Ordinaries

Thomas Kuhn, Adam Smith, and Charles Darwin

Terence C. Burnham¹ · Jay Phelan²

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Abstract

This feature will report on the “anomalies” of behavioral economics. Using the framework of Thomas Kuhn, behavioral economists label a result as anomalous if it is inconsistent with neoclassical economic theory. We argue that the anomalies of behavioral economics are intellectual artifacts, generated by viewing behavior through the distorting lens of current economic theory. The *Ordinaries* column will interpret economic behavior from the perspective of evolutionary biology. From this view of life, the anomalies of behavioral economics will disappear into a coherent biological framework that incorporates elements of neoclassical economic maximization.

Ordinary: “With no special or distinctive features; normal. Not interesting or exceptional; commonplace.”

–Oxford English dictionary.

1 Why a feature on ordinaries?

In 2008, a US Naval officer somehow lost a bag of tools while distracted with the cleaning of a mess from a grease gun that had leaked. This would not be a noteworthy occurrence except that it was among the most expensive tool bags in the history of humankind, valued at over \$100,000. Perhaps more surprising is the fact that this Naval officer holds an advanced degree from MIT, has received numerous military decorations – including several medals for “superior meritorious service” – and had previously performed some of the most technically-challenging mechanical repairs ever completed. How can an experienced, well-trained, certified genius lose a \$100,000 tool bag?

Mainstream or ‘neoclassical’ economics is built on a model that assumes people behave in an ‘optimal’ manner, unconsciously acting in accordance with the rules of

✉ Terence C. Burnham
burnham@chapman.edu

¹ Chapman University, Orange, CA 92866, USA

² Department of Life Sciences Core Education, UCLA, Los Angeles, CA 90095, USA

underlying mathematics. An optimizing person would definitely keep track of expensive tools; to not do so would have serious consequences. In sharp contrast to the neoclassical economists, Richard Thaler and other behavioral economists start, not with a model, but rather by simply observing human behavior. And observations reveal that, far from behaving optimally, human beings make mistakes all the time, mistakes that might include losing something worth \$100,000.

In 1987, Professor Thaler wrote the first of his “anomalies” articles, in which he describes human behaviors that are inconsistent with neoclassical economic theory, writing, “An empirical result is anomalous if it is difficult to ‘rationalize,’ or if implausible assumptions are necessary to explain it within the [neoclassical] paradigm.” (Thaler 1987, p. 198).

We entitle this series of articles *Ordinaries*, because we believe that the anomalies of Professor Thaler are intellectual artifacts, generated by viewing behavior through the distorting lens of current economic theory. Viewed instead with the clearer optics rendered by the natural sciences—recognizing humans as evolved, biological organisms—the anomalies of behavioral economics are expected, predictable, and commonplace behaviors.

In time, biology will synthesize neoclassical and behavioral economics into a coherent field. Neoclassical economics is correct to emphasize optimization. Yet behavioral economics is also correct, to identify systematic failures to optimize. A biological perspective reconciles these seemingly inconsistent views of humans as both intelligent optimizers and prone to systematic mistakes (Burnham 1997; Burnham and Phelan 2000).

Humans are the product of natural selection, which favors maximization. If selection is so powerful, however, why do humans make so many mistakes? The answer is that natural selection does not produce behaviors. Rather, selection produces behavior-generating physiological mechanisms that are sensitive to environmental cues. The anomalies of behavioral economics are produced when this flexible biological machinery operates in particular settings.

The *Ordinaries* column will interpret economic behavior from the perspective of evolutionary biology. From this view of life, the anomalies of behavioral economics will disappear into a coherent biological framework that incorporates elements of neoclassical maximization.

2 The neoclassical school of economics

The neoclassical school of economics assumes that people make good decisions, constrained by both the environment and their individual circumstances. Summarized by Nobel Laureate Gary Becker, it is “the combined assumption of maximizing behavior, market equilibrium, and stable preferences, used relentlessly and unflinchingly.” (Becker 1976, p. 5). Colloquially, the neoclassical economic view is summarized by stating that people ‘maximize utility.’ Each person picks the best option, based on what that individual likes and on the opportunities presented in the world.

Neoclassical economics is a ‘Cartesian’ field, in that answers are derived from a set of axioms. For example, the neoclassical “proof” that free trade is good is straight-

forward. When people trade, they must be better off because neoclassical economics assumes each person does what is in their own self-interest. People know what makes them happy, and act accordingly, revealing their preferences through their actions.

