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Metaphorical Framing of Obesity

by

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Abstract

The study of metaphor has moved from abstraction and poetics into the realms of cognitive science and cultural studies. Rather than being seen as purely figurative and secondary to literal meaning, investigation of metaphors reveals a close relationship to our processes of reasoning, a capacity to both reveal and cover, and a plasticity that forms within surrounding cultural values. I reviewed current metaphor theory, including its concerns and justifications, and designed a simple survey experiment through the Qualtrix webpage. The survey was distributed via the Amazon Mechanical TURK system. The experiment, in two different versions, briefly described obesity and then asked participants to describe their attitudes toward, and preferred solutions for, this emerging public health issue. The paragraphs differed only in the metaphor used to describe obesity. Based upon a metaphorical framing hypothesis, it was predicted that obesity as an "infectious epidemic" would bias readers towards societal causes and a preference for public policy changes, while obesity as "simple calorie math" would bias readers towards individualized causes, and less support for public policy changes.

The hypotheses of the study were not supported; there was no significant difference in participant responses between frame conditions. Possible reasons for non-significant results include the survey format, unique aspects of obesity as a public health problem, and participants' level of media exposure to obesity. However, this study could be easily altered into various iterations to confirm or deny many aspects of brief metaphorical framing.

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This project was a long journey. Great thanks to my parents,

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Introduction

Enduring social problems within public health defy simple categorizations and solutions, and so necessitate continual conversation and input from multiple perspectives. The way these large, abstract problems are presented, the frame around them, influences the interpretation individuals create when searching for solutions. When studied, these framing influences can become tools for greater understanding and more potent communication design. The importance of metaphors as framing devices, and more fundamentally as the basis of conceptual thought, has recently come into focus. Scholars have shown their necessity in concept interpretation and in the analysis of how Americans interpret problems in their society, and in the realm of public health. This paper will address the influence of metaphorical framing upon opinions about the causes of obesity, and public policy solutions to obesity. It will review the role of metaphors in concept formation, and how metaphors might affect citizens constructing opinions about problems in their society. Studies that have linked grounded, modal experiences with specific and measurable shifts in concepts are presented, as well as example studies in which simple metaphors influenced the opinions of readers.

In order to further the study of obesity and metaphorical associations, this paper will highlight two metaphors used to frame obesity, and present a study designed to measure their effects. Two obesity metaphors were chosen for their opposing entailments: individual cause or societal cause. These were used within a survey designed to answer the following question: what effect will brief metaphorical framing have upon participants' opinions on the causes of obesity and

their support for public policy solutions. Survey methods are explained, and survey results are discussed.

Theory

According to the CDC, about one-third of U.S. adults (33.8%) are obese, and approximately 17% (or 12.5 million) of children and adolescents aged 2—19 years are obese. Ninety percent of Americans believe that most people in the country are overweight, 67 percent see it as a major issue, and 90 percent think that overweight people face discrimination. (Taylor, Funk, and Craighill, 2006). The problem of obesity has received increased attention; in major U.S. media outlets, fewer than a dozen articles dealing with obesity appeared in the last quarter of 1999, but by the last quarter of 2002, the count was over 1200 (Kersh and Morone, 2005).

Studying the language used to characterize obesity can be a step towards understanding public perception, and creating optimal public policies. Media coverage of social problems carries the potential to influence subsequent interpretations of those topics, a phenomenon studied as framing within the field of Communication. "By presenting the news in either thematic or episodic form, television influences attributions of responsibility both for the creation of problems (causal responsibility) and for the resolution of these problems (treatment responsibility)" (Iyengar, 1991, p. 3). Thematic frames place issues within larger backgrounds, such as economic realities and environmental pressures. "Episodic framing depicts concrete events that illustrate issues, while thematic framing presents collective or general evidence" (Iyengar, 1991, p. 14). In terms of how metaphors create effective frames, a fruitful question emerges: which metaphors for obesity result in a thematic frame that is connected to forces outside of individual

control, and which metaphors instantiate individual control and responsibility - an episodic frame?

This study draws from past scholarship showing "that how an issue is characterized in news reports can have an influence on how it is understood by audiences" (Scheufele and Tewksbury, 2007, p. 11). The hypothesis of this study is based upon the assumption that an initial metaphor will evoke entailments that characterize the issue presented in the proceeding paragraph, and measures the effect of a single metaphor upon the characterization of obesity.

Studying the influence of metaphors in the field of public health and medicine can increase our understanding of how medical issues are interpreted, and how better messages can be designed. Incorrect understanding by patients of their medical condition is common in the field of healthcare. Sappir et al. (2000) found that 10% of patients with progressing tumors thought that they were in full or partial remission, 26% thought their prognosis was undetermined, and 44% thought they were stable. Only 30% knew their actual condition. Within this environment, health professionals and designers of public health messages employ metaphors to simplify information and help people make decisions about problems with no simple solution. While "metaphors may be a useful tool for encouraging culturally competent health communication…they may also lead to unintended effects," such as mischaracterization of a problem, or misunderstanding of how serious a condition has become (Krieger et al., 2000 p. 15). The metaphors used to characterize and interpret medical conditions should be scrutinized closely, and by

extension those used to describe public health issues should also be subject to examination.

Even if a metaphor is useful in accurately conveying needed information, it cannot be assumed that a metaphor or term used within one culture will be effective for increasing understanding in another culture. A persistent connection to common human experiences has been shown in the study of metaphors, and will be discussed in this paper, but differences in cultural knowledge holds "enormous potential for a message source and recipient to perceive a different ground for a particular metaphor" (Krieger et al. 2000, p. 7). No single interpretation of a metaphor should be assumed. Accessing and employing a particular culture's background knowledge in the formation of specific metaphors requires experience and sensitivity, as well as a commitment to avoid seeing culture as a "categorization variable that is relatively simple and fixed, rather than a complex, dynamic, and adaptive system of meaning" (Kreuter and McClure, 2004, p. 440).

