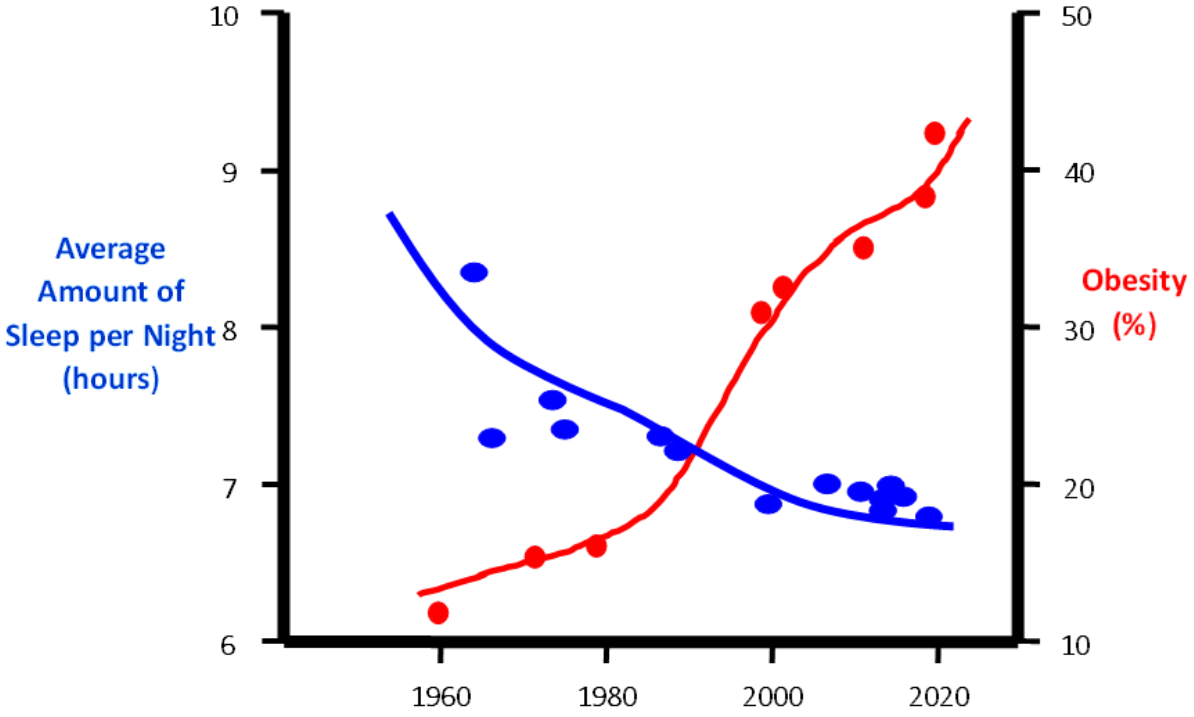


Figure 1. Shows the inverse trend in sleep duration (hours) and obesity (%) in the US from 1960 to 2020. This information is adapted from a scientific review and national health statistics.

If sleep outside of a 7 to 9 hour range does in fact mediate the risk of obesity, it is not a surprise that the rising amount of sleep loss in the US coincides with the increasing rates of obesity. Over the last 60 years, the average sleep duration of American adults has decreased from 8.8 hours 6.8 hours of sleep a night — *a 2 hour difference*! Additionally, 1 in 3 people report sleeping less than 6.5 hours per night during the workweek. On the flip side, only 8% of Americans report exceeding >9 hours of sleep. The inverse trend in weight gain and sleep loss in the US is shown in **Figure 1**.

Why are people who sleep less than 7 hours a night at risk for obesity?

Sleep loss is linked to increased appetite, food consumption and, subsequently, weight gain (**Figure 2**). What are some of the studies that have investigated the association between sleep loss and weight gain? Well, a seminal research study from the University of Colorado examined 16 healthy volunteers who were instructed to sleep for 9 hours each night for a week, followed by 5 nights of 5 hours of sleep to closely resemble a "typical" workweek in the US. Participants in this study were provided unlimited food and instructed to eat as they desired. The researchers found that in less than one week, volunteers significantly increased food intake (*6% more calories*) and gained weight (*nearly 2 pounds*) when they did not have sufficient sleep!

Scan me to learn more about sleep loss and weight gain from a study at University of Colorado!

Similarly, in another recent sleep loss study, researchers examined a hormone in the blood that signals hunger (known as ghrelin) as well as subjective hunger (via food questionnaires). This study found that sleep loss was associated with increased hunger (increased ghrelin) as well as increased subjective hunger. This study also found that during sleep loss, people tend to