Thus, with a few caveats, the best solution in trade and other areas, according to neoclassical economics, is the *laissez-faire* solution of letting people do as they please. Free trade is good because all voluntary actions are good, and all actions not freely taken would be bad.

The axioms of neoclassical economics represent a model of human motivation and behavior. The core is the idea that people have tastes, and they have attitudes (“preferences”) toward risk, time, and other people. Individuals make decisions that reflect, and reveal, those preferences. If a person’s preferences were known, neoclassical economics argues, it would be possible to predict behavior. Conversely, observing behavior reveals an individual’s preferences.

Four everyday decisions illustrate the axioms of neoclassical economics.

1. Should I eat saturated or unsaturated fats?
2. How much should I save for retirement?
3. What deductible should I pick for my car insurance?
4. How much money should I donate to charity?

Axiom 1: *Choice between alternatives.*

The choice of saturated versus unsaturated fats involves myriad attributes including price, taste, and health consequences. Neoclassical economics assumes that each person makes optimal choices that reflect the individual’s preferences and budgetary trade-offs.

Axiom 2: *Choice over time.*

Wimpy says, “I’d gladly pay you Tuesday for a hamburger today.” A person like Wimpy who consumes a lot today will have less to spend in the future. Neoclassical economics assumes that people make the correct, optimal decisions about savings and other ‘intertemporal’ choices.

Axiom 3: *Choice under uncertainty.*

Insurance decisions such as selecting the right level of deductible involve uncertainty, because the outcome is not known. Pay more for a low deductible and save money in the event of an accident, but have paid for the insurance with no financial return if no accident occurs.

Risky decisions include insurance and investing, but they also include choices in many other areas including, for example, career and marriage. A young athlete hoping to become a professional cannot know the outcome in advance, nor can a newlywed. Thus, there is uncertainty in most decisions. Neoclassical economics assumes that people make the correct decisions regarding risk.

Axiom 4: *Choices that impact other people.*

A folktale tells the following story. A god meets a farmer and makes the following offer, “I will grant you any wish you ask. However, whatever I give to you, I will give doubly to each of your neighbors.” The farmer thinks for a bit and then replies, “blind me

in one eye.” Neoclassical economics assumes that people care only about themselves and, abacination notwithstanding, derive no pleasure from helping or hurting others.

The neoclassical economic model is parsimonious. Each person is a competent optimizer who cares about no one else, makes perfect choices between alternatives, and exhibits discipline when it comes to savings and risk.

The neoclassical economic individual saves exactly 16.3% of their salary (if that is the correct amount in order to have the ideal retirement account balance in 41 years). The neoclassical individual has the correct insurance deductibles, does not gamble away the family nest egg in Las Vegas, goes to the gym 3.2 times per week, and has 7% body fat, if that is what makes them happy. If the person smokes, eats nitrates, or consumes unhealthful drugs, they do so understanding the impact of these choices on their life expectancy.

Neoclassical economic optimizers die with a contented grin because they have spent a life maximizing utility.

3 Behaviors that may seem inconsistent with neoclassical economics

Is this maximizing model of human nature consistent with your observations and experiences? Consider a few candidate behaviors that seem to contradict the optimizing view of human nature assumed by neoclassical economics.

- Opiate addiction
- Obesity
- Failure to save money
- Suicide

Opiate addiction

Between 1997 and 2017, 700,000 people in the US died from drug overdoses. Two-thirds of those deaths were caused by consumption of some form of opioid. Currently, 130 Americans die each day from an opioid overdose (Hedegaard et al. 2017; Scholl et al. 2019).

Obesity

40% of Americans are classified as obese by the US government (Ogden et al. 2015; Hales et al. 2017). Obesity causes an increased chance of early death through heart disease, stroke, type 2 diabetes, and some cancers (Sassi et al. 2016). These facts are well-understood among health care workers, but still 25% of British nurses are obese (Kyle et al. 2017) and 49% of doctors are overweight or obese (Gelber et al. 2008). Half of all Americans are trying to lose weight (Martin et al. 2018) and, on average, Americans weigh 14 pounds more than their own stated desired weight (Gallup 2019).

Failure to save money

The US Government Accounting Office summarizes its review of savings by entitling its 2015 report *Most Households Approaching Retirement Have Low Savings*. For

households with savings accounts, the median amount of savings is \$104,000, an amount that produces an annual annuity of under \$7,000 per year (Jeszeck et al. 2015). Perhaps fearing living on under \$600 a month, only 40% of people report that they are satisfied with their savings behavior (Federal Reserve 2018).