Each culture and sub-culture has its own particular set of salient and accessible associations, some more relevant to the task of constructing health communication messages. These associations may be directly or indirectly linked to "health-related priorities, decisions, behaviors, and/or with acceptance and adoption of health education and health communication programs and messages" (Kreuter and McClure, 2004, p. 440).

While cultural variation is a reality that must be considered, this perspective has a pragmatic limit. It's not realistic to exhaustively divide an audience into smaller and smaller sub-groups using cultural categories and labels. It simply may

not be "feasible and cost-effective to identify audience segments that are homogeneous in terms of culture" (Kreuter and McClure, 2004, p. 450). While we may be able to find multiple unique metaphors within culturally narrow populations, studies such as the one presented in this paper will need to stop qualifying cultural groups at a realistic point.

Creation of public health communication messages should include consideration of all the topics mentioned above: framing, message design, and cultural associations. Beginning with a concern for prevalent expressions and mental heuristics has the potential to produce Health Communication Campaigns (HCCs) that present effective material. When individuals are able to think quickly, and talk easily, about the health issues of their community, HCCs will have a greater likelihood of influence. Studying the way people talk and write about public health issues is one method of accessing "the complex interaction between individual-level (micro) behavioral change and community-level (meso/macro) social change" (Chatterjee, et al., 2009, p. 626).

Within this framework, particular metaphors and message designs impact the public's default thinking on healthcare topics. The "opacity of much scientific and medical knowledge to most non-specialists means that attempts to disseminate it outside its original context in the laboratory and academy unavoidably depend on metaphors" (Larson, 2005, p. 244), and these metaphors define the issue in societal dialogues. Studying popular metaphors for health issues such as obesity reveals naturalized, hidden comparisons that may have already been integrated into political solutions.

Obesity is just one example of a multi-faceted problem that is often understood using simple metaphorical comparisons. Obesity was not even defined by the American Medical Association as a disease until 2013, after its own Committee on Science and Public Health produced "a five-page opinion suggesting that obesity should *not* be officially labeled as a disease" (Brown, 2015). A recent 2015 study found six distinct types of individuals with an obese BMI of over 30 (Green et al., 2015). If our goal is democratic and novel solutions to public health problems, we should be ready to critique common metaphors and classifications. The construction of new solutions "requires an epistemological diversity that can come only from a disruption of those metaphors that come to appear natural and necessary in contemporary political discourse" (Skinner and Squillacote, 2010, p. 44). Assumptions about obesity should be examined, along with the way obesity is spoken about in public discourse and scientific literature.

Metaphors Within Language

Contemporary analysis of metaphors began in the 1950s, when Max Black described *comparison theory*, claiming that metaphors are collapsed comparisons that, when broken down, communicate the meaning of similarities between A and B. (Black, 1954 and 1955). He claimed that the cognitive content of metaphorical expressions could *not* be fully reduced to a list of literal features, proposing interaction theory and elucidating the interactions of common associations in the source and target of the metaphor. From this work and time period, "the idea began to take hold that there might be something cognitively special about metaphor and

that this fact might require serious revision of deeply rooted views of thought and language" (Johnson, 2010, p. 401). Following Black's work, the themes and limits of metaphorical language were considered by philosophers and psychologists. What are the cognitive processes underlying metaphors? As speech acts, how can metaphors best be explained?

An elaborated theory for solving the source of metaphorical language was presented in Lakoff and Johnson's Metaphors We Live By (1980). The authors explained how our sensory and motor experiences could provide the raw material to form metaphorical concepts that are necessary for human cognition. Being rooted in lived experience, metaphors are essential in speech and gesture; they form the basis of our ability to communicate, rather than serving a superfluous or ornamental function.

For example, babies experience warmth when cuddled, forming the basis for the conceptual metaphor, *warmth is affection*. From this grounding we understand the metaphors of "a warm reception" and "a chill in the air." We experience being higher than someone or something as allowing for more control and accurate predictions. From the conceptual metaphor of *height is control* we can understand the everyday use of hierarchies, such as "my boss is above me in the company" or "climb the corporate ladder", as well as phrases like "no problem, I'm on top of it". Basic conceptual metaphors provide us with ways to gain knowledge in a systematic way. Metaphors We Live By succeeded in presenting an elaborated paradigm for understanding the use of metaphors in everyday, functional speech, and in showing how they are intertwined with cognitive processes. When we think, we aren't just

comparing two things, we are experiencing one thing as another. Current scholarship is continuing to reveal that metaphors are unavoidable and impossible to ignore in our everyday thoughts.

Gibbs (1992) provides four compelling kinds of evidence supporting the metaphorical basis of thought. First, many common expressions exhibit a systematicity. *Love is a journey* provides the basis for all sorts of expressions like "our relationship is on the rocks" and "it's been a long, bumpy road." Basic concepts in everyday thought, such as time, anger, and spatial orientation, include metaphorical systems. Secondly, conventional metaphors are easily extended in speech and poetry. The connections are already present within the baseline conceptual metaphor, and the novel metaphors draw attention to them rather than creating completely new categories ad-hoc. Third, polysemous words are quite prevalent in our language, possessing multiple meanings that are systematically related. Out of the 100 most frequent English words, 97 are polysemous, and evidence suggests that "many of a polysemous word's meanings are motivated by the metaphorical projection of knowledge from one domain to another" (Gibbs, 1992, p. 574). Words become polysemous within regularities that make sense to us, based upon conceptual metaphors. Finally, the psychological study of idioms supports a basis of conceptual metaphorical knowledge. Idioms exhibit specific connections to their source domains; people show remarkable similarity in transferring source domain qualities onto target domains in predictable ways (Gibbs, 1992, p. 575).

Recent studies have refined what it means to assert that metaphors form the basic fabric of thought, and how best to demonstrate this. When we read a metaphor, we understand it by creating a real-time, imaginative simulation. These "metaphorical simulations are not abstract, or amodal, but are created in terms of 'as if' bodily action" (Gibbs and Matlock, 2008, p. 167). These simulations can be purely mental, and are not complicated or inflated beyond an immediate situation, but rather they are automatic and subconscious. Our understanding of concepts likely comes from simulations, though we are not always able to explain this apart from the simulation, nor apart from using metaphors as linguistic markers of those simulations.