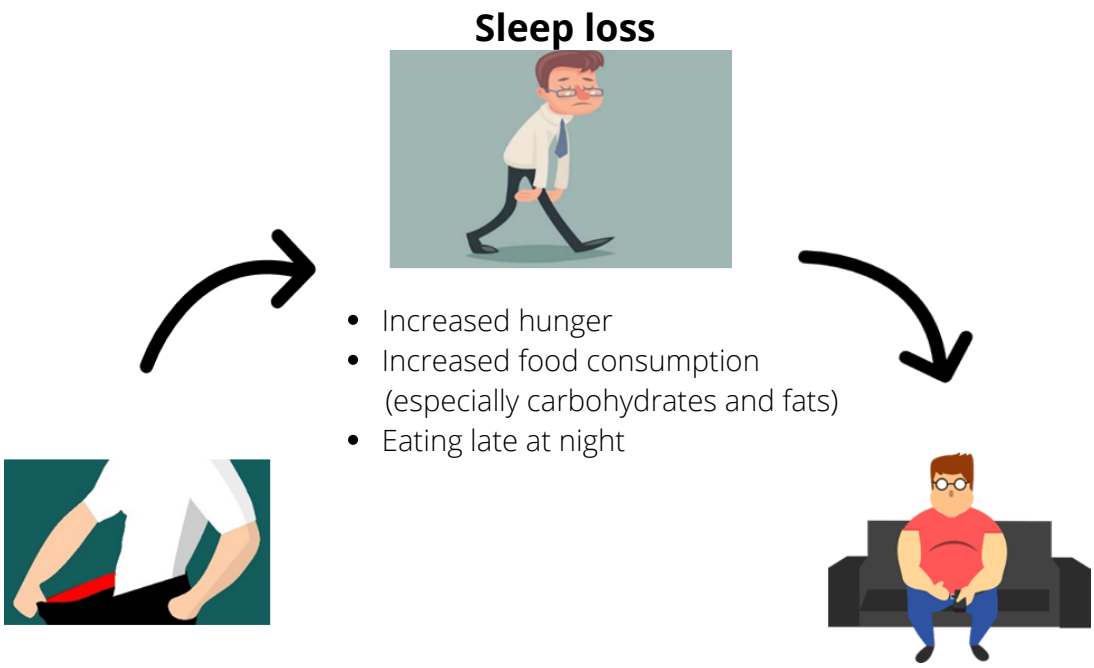


Figure 2. Conceptual model of how sleep loss is linked to weight gain and obesity. This image is adapted from a scientific perspective review co-written by professor Josiane Broussard from Colorado State University.

postpone the majority of their food consumption to the evening. This is an issue because later food consumption timing has been linked to increased body fat and body weight. Sleep loss increases hunger, food consumption, the time when we eat, and ultimately, weight gain, as indicated by the conceptual model shown in **Figure 2.**

Does sleep extension lead to weight loss?

As discussed above, sleep loss is associated with weight gain. However, researchers are now investigating if extending sleep into the 7 to 9 hour range could lead to weight loss. In the previously discussed study from the University of Colorado, after healthy participants were sleep restricted for a work week, they returned to 9 hours of sleep per night. Upon returning to adequate sleep, participants lowered their food consumption, especially their consumption of fats and carbohydrates. In turn, participants lost weight, demonstrating that restoring a healthy sleep pattern can improve weight loss.

Another clinical trial randomized participants into two groups, with participants in the first group asked to maintain their habitual sleeping patterns while participants in the second group asked to extend their sleep by 1.2 hours per night. Food consumption and weight were measured in both groups for two weeks. At the end of the two weeks, the second group on average lowered their food intake and significantly reduced their weight by nearly 2 pounds compared to the control group.

Although sleep extension is associated with moderate weight loss, sleep extension along with dieting (caloric restriction) appears to be more effective than dieting alone. In a study conducted in Mexico, 52 adolescents living with obesity were enrolled in a weight loss program. In a month long study, half of the participants underwent a 500 calorie restriction diet whereas the other half of the participants underwent a 500 calorie restriction diet along with one hour of sleep. Although both groups lost weight, the group that underwent both the caloric restriction and sleep

extension significantly lost weight along with improvements in other health metrics compared to the group that only underwent caloric restriction (4.6 lbs. compared to 2.8 lbs.). Extending sleep to the 7 to 9 hour range lowers food consumption and leads to weight loss, especially when combined with a traditional caloric restriction diet.

2023 New Year's Resolution

As we turn the chapter to 2023, millions of Americans will make losing weight a goal. An increased focus on sleep could aid in this goal. Along with continuing to exercise and eat healthfully, sleeping between 7 to 9 hours a night could help protect against unwanted weight gain and help us fulfill our New Year's resolutions.

Contributors

Chris Rom graduated with a PhD in Chemistry in December 2022. His research focused on discovering new materials for renewable energy technologies like semiconductors and batteries. When he isn't in the lab, he's probably out running on some trails, listening to an audiobook, and/or asking strangers what made them smile recently.

Jen Felker is a first-year medical student at the University of Colorado School of Medicine at Colorado State University. When she's not doing endless amounts of flashcards, she enjoys spending time with her husband and two fluffy dogs. Jen is passionate about exploring the grey areas of medicine in hopes of improving quality of care outcomes.

Sophie Seward is a PhD candidate in the Health and Exercise Science. Her research focuses on the cardiovascular effects of sleep and circadian disruption. When Sophie isn't watching people sleep in the lab, she is preparing for the 2024 USA Olympic marathon trials.

Raj Trikha graduated with his Master's of Science in Human Nutrition in May of 2020. Last fall, he began medical school with aspirations of working in academic medicine one day. His goal is to communicate the science of health care to the general public.

Elliot Graham is a PhD candidate in Food Science and Human Nutrition. His research focuses on how high fat and high sugar diets affect the abundance of microbes in the gut, contributing to cardiometabolic disease. In his free time, Elliot enjoys lifting weights, hiking, and this should come as no surprise considering the department he is in, eating!

WINTER 2022

Photograph by Luke Treat

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