Suicide

In 2017, 47,173 Americans committed suicide. Furthermore, there was a 33% increase in suicide rates between 1999 and 2017 (CDC 2018). In 2016, suicide was the 2nd leading cause of death for ages 10–34 (CDC 2018).

Are people who are broke, trying to lose weight (but mostly failing), and killing themselves directly by suicide or indirectly through opiate addiction, maximizing utility as assumed by neoclassical economics? Let us see.

4 Failed frontal critiques of neoclassical economics

Behavioral economists argue that the neoclassical view of human behavior is wrong. In fact, Professor Richard Thaler won a Nobel Prize by systematically documenting human behaviors that deviate from those predicted by neoclassical economics.

In his anomalies articles in the *Journal of Economic Perspectives*, Professor Thaler details the gems of behavioral economics—those behaviors with the most glaring divergence between *actual* human behavior and that predicted by neoclassical economics. Each anomaly represents, in the behavioral economic view, strong evidence that the neoclassical economic model of human nature is wrong.

When Professor Thaler began his series of anomalies articles, what was the opening argument in his indictment of neoclassical economics? Drug addiction? Poverty? Suicide? Or perhaps some other epic human woe?

Here is the actual opening to his seminal anomalies column (Thaler 1987).

Consider the following problem. You are presented with four cards lying on the table before you. The cards appear as shown:

A, B, 2, 3

Your task is to turn over as few cards as possible to verify whether the following statement is true: *Every card with a vowel on one side has an even number on the other side*. You must decide in advance which cards you will examine.

In this article, Professor Thaler reveals the shocking fact that most humans do not answer this card-flipping puzzle correctly. So, the leading behavioral anomaly—the biggest proof that neoclassical economics is importantly incorrect—is humans' inability to solve an abstract logical puzzle. What about drug addition, suicide, and poverty?

To understand why Professor Thaler picked this seemingly trivial behavior instead of, for example, suicide, consider the following anecdote told by Nobel Laureate Professor Amartya Sen.

“What should an economist do when observing a person trying to cut off one of their own fingers with a dull pair of scissors?”

Professor Sen's answer: "Offer the person sharper scissors." The quip highlights that the neoclassical economic model rests on the assumption that people maximize utility. Because utility is not measurable in an objective sense, drug addiction, obesity, poverty, and suicide are all consistent with optimization. It's not possible to prove that these behaviors are anomalies. Observing a person cutting off fingers, a neoclassical economist assumes that the person is making a good decision.

Professor Sen's macabre suggestion even incorporates a subtle detail. He did not say, "Give the person sharper scissors." After all, the neoclassical model argues that not only is the person maximizing utility by cutting off their fingers, but they might actually prefer a slow cutting with dull scissors to the quicker, cleaner chop of a sharper blade. So neoclassical economics starts by assuming all freely chosen behaviors are optimal for the individual. Thus, the key phrase of "offer" as opposed to "give" sharper scissors.

To the critic who points out that "millions of people are addicted to opiates and tens of thousands are dying," the neoclassical economist responds with a Panglossian, "yes, isn't it great that these people are maximizing utility!"

In "*A rational theory of drug of addiction*," Nobel Laureate Gary Becker and Professor Kevin Murphy explain how drug addiction is an example of the neoclassical model being correct (Becker and Murphy 1988). Drug use, as explained by Professors Becker and Murphy, involves a trade-off between pleasure now and unhappiness in the future.

Some people care relatively more about the future, and/or get less pleasure from drugs. For these people, not using drugs is optimal. However, for people who love drugs, and care relatively less about the future, the best decision, according to neoclassical economics is to have a fantastic couple of hours and then to die. (This is not a joke.)

In the words of Professors Becker and Murphy, "Addictions, even strong ones, are usually rational in the sense of involving forward-looking maximization of stable preferences." (p. 675) "A rational person recognizes that consumption of a harmful good ($u_s, w_s < 0$) has adverse effects on future utility and earnings." (p. 678) From the neoclassical economic perspective, people dying in the street from opiates is not proof of the model's failure. It is exactly the opposite.

This example illuminates the wisdom behind Professor Thaler's odd-seeming choice of "failing at the card-flipping puzzle" to kick off his anomalies column. Within the framework of neoclassical economics, there is room for "a rational theory of drug addiction," but no possibility of "a rational theory of card-flipping puzzle failure."