Acting out an action results in faster response times to metaphorical phrases (Wilson and Gibbs, 2007), but "real movement is not required to facilitate metaphor comprehension, only that people mentally simulate such action" (Gibbs and Matlock, 2008, p. 168). For example, Decety et al. (1989) showed that people take longer to imagine walking 30 yards with a heavy backpack than walking the same distance without anything on their backs. In a more recent study, when participants read or created sentences with imaginary motion, this simulation influenced their answer to an ambiguous time question about moving a Wednesday meeting forward two days to either Monday or Friday (Matlock et al., 2005). Even counting down vs. counting up influenced answers towards Monday or Friday (Lakoff and Nunez, 2001), suggesting that participants simulated motion without a subject and without a physical space; "people engage in embodied simulations for actions that in many cases are not physically possible" (Gibbs and Matlock, 2008, p. 173).

Category construction also suggests a metaphorical, simulation background. Barsalou (1995) showed that only 66% of category features were duplicated in the same test after two weeks had passed. The same researcher showed that American and Chinese citizens differ in their definition of what birds are "typical" (Barsalou and Medin, 1986). People who work with specific categories of objects regularly in their job will develop various representations that come directly from what they do with those objects (Medin et al., 1997). From our infancy, we build scripts and simulations through the interaction of our body with our environment. These unconscious simulations are not always accessible to our conscious, rational minds; though we can't always articulate the knowledge we have in isolated terms, it dramatically affects our actions and interpretations.

The link between experience and underlying conceptual metaphors can also be demonstrated through specific modal pathways. Zhong and Liljenquist (2006) found measurable results when studying the conceptual metaphor, *moral is clean*. Participants actually preferred cleaning products, and were more likely to take a free sanitizing product with them, after encountering a story involving questionable morality. Lee and Schwarz (2010) went further, showing that the specific modality involved in moral acts was relevant in the underlying construction of moral purity. Participants preferred mouthwash after speaking lies, and hand sanitizer after typing untrue emails. They connected moral actions with being clean, even distinguishing between a clean mouth and clean hands.

Casasanto and Dijkstra (2010) found that people retrieved positive memories faster when moving marbles up, and negative memories when moving

marbles down, thereby demonstrating an underlying conceptual metaphor of *positive is up*. Wexler et al. (1997) showed that, in four different experimental situations, mental rotation flowed directly from the motor processes involved in physical rotation, demonstrating that mental processes employ the same brain activity as physical actions. Finally, Nail et al. (2006) were able to induce liberals to think like conservatives by asking them to simulate a threatening situation, showing that thinking about societal problems and political solutions relies at least partially on what actual experiences we employ to understand these abstractions. The above results demonstrate that our unconscious reasoning relies upon experiences our bodies have gone through, and that these are used as embodied simulations to think about problems and tasks in daily life.

Borodistky and Ramscar (2002) found more evidence when they looked at our everyday conception of time, and how it shifts depending on our situation. Time can be conceived as flowing towards oneself, or as a medium that one's own ego moves through. Both are based on the conceptual metaphor, *time is space*. Depending on how one views time, when asked what day a meeting will be held after being moved two days forward from Wednesday (the same question used in previously mentioned time studies), people will answer either Monday or Friday. Participants were shown a picture of a chair with a rope and asked to imagine one of two scenarios: either pulling themselves along the rope while seated in the chair, or pulling the chair towards themselves using the rope. After having imagined pulling a chair towards themselves, participants favored time moving towards them, answering Monday, whereas when they imagined moving themselves towards the

chair, participants favored their ego moving through the medium of time, and answered Friday.

In another scenario within the same study, just after boarding a train people answered as though they were moving through time, but after having sat on the train for a few minutes, more people answered as though time was moving towards them. When waiting in line, people answered differently depending on how long they had been waiting in line; the longer one waits, the more likely that one will see time as flowing towards the ego, rather than the ego moving through time. In other words, we rely upon a simulation to understand what time is, and this understanding shifts back and forth, depending on our immediate physical experience. The conceptual metaphors "time is movement around me" versus "time is stillness moved through by me" are not just comparisons. They are essential and unavoidable, they *are* the cognitive method by which people understand time.

While physical tasks can be used to show that we understand problems and abstractions through salient experiences, embodied understanding can be demonstrated by utilizing specifically crafted written messages as well. Fausey and Borodistky presented readers with two descriptions, differing in their transitive or intransitive verbs. A measurable difference in blame and financial responsibility was found, confirming that various linguistic methods could be employed to frame situations (Fausey and Boroditsky, 2010). In particular, metaphors are a simple and direct way to elicit a framing effect. Written metaphors frame the question or problem not only because they are comparing two things, but because they are activating a particular simulation of experience. Metaphors are not solely rhetorical

devices, they are also linguistically representative of how our thought processes must operate in order to arrive at a solution.

Thibodeau and Boroditsky (2011) showed that one metaphor at the beginning of a paragraph of crime statistics could influence the solutions participants favored for the problem of crime. The only difference between paragraphs shown to participants was the framing of crime as a "beast" or crime as a "virus". Controlling for other factors, the people who read crime as a virus were more inclined to see preventative and educational measures as the most effective solutions for the problem.

In follow-up experiments, the same researchers showed that these metaphors influenced solution preference even when participants had a list of solutions to choose from, and that the effects remained the same when participants could not directly recall the metaphor they had read (Thibodeau and Boroditsky, 2013). With only one brief metaphor, the authors of these studies influenced attitudes towards a problem every society addresses, and every citizen influences through voting. "Metaphorical frames can play a powerful role in reasoning because they implicitly instantiate a representation of the problem in a way that steers us to a particular solution" (Thibodeau and Boroditsky, 2013, p. 7). Such a potent avenue of influencing attitudes is worth pursuing, and this paper outlines one way of applying brief framing to a problem that cuts broadly across society.

In summary, experimental studies support the claim that the characteristics of language, including metaphorical language, can have powerful framing effects, and are integral to thinking and knowledge. Evidence suggests our minds use

embodied knowledge to simulate past sensory experiences. These pathways bias us towards particular interpretations of language. Different cultures and communities employ language in contextually relevant ways, shaping the most salient metaphors and mental shortcuts. This results in vast diversity and plurality in meaning, and the apprehension of reality. Taking all this into account, we can consider the framing of various social issues and topics as natural extensions of using metaphors to understand, and solve, societal problems.

Obesity Metaphors

Although the literature focusing specifically on obesity and metaphors is sparse, Barry et al. (2009) recently studied whether people's metaphorical beliefs about obesity affected their support for obesity-related policies. The authors recognized that "metaphors are *partial* comparisons highlighting certain features of a newly identified matter of concern" (p. 9) and that "when a problem becomes salient to the public at large, individuals attempt to make sense of it through a variety of sources" (p. 8). Since metaphorical reasoning is inherently partial, citizens may also "use multiple metaphors to help clarify complex social phenomena" (p. 10). The authors point out that metaphors can be very influential upon public opinion about obesity due to four reasons: obesity is at an early stage of public attention, metaphors may be very useful to people who are not usually interested in public affairs, people use metaphors to understand complicated problems, and the media discourse surrounding obesity is filled with metaphors.

Barry et al. (2009) compared participant agreement towards obesity metaphors with appraisal of public policy solutions. They suggested that obesity metaphors can be placed along a spectrum, from personal choice to external forces, "the former being most strongly associated with blaming those who are overweight" (p. 19). They also found that metaphors with low individual blame "were consistently positively associated with policy enactment" (p. 38). Echoing these findings, Niederdeppe et al.'s 2011 review of obesity research found "only three published experiments (to our knowledge) directly relevant to obesity," but within one study, "thematic frames produced higher societal attributions of responsibility than episodic frames, particularly when thematic frames also emphasized risks of becoming obese from societal causes. (Niederdeppe et al., 2011, p. 298)

Applied to this current study, a frame that instantiates low individual agency is predicted to be associated with a thematic understanding and social policy enactment, while a frame that instantiates high individual agency is predicted to be associated with an episodic understanding and the expectation of solutions at an individual level. While Barry et al. presented extended metaphors, this study uses only a brief frame at the beginning of the paragraph, just as in Boroditsky's 2011 and 2013 studies on crime.

Two frequently appearing frames that suggest the thematic or episodic aspects of the topic are *obesity as infectious epidemic* and *obesity as simple calorie math*. These two phrases are continually used to characterize the issue of obesity, and to guide interpretation of it. While obesity, as a lifestyle disease, is numerically an epidemic in the population, the domain of infectious disease is distinct, and used

to highlight particular aspects of the social issue. Clearly "epidemic" is a popular and useful word. This metaphor is used not only in reference to the spread of obesity; it can also be found attached to a host of other societal problems, such as unscrupulous banking practices, ADHD, and police violence.

There is no shortage of popular articles suggesting that the "obesity epidemic" will negatively affect life expectancy and the American economy, but there is little scholarly literature regarding the metaphorical frame of obesity as a condition that is readily contagious. The notion of catching obesity is necessarily included within the concept of an obesity epidemic, "but the distinctive implications of contagion—personal exposure and attendant threats to well-being—were not fully articulated in the elite literature until relatively recently" (Barry et al., 2009, p. 40).

An epidemic occurs when a disease is found in a population at a level much higher than is expected in recent experience (Green et al., 2002). Though we read of obesity as an epidemic, it is not directly infectious through a single vector. However, highlighting the characteristic of spreading contagion via the epidemic frame has provided a useful communication tool for public health advocates, as well as companies who stand to profit from prescription obesity medicine (Theiss, 2012).

Still, the essential question looming over the epidemic frame is, succinctly, "you can't catch obesity. So why act as if you can?" (Richman, 2002). The answer, found connected to many frames, is that treating obesity as an epidemic might be an effective way of understanding important facets of the problem, especially when influencing people to support public policy changes. If obesity can be greatly

reduced through the public policies found in this study's survey, there are compelling reasons to pursue the epidemic frame, even in light of its limitations. Though obesity is not always and strictly a direct result of our environment, we might still have reasons to follow solutions that minimize the chances of people living in an environment biasing them towards a condition connected with a host of other health problems.

Macro-level changes will likely involve public health campaigns or public policy changes. Rather than asserting that enlightened individuals will reliably make individual choices to stand against great odds, the results of studying obesity metaphors should directly influence collective action towards characterizing the problem in a way that is most likely to change behavior in American society. Prevention of obesity and other "lifestyle diseases" in developed countries is essential, just as hygiene and public health reforms were essential in the 19th century, and were "undertaken for people, rather than by people.'" (Farley and Cohen, 2001).

A contrasting frame entrenched in our understanding of obesity and nutrition is calorie math, borrowing from the distinct domain of simple mathematics. Conventional wisdom suggests that people gain weight when they use less calories than they consume. "By this logic, any excess of calories—whether from protein, carbohydrate or fat … will inevitably pack on the pounds. So the solution is also obvious: eat less, exercise more" (Taubes, 2013). While attractive as a metabolic certainty, there are so many variables at play that calorie utilization is not just simple math, nor is it always useful in addressing obesity. "No one can

count calories to within significant degrees of accuracy… so it's rather a pointless practice." (Theiss, 2012). Not only is it difficult to measure how different sources of calories are metabolized, there is currently emerging evidence that food breakdown is influenced by a plethora of factors we do not have immediate control over. For example, a recent study that transplanted gut bacteria into mice, causing them to become fat or thin, provided "the clearest evidence to date that gut bacteria can help cause obesity" (Kolata, 2013).

There is more and more reason to view obesity as a problem caused by multiple factors, some quite complex. A purported simple mathematical solution obscures important variables, but at the same time it highlights an ability to choose foods and activities that will balance caloric intake. As the mayor of New York said, "If you want to lose weight, don't eat. This is not medicine, it's thermodynamics. If you take in more than you use, you store it." So it's just science, even the hard science of physics (Berreby, 2013). While simple calorie math provides an easy solution drawn upon time and time again, it must be viewed alongside current research.