Returning to our earlier question, we asked, "Are people who are broke, trying to lose weight (and mostly failing), and killing themselves directly by suicide or indirectly through opiate addiction, maximizing utility as assumed by neoclassical economics?"

YES, is the resounding answer given by neoclassical economics. Drug addiction, morbidity and mortality due to obesity, overspending oneself into homelessness, and suicide are all compatible with the idea that people maximize utility.

As such, a neoclassical economist must endorse a well-informed suicide by the logic that “zero future utility is, after all, better than negative future utility.”

It might seem that we are at an impasse, as critiques of neoclassical economics that focus on self-destructive choices fail to gain any traction within the field. The choices that seem most obviously problematic to non-economists are consistent with neoclassical optimization of the invisible, unmeasurable, and infinitely adaptable entity of “utility.” But we are not.

5 Thomas Kuhn, anomalies, paradigm shifts, and behavioral economics

“The call is coming from within the house.” This is the creepy climax of a famous horror movie in which the police trace a series of threatening phone calls.

Behavioral economics has been academically successful (where seeming common sense has failed) because it criticizes neoclassical economics from “inside the house.” The behavioral economic critique focuses on internal inconsistencies within the neoclassical model and can accept the neoclassical assumption that individuals maximize the vague entity of utility.

Here is a joke told at a Harvard economics department holiday party in the early 1990s:

Professor Eric Maskin (later awarded the 2007 Economics Nobel Prize) walks into a restaurant.

Professor Maskin (portrayed in the skit by a graduate student): “What do you have for lunch?”

Server: “Chicken or beef.”

Professor Maskin: “I’ll have the chicken.”

Server: “We also have fish.”

Professor Maskin: “In that case, I will have the beef.”

MASSIVE LAUGHTER by a room full of Harvard economists.

The joke was funny to the economics audience because the addition of fish is not supposed to change the choice between chicken and beef. With two alternatives, Professor Maskin prefers chicken to beef. With three choices, however, Professor Maskin prefers beef to chicken. His reversal of tastes is comically inconsistent with neoclassical economic assumptions about human nature.

The foundation of the behavioral economic school is the evidence of divergences between neoclassical economic predictions and actual human behavior. These divergences are strategically labelled as “anomalies” by behavioral economic scholars in order to align their work with the “paradigm shifting” framework of (Kuhn 2012).

In *The Structure of Scientific Revolutions*, Kuhn argues that the structure of scientific revolution contains three phases.

Phase 1: An incorrect or incomplete paradigm is prevalent. In economics, the neoclassical model is the prevailing, but incomplete, paradigm.

Phase 2: Evidence that the existing model is incorrect accumulates. Such evidence is labeled “anomalous.” Kuhn argues that the inability to reconcile anomalous findings can create a crisis that creates the opportunity for an intellectual revolution. Behavioral economists have been working on Phase 2 since the early 1970s.

Phase 3: A new, better paradigm emerges. The new paradigm incorporates the correct parts of the original paradigm while resolving the anomalies identified in Phase 2. Phase 3 has not happened yet in economics.

Kuhn argues that incomplete or incorrect scientific paradigms can persist for long periods. The accumulation of anomalies, however, eventually helps topple a paradigm. Kuhn writes, “Discovery commences with the awareness of anomaly, i.e., with the recognition that nature has somehow violated the paradigm-induced expectations that govern normal science.” p. 53

While behavioral economists seek to topple neoclassical economics, an important concept for them is, “within the paradigm.” This forces the behavioral economists into a strange intellectual pigeonhole, documenting internal inconsistencies within the neoclassical model, while implicitly allowing suicide, and other seemingly bad decisions, to be viewed as optimal choices.