Consider the study that measured animal weight over the past 20 years, finding that as Americans gained weight, so did "laboratory macaques, chimpanzees, vervet monkeys and mice, as well as domestic dogs, domestic cats, and domestic and feral rats from both rural and urban areas" (Berreby, 2013). And calories are not all equal, they can't be usefully equated without taking into account the form in which they enter our bodies. The number of calories is likely not the essential problem. Instead we should be examining "biochemical influences on the body's fat-making

and fat-storage processes … sheer quantity of food or drink are not the all-controlling determinants of weight gain" (ibid.). To add even more layers, we are also influenced by our parents' nutritional past: the descendants of undernourished people are "more likely to become obese in a food-rich environment." (ibid.). And finally, the very economics of food production bias towards addictive, high sugar and fat foods, since food companies encourage people to select foods that are the most profitable for them to produce and sell. While it is not within the scope of this study to include all possible factors of obesity's spread over the past 20 years, it is worth mentioning that individual choice based on mathematical certainty is only *one possible way* of viewing obesity, and in fact this frame has failed to produce reduction solutions over the last few decades.

All these complications do not make obesity metaphors inert or ineffective. A particular type of bacteria may directly contribute to one kind of obesity; it does not mean that these bacteria are highly contagious to the general public and the cause of an alarming epidemic. Though reducing calorie intake changes the body's fat storage and energy utilization, it does not mean that calorie math is the simple and obvious solution for obesity. A metaphor need not be an exhaustive explanation of a problem to evoke a framing simulation, nor should it be dismissed by showing a few false aspects of the metaphorical comparison. None of the above factors negate the value of using various metaphors to understand the problem of obesity. They instead show the limitations of naturalized metaphors, and the need for close study. Even when compelling reasons to discard a metaphor become apparent, that

metaphor might persist because of how it addresses a few aspects of a societal problem, and due to its usefulness for particular vested interests.

Here within this limited study of two phrases, *obesity as infectious epidemic* is predicted to evoke a frame of obesity as primarily caused through environmental factors. Just as a body can catch an infection, it is possible for our eating choices to be greatly affected by harmful influences all around us; being overweight can be understood as an illness contracted from the environment. Entailments of this metaphor include measures to control an infectious illness: education, reduction of environmental vectors, and introduction of factors necessary to restore health. Therefore, participants are predicted to favor communal responsibility and public policy changes.

Obesity as simple calorie math is predicted to cause readers to apply a frame of individual choice with a simple solution. When utilizing this frame, obesity is a simple problem with a clear solution. The individual chooses to ignore basic truths that are simple and widely known, and their body is affected negatively as a result. Entailments of simple math include clear and obvious solutions that individuals ought to understand and follow. Therefore participants considering the problem of obesity within this frame will be biased towards individual responsibility and lower support for public policy changes.

Turning to quantitative measurement and evaluation of metaphorical influence, again the body of highly relevant literature is not robust. However, along with the study by Barry et al. (2009), Niederdeppe et al. (2011) stands as a notable forerunner. This study measured the effect of narrative and non-narrative messages

on how people attributed responsibility for the causes and solutions to obesity. The authors were aware that "message designers can frame a social issue like obesity as being caused by internal factors, external factors, or both" (Niderdeppe et al., 2011, p. 298). The limited work on obesity cause attribution reveals "a pattern of results, finding that beliefs that placed external, societal factors at fault for causing obesity (e.g. food industry marketing) were positively associated with support for a variety of upstream policies to reduce obesity" (ibid., p. 297).

Niederdeppe et al. measured attitudes towards the causes of obesity using 12 randomly ordered statements, along with five-point Likert scales of agreement. The 12 statements were gathered from previous surveys from various sources, such as the Harvard School of Public Health and ABC News. Categories were created through exploratory factor analysis; six items measured societal cause attribution for obesity (Cronbach's $\alpha = .77$; $M = 3.22$, $SD = 0.85$); four items measured individual cause ($\alpha = .71$; $M = 3.54$, $SD = 0.77$); and two items measured genetic cause attribution ($r = .45$; $M = 2.50$, $SD = 0.84$). To measure public policy support Niederdeppe et al.'s 2011 study took questions from Barry et al. (2009), who had reduced Brescoll, Kersh, and Brownell's (2008) list. "The items we chose were judged to be of moderate political feasibility by a panel of national experts in health policy, [and] of high potential impact by a panel of national experts in public health" (Niederdeppe, 2011, p. 306). These questions were chosen for this current study due to their tested efficacy in measuring attitudes towards the causes of obesity, and public policy solutions.

Research Question and Hypotheses

This study is concerned with the effect of brief framing at the beginning of a written paragraph. Previous studies have shown that metaphors are essential to thought, and that metaphors can influence the interpretation of problems and questions. The following Research Question is an extension of past research on metaphors and obesity: What effect does brief metaphorical framing exert upon attitudes regarding the causes of obesity and public policy solutions to obesity?

A metaphor that instantiates environmental cause and contagion should bias participants towards agreement with societal causes, and Hypothesis 1 addresses this prediction: attribution of responsibility to societal factors will be higher when obesity is framed as an *infectious epidemic* than when obesity is framed as *simple calorie math*. Furthermore, a metaphor that instantiates environmental cause and contagion should bias participants towards support for public policy solutions, and Hypothesis 2 formulates this prediction: support for societal solutions will be higher when obesity is framed as an *infectious epidemic* than when obesity is framed as *simple calorie math*.

Method

Design

In order to test these hypotheses, this study exposed participants to one of two frames: obesity as "infectious epidemic" or obesity as "simple calorie math," and then measured participant agreement with personal causes and societal causes of obesity, as well as participant support for public policy solutions. It was predicted that the infectious epidemic frame would bias participants towards agreement with societal causes and public policy solutions. The simple calorie math frame was predicted to bias participants towards personal cause attribution and lower public policy support. Participants were recruited through the Amazon TURK website and compensated 50 cents for completing the survey.

Qualtrics.com allows users to create online surveys through a web-based drag and drop graphical interface; the type of question and ordering can all be customized. Using the Qualtrics website, an online survey was created. The survey was designed to first display survey information and an informed consent message. Then the survey randomly displayed one of two short paragraphs about obesity. The only difference between the two paragraphs was in the metaphor used to describe obesity, either "an infectious epidemic" or "simple calorie math":

> Please read this paragraph and be ready to give your opinion. Today in America, obesity is [an infectious epidemic / simple calorie math] and the results are obvious. According to the CDC, about one-third of U.S. adults (33.8%) are obese, and approximately 17% (or 12.5 million) of children and

> adolescents aged 2—19 years are obese. The World Health Organization states that obesity is a major risk factor for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer. The cost of obesity in America is about 73 billion dollars a year, but obesity is usually preventable. We need to find the causes of obesity, and figure out how to solve this problem.

The paragraph about obesity, including one of the two frames, was displayed completely on one online survey page. This page was locked for ten seconds before the continue button was displayed below the paragraph. This ensured that participants were presented with the information for a minimum consideration time of ten seconds, enough time to read the short paragraph.

Questions were presented immediately following the paragraph in order to measure participant appraisal of obesity. The most relevant studies mentioned above utilized immediate assessment of metaphorical processing without tasks in-between, and this survey followed those examples. There was no time limit set for the two sets of questions, though the entire survey time was limited to 15 minutes. Participants chose, within five-point Likert scales, their level of agreement with ten statements that measured agreement with cause attributions towards obesity. The statements were presented randomly and the Likert scales were oriented horizontally. Next, participants were asked to indicate their level of agreement, through the same five-point Likert scales, with eight possible changes in public policy. A comprehension statement with clear directions was given within this

second set of questions to ensure participants were actually reading the survey questions. This statement instructed participants to check two specific boxes within the same Likert scale as found in the questions. Participants who did not correctly complete the task were not included in the results. The survey concluded with a basic set of demographic questions and was intended to take less than five minutes. A complete transcript of the online survey is included here in the Appendix.

Measurement

Ten cause attribution statements were taken from Niederdeppe et al.'s 2011 study. Niederdeppe et al. used six statements to measure societal cause attribution (Cronbach's $\alpha = .77$; $M = 3.22$, $SD = 0.85$); , while four statements measured individual cause attribution (Cronbach's $\alpha = .71$;$M = 3.54$, $SD = 0.77$). Questions about genetic cause were not used in order to focus and shorten the online survey.

Societal cause questions were presented as a random set with personal cause questions. These societal cause questions were based upon past obesity research, and allowed for analysis of several distinct societal cause categories.

-There is too much advertising for unhealthy food. (Advertising)

-Healthy food is too expensive for many people. (Health Food)

-There are not enough healthy food options in restaurants and supermarkets. (Rest Opt)

-There are not enough safe and affordable places for people to exercise. (Places)

-There is a lack of information on healthy food choices.

(Choices)

-There is a lack of information about the content of foods in restaurant and supermarkets. (Rest Info)

One error was present in the question about the expense of healthy food (Health Food). Instead of "Strongly Agree," the words above the Likert choice read "Strongly Disagree," and there were two of the same answer on both sides of the scale. The answers to this question were removed from analysis.

The following four questions measured agreement with personal cause. They were presented as a random set with the societal cause questions.

-Most people lack the willpower to diet regularly. (Diet)

-Most people lack the willpower to exercise regularly. (Exercise)

-Most overweight people lack self-control. (Self-control)

-Most overweight people don't view their weight as a problem. (Problem)

Questions measuring support for public policy changes were chosen based on past use by Niederdeppe et al. (2011), and on the moderate feasibility of their implementation. They were presented as a random set following the cause attribution questions. The comprehension check statement was also randomly presented with the public policy questions.

-Have zoning laws requiring that all new residential and commercial developments include sidewalks and other safe paths to encourage physical activity.

(Zoning)

-Require warning labels on foods with high sugar or fat content, indicating that such foods may be addictive. (Labels)

-Require restaurants to list the calorie count and fat content of all items on their menus. (Menus)

-Require TV stations to provide free air time for public service announcements on healthy eating and exercise in proportion to the food advertising they carry. (TV)

-Have the government require that restaurants and fast food establishments prepare their foods using the healthiest ways of cooking even if this drives up the costs of a meal. (Restaurants)

-Require grocers to add a surcharge to high-sugar, high-fat foods and use the revenues to reduce their prices for fresh fruits and vegetables. (Grocers)

-Impose a tax on junk food similar to existing government taxes on cigarettes and alcohol. (Tax)

-Require health insurers to charge higher premiums for policyholders who are overweight or fail to exercise regularly, allowing them to reduce premiums for everybody else. (Insurance)

Participants

An advertisement was placed on the Amazon TURK website asking for participants to complete a survey on public health. Participants were required to have a 95% approval rating, a geographic location within the United States, and an age greater than 18. Analysis was restricted to United States residents who are

native English speakers, and IP addresses were used to ensure that participants took the survey only once. Eligible volunteers who accepted the task were given a link to the online survey, hosted on the Qualtrics website. Upon completion, each participant was given a unique completion code to enter into the Amazon TURK system, in order to be paid 50 cents for taking the survey.

The number of valid participant surveys totaled 376. They were 233 male, and 143 female participants. 189 participants were shown the "infectious epidemic" frame while 187 were shown the "simple calorie math" frame. Mean age was 33, and 82 participants reported a weight/height ratio that met the definition of an obese BMI. 53 participants identified themselves as Republicans, 171 as Democrats, 131 as Independents, and 21 as Something Else.

Ethics Statement

The experiment detailed here followed the ethical requirements of Portland State University's Institutional Review Board. Participants were informed that their data would be treated anonymously and that they could stop taking the survey at any time. Contact information for the principal researcher and the Communication department at Portland State University was given before the survey began. To address the effect of metaphors on the perception of obesity in an economical and attainable way, the Amazon mechanical TURK system was used as a recruitment tool to gather a diverse pool of participants. Eligible volunteers were given a link to a simple online survey presented through the Qualtrics website. Upon completion, each participant was given a completion code. This code was entered into the

Amazon TURK website to confirm completion of the survey. Each confirmed participant received compensation of 50 cents in their Amazon TURK account.