In Table 1, we summarize the current state of economics. The first column is the neoclassical summary for each axiom. This neoclassical column is always the same: people optimize by choosing the best for themselves. The second column is the non-

Table 1 The axioms of economics from three perspectives. Adapted from (Burnham 2016)

	Neoclassical economic view	Naïve critique from outside the economics paradigm	Behavioral economic critique from inside the economic paradigm
Goods	People optimize by picking the best , feasible option	People sometimes make bad decisions. People like some products that are bad for them (e.g., heroin) and dislike some products that are good for them (e.g., vaccines)	People make inconsistent decisions, and choices often are impacted by irrelevant attributes
Risk	People make good , consistent decisions regarding risk	People make bad decisions involving risk	People make inconsistent decisions regarding risk
Time	People make good , consistent decisions involving multiple time periods	People make bad decisions involving multiple time periods	People make inconsistent decisions involving multiple time periods
Selfishness	Individuals care about themselves and derive no pleasure or pain from the lives of others, not even their children	Individuals are sometimes altruistic in sacrificing to help others, and at other times, individuals are spiteful in obtaining pleasure from other individuals' pain	Individuals are inconsistent in their attitudes toward other people

economist critique. It points out the ubiquitous **bad** decisions in every domain of human life. The final column of Table 1 summarizes the behavioral economic literature.

6 The future of economics based in the natural sciences

Economics without the natural sciences is a field irreparably divided upon itself. Neo-classical and behavioral economists disagree about each and every axiom of the field. Because economics is a Cartesian field, disagreements about the axioms mean that every conclusion of economic theory is in doubt.

For example, free trade is good if neoclassical economics is correct in assuming that people are selfish and smart. If, however, people are altruistic or not always smart, then free trade might not be good. Similarly, for every theorem of economics.

Humans evolved by natural selection and this is the key to a modern synthesis of economics. *Ordinaries* are defined as “not interesting or exceptional; commonplace”. The anomalies of behavioral economics are, from an evolutionary and biological perspective, completely predictable. As such, they are *Ordinaries*.

A brief primer:

Natural selection is a mechanism of evolution that occurs when there is heritable variation for a trait, and individuals with one version of the trait have greater reproductive success than do individuals with a different version of the trait.

Adaptation (which refers both to the process by which organisms become better matched to their environment and to the specific traits that make an organism more fit) occurs as a result of natural selection. (Examples of adaptations abound. Bats have an extremely accurate type of hearing, echolocation, for navigating and finding food, even in complete darkness. Porcupine quills make porcupines almost impervious to predation. Mosquitoes produce strong chemicals that prevent blood from clotting, so that they can extract blood from other animals). (Phelan 2018)

Natural selection has produced organisms that are very good at solving problems. Bats have radar, porcupines protect themselves with mini spears, mosquitos are chemists, cheetahs can run very fast, and birds can fly.

Why then has natural selection produced humans who make some remarkably poor choices? Let us return to our lost \$100,000 tool bag for insight. MIT-trained and impressively experienced astronaut Heidemaire Stefanyshyn-Piper did, in fact, lose a \$100,000 tool bag during a NASA spacewalk to repair the international space station. The tool bag was not appropriately tethered and so drifted off into space.

The fact that this event took place in space has two significant implications for economics.

First, humans developed the ideas and necessary machinery to send people into space. The behavioral economic idea that people are inept must be reconciled with the fact that humans are super smart. Humans have created an amazing array of inventions including rockets, life-saving drugs, money, and myriad sophisticated tools. We are a successful species.

One important measure of biological success is biomass, the total weight of all the individuals in a species. By this measure, humans are, in fact, the most successful large, multicellular animals on the planet. The only other species that come close in biomass are those that humans keep to eat (i.e., livestock). Humans and livestock compose more than 95% of the biomass of mammals (Bar-On et al. 2018). So, humans are quantitatively successful in a manner not captured by behavioral economics.

Second, the tool bag was lost in an alien environment. On earth, a tool bag does not wander off, so there is no need for a tether. Space is such a strange environment that astronauts, during earth-based training, must spend many hours learning how to use a space toilet, and need to be taught how to sleep in the absence of strong gravity. Because evolution has not adapted humans to life in space, no one should—and, in fact, no one does—expect people to be naturally good at living in space.

Quite to the contrary, organisms can reliably expect to have poor outcomes in novel environments. Chaucer used the phrase “a fish out of water” in the 14th century. It is a well-documented and near universal observation among biologists: place an organism in an alien environment and it will experience bad outcomes. Fish out of water die, orangutans in zoos and rodents in laboratories become morbidly obese, people in space need adult toilet training. Almost nothing comes naturally or functions smoothly in a novel environment.

From the perspective of natural selection, modern industrialized economies are alien environments for humans. There is a mismatch between our modern environment and the environment to which we are adapted. People living in these novel environments struggle to avoid eating too much, to buy the correct financial insurance, to minimize opioid consumption, and to save money. None of our ancestors, who lived before the invention of agriculture, faced these problems. As a consequence, humans will solve novel problems in novel situations only with significant cognitive effort and training. (And even then, with varying degrees of success.)