Results

A reliability analysis showed that removing one question from each variable set slightly increased the reliability of the scales, but the subsequent results did not differ significantly from using the full set of questions for each variable; the results reported here exclude only the question with an error in the Likert scale. The Likert scale answers, ranging from 1: strongly disagree, to 5: strongly agree, were averaged for each variable. Participants in the epidemic frame condition (n = 189) agreed with societal cause (m = 3.16, sd = .821) and participants in the calorie math condition (n = 187) agreed with societal cause (m = 3.15, sd = .800, t = -.08, n.s.). Participants in the epidemic frame condition (n = 189) agreed with personal cause (m = 3.69, sd = .683) and participants in the calorie math frame agreed with personal cause (m = 3.65, sd = .643, t = -.52, n.s.). Epidemic frame condition participants (N=189) agreed with societal solutions (m= 3.35, sd = .80) and participants in the calorie math frame condition (N=187) agreed with societal solutions (m=3.25, SD=.71, t=1.34, n.s.).

Hypothesis #1 stated that attribution of responsibility to societal factors would be higher when obesity was framed as an *infectious epidemic* than when obesity was framed as *simple calorie math*. Hypothesis #1 was not supported. Hypothesis #2 stated that support for societal solutions would be higher when obesity was framed as an *infectious epidemic* than when obesity was framed as *simple calorie math*. Hypothesis #2 was not supported.

Table 1 - Societal Cause Table of Means

	N	Mean	Std. Deviation	Std. Error Mean
"Epidemic"	189	3.16	.821	.060
"Math"	187	3.15	.800	.058

Table 2 - Societal Cause T-Test Between Frames (Equal Variances Assumed)

t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
					Lower	**Upper**
-.082	374	.935	-.007	.083	-.171	.158

Table 3 - Personal Cause Table of Means

	N	Mean	Std. Deviation	Std. Error Mean
"Epidemic"	189	3.69	.683	.050
"Math"	187	3.65	.643	.047

Table 4 - Personal Cause T-Test Between Frames (Equal Variances Assumed)

t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
					Lower	**Upper**
-.518	374	.605	-.035	.068	-.170	.099

Table 5 - Policies Table of Means

	N	**Mean**	**Std. Deviation**	**Std. Error Mean**
"Epidemic"	189	3.35	.795	.058
"Math"	187	3.25	.706	.052

Table 6 - Policies T-Test Between Frames (Equal Variances Assumed)

t	**df**	**Sig. (2-tailed)**	**Mean Difference**	**Std. Error Difference**	**95% Confidence Interval of the Difference**	
					Lower	**Upper**
-1.34	374	.182	-.104	.078	-.256	..049

Post-Hoc Analyses

A two-factor analysis of variance test showed no interaction between sex and frame within societal cause agreement, $F(3,372) = 1.37$, n.s. Similarly, there was no interaction within personal cause agreement, $F(3,372) = 2.53$, n.s., and no interaction within public policies, $F(3/372) = .221$, n.s. However, sex was significantly influential in agreement with societal cause, $F(3,372) = 4.25$, $p = .040$, and personal cause, $F(3,372) = 8.10$, $p = .005$. Females agreed more with societal cause, while males agreed more with personal cause.

Table 7 – Frame and Sex ANOVA; Societal Cause

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3.307[a]	3	1.102	1.690	.169
Intercept	3564.314	1	3564.314	5466.093	.000
Frame	.040	1	.040	.062	.804
Sex	2.468	1	2.468	3.813	**.052**
Frame * Sex	.738	1	.738	1.133	.288
Error	242.573	372	.652		
Total	3994.400	376			
Corrected Total	245.879	375			

a. R Squared = .013 (Adjusted R Squared = .005)

Table 8 – Frame and Sex ANOVA; Personal Cause

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	6.007[a]	3	2.002	4.693	.003
Intercept	4699.204	1	4699.204	11013.461	.000
Frame	.021	1	.021	.049	.826
Sex	4.377	1	4.377	10.258	**.001**
Frame * Sex	1.372	1	1.372	3.216	.074
Error	158.724	372	.427		
Total	5229.625	376			
Corrected Total	164.731	375			

a. R Squared = .036 (Adjusted R Squared = .029)

Table 9 - Sex and Personal Cause Table of Means

	N	Mean	Std. Deviation	Std. Error Mean
Male	233	3.7554	.64429	.04221
Female	143	3.5315	.67126	.05613

Table 10 – Personal Cause T-Test Between Sexes (Equal Variances Assumed)

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
3.219	374	**.001**	.22390	.06954	.08715	.36064

Table 11 - Sex and Societal Cause

	N	Mean	Std. Deviation	Std. Error Mean
Male	233	3.0927	.76608	.05019
Female	143	3.2629	.86868	.07264

Table 12 - Societal Cause T-Test Between Sexes (Equal Variances Assumed)

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
-1.987	374	**.048**	-.17023	.08568	-.33871	-.00175

There was no significant interaction between political affiliation conditions and frame conditions for societal cause, $F(7,368) = 1.752$, n.s.; personal cause, $F(7, 368) = 1.602$, n.s.; or policy support, $F(7, 368) = 3.989$, n.s. However, political affiliation itself was a significant factor in public policy agreement, $F(3,368) = 6.905$, $p < .001$. Democrats agreed most with public policy solutions, followed by Independents, and then Republicans. This is not really surprising, considering that political parties are often defined in terms of what policies the government should enact.