Economics fits well into the Kuhnian framework. Kuhn’s Phase 1 is the incomplete neoclassical model of human behavior. Phase 2 consists of the identification and cataloging of anomalies by behavioral economics. Phase 3 is yet to be completed, and therefore the field remains in crisis. While the failures of neoclassical economics are well-documented, no better theory has emerged to complete a paradigm shift.

In Kuhn’s words, the crisis caused by the cumulative weight of anomalies can be resolved “only when the paradigm theory has been adjusted so that the anomalous has become the expected.” (Kuhn 2012) p. 53.

In the *Ordinaries* columns to come, we will argue that biological economics represents the new Kuhnian paradigm that can heal the schism between the neoclassical and behavioral economic schools. In this new light, the behaviors that so puzzle economists will become, in Kuhn’s words, expected.

References

- Bar-On, Y. M., Phillips, R., & Milo, R. (2018). The biomass distribution on Earth. *Proceedings of the National Academy of Sciences*, 115(25), 6506–6511.
- Becker, G. (1976). *The economic approach to human behavior*. Chicago: Chicago University Press.

- Becker, G., & Murphy, K. (1988). A theory of rational addiction. *The Journal of Political Economy*, 96(4), 675–700.
- Burnham, T. C. (1997). Essays on genetic evolution and economics. PhD dissertation, Harvard University.
- Burnham, T. C. (2016). Economics and evolutionary mismatch: Humans in novel settings do not maximize. *Journal of Bioeconomics*, 18(3), 195–209.
- Burnham, T. C. & Phelan, J. (2000). Mean genes. From food to sex to money, taming our primal instincts. Cambridge, Mass, Perseus.
- CDC. (2018). Suicide mortality in the United States 1999–2017. NCHS Data Brief(330).
- Federal Reserve. (2018). Report on the economic well-being of US households in 2017.
- Gallup. (2019). Personal Weight Situation. Retrieved August 24, 2019, from <https://news.gallup.com/poll/7264/personal-weight-situation.aspx>.
- Gelber, R. P., Gaziano, J. M., Orav, E. J., Manson, J. E., Buring, J. E., & Kurth, T. (2008). Measures of obesity and cardiovascular risk among men and women. *Journal of the American College of Cardiology*, 52(8), 605–615.
- Hales, C. M., Carroll, M. D., Fryar, C. D. & Ogden, C. L. (2017). Prevalence of obesity among adults and youth: United States, 2015–2016.
- Hedegaard, H., Warner, M., & Miniño, A. M. (2017). Drug overdose deaths in the United States, 1999–2015.
- Jeszeck, C. A., Collins, M. J., Glickman, M., Hoffrey, L., & Grover, S. (2015). Retirement security: Most households approaching retirement have low savings. United States Government Accountability Office.
- Kuhn, T. S. (2012). *The structure of scientific revolutions* (4th ed.). Chicago: University of Chicago Press.
- Kyle, R. G., Wills, J., Mahoney, C., Hoyle, L., Kelly, M., & Atherton, I. M. (2017). Obesity prevalence among healthcare professionals in England: A cross-sectional study using the Health Survey for England. *British Medical Journal Open*, 7(12), e018498.
- Martin, C. B., Herrick, K., Sarafrazi, N., & Ogden, C. (2018). Attempts to lose weight among adults in the United States, 2013–2016. NCHS data brief No. 313. Centers for Disease Control and Prevention.
- Ogden, C. L., Carroll, M. D., Fryar, C. D., & Flegal, K. M. (2015). Prevalence of obesity among adults and youth: United States, 2011–2014.
- Phelan, J. (2018). What is life? A guide to biology, with physiology, Macmillan.
- Sassi, F., Devaux, M., & Cecchini, M. (2016). *The health impacts of obesity. World Scientific handbook of global health economics and public policy: Health determinants and outcomes* (Vol. 2, pp. 355–396). Singapore: World Scientific.
- Scholl, L., Seth, P., Kariisa, M., Wilson, N., & Baldwin, G. (2019). Drug and opioid-involved overdose deaths—United States, 2013–2017. *Morbidity and Mortality Weekly Report*, 67(5152), 1419.
- Thaler, R. H. (1987). Anomalies: The January effect. *The Journal of Economic Perspectives*, 1(1), 197–201.

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