Table 13 – Frame and Politics ANOVA; Public Policies

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	14.977[a]	7	2.142	3.989	.000
Intercept	1982.821	1	1982.821	3691.482	.000
Frame	.131	1	.131	.243	.622
Politics	11.127	3	3.709	6.905	**.000**
Frame * Politics	1.905	3	.635	1.182	.316
Error	197.665	368	.537		
Total	4307.797	376			
Corrected Total	212.662	375			

a. R Squared = .071 (Adjusted R Squared = .053)

Table 14 - Politics and Agreement with Public Policies

	N	Mean	Std. Deviation
Republican	53	3.1156	.75553
Democrat	171	3.4817	.66885
Independent	131	3.2071	.72933
Something Else	21	2.8690	1.12464
Total	376	3.3002	.75306

ANOVAs were also performed to look at the possible influence of obesity (greater than 30.0 BMI). There was no interaction found between obese BMI condition and frame conditions for societal cause, $F(3,372) = .369$, n.s.; personal cause, $F(3,372) = .1.586$, n.s.; or public policy support, $F(3,372) = 2.178$, n.s. Nor was there any significant influence from obese BMI by itself. Additional tables can be found in Appendix B.

Discussion

Considering the past work on metaphors and brief framing, the lack of significant difference between frame conditions is notable. Essentially this study did not extend the findings of Thibodeau and Boroditsky when applied to the public health issue of obesity; the frames produced no significant differences in participant agreement with the causes of, and solutions to, obesity. There are numerous possibilities of course, and more studies are needed to separate variables that influence participant responses towards obesity causes and interventions. Given that past experiments have shown the effect of framing, future refinements could be performed on studies like this one to find more information and show salient variables.

Steen et al. (2014) repeated Thibodeau and Boroditsky's experiments, but also found no metaphorical framing effect. Steen et al. added a non-metaphorical control condition, removed potential supporting metaphors in the stimulus text, and measured political preference before as well as after exposure to the metaphor and text. Steen et al. contended that several phrases within Thibodeau and Boroditsky's stimulus paragraph could "be read as metaphors that either continue the beast or the virus frame" (Steen et al., p. 4). The researchers created an alternate version of the stimulus paragraph without ambiguously metaphorical phrases, so there was no possibility of elaboration, and tested stimulus paragraph influence using both versions. Secondly, the authors tested a non-metaphorical control version, presenting crime as simply "a problem." Third, policy preferences were measured before and after exposure to the stimulus paragraph in order to provide a basis of

comparison. Therefore, in total, Steen et al.'s research measured the relative effects of six different stimulus paragraphs, one of which was identical to the stimulus paragraph used by Thibodeau and Boroditsky.

Steen et al. "consistently found no effects of metaphorical frames on policy preference" (Steen et al., p. 20), neither with the original stimulus text, nor with the modified versions. The only influence of the stimulus paragraph was found for "the presence of metaphorical support on memory for metaphorical frame" in two of the four experiments (ibid.). In other words, participants remembered the virus or beast metaphor better after the paragraph versions with metaphor elaboration, showing that metaphor elaboration was a potentially important factor. Additionally, Steen et al. found that "reading a text about crime makes people more likely to prefer an enforcement-oriented policy response (regardless of metaphorical frame)" (Steen et al., p. 21). In keeping with previous exposure studies, Steen et al. interpreted these results as further evidence that increased exposure to media about crime causes participants to favor strong enforcement responses. Taking all results into consideration, the authors concluded that studies on metaphorical influence should directly address the conditions needed for such influence to occur. "These conditions do not only concern variation between metaphors and participants, but also the structure and function of the overall reading process in relation to prior beliefs, attitudes and intentions" (Steen et al., p. 23).

Steen et al.'s 2014 attempt to replicate Thibodeau and Boroditsky was published after this obesity study began in 2013, but comparing the Steen study to this obesity study yields some useful insights. First, the obesity stimulus paragraphs

used here lacked metaphorical elaboration, just as in Steen et al.'s research. This might suggest an explanation for the lack of significant results in this study, but Steen et al. found no results even when using metaphorical elaborations. Secondly, Steen et al. included a third control version, suggesting that this study should have included a stimulus paragraph that simply described obesity as a "problem," which it did not. However, there is no reason to think that a control condition would have produced different results, since each of the two frames in effect serve as a control for the other. A control condition phrase would test whether the use of a metaphor per se has an effect, but Steen's findings provide no basis for this expectation. Finally, Steen et al. measured the *relative* change in participant opinions and found that overall, participants preferred stronger enforcement solutions after reading about crime. If this study had pre-measured participant preferences, it could have shown the relative changes in participant opinions, and even possibly results from just exposure to a text about obesity.

As for survey logistics, a common problem lies with participants failing to read the paragraph presented to them, and then completing the survey without thought to the actual content of the reading. While this is possible, there were several safeguards in place to reduce the likelihood of this scenario. The recruited workers had a 95% approval rating, the stimulus paragraph was forced to display for 10 seconds before the advance button appeared, and a reading check question directing participants to check two specific boxes was included in the survey. Even more could be done, however, such as asking a question after the paragraph that evaluated what the participant had read in a simple and neutral form.

It's also possible that the final sentence in the paragraph influenced participant understanding of the issue. All participants saw the final two sentences: "The cost of obesity in America is about 73 billion dollars a year, but obesity is usually preventable. We need to find the causes of obesity, and figure out how to solve this problem." This could have been seen as a call to action, since framing can also be enacted using final statements when presenting an issue. A future version of the survey could remove any evaluation and present only the initial frame and the prevalence of obesity in American society.

The emergence of obesity as a public health issue could also be examined. Given the intense contemporary media coverage of obesity, perhaps participants were accustomed to reading about obesity in a variety of ways, or perhaps the frames chosen were irrelevant and disconnected to obesity for the participant population. It's possible the effect of the frames was diminished by relative exposure to media dealing with the topic, or perhaps readers did not need metaphors to understand obesity. As Steen et al. noted, "some scholars suggest that metaphorical frames only have an effect when they are needed to understand the matter discussed in the text" (Steen et al., 2014, p. 23). The conditions of topic interpretation must also be examined in order to draw stronger conclusions about the framing of an issue such as obesity.

This is also connected to how particular cultures, and how particular participants within cultures, actually interpreted the two frames. A norming study should have been performed to address how participants were reading the frames. Perhaps "infectious epidemic" is not automatically associated with contagion and

the need for preventive action within our participant population, no matter what issue follows it. Perhaps "simple calorie math" is not associated with an easy problem that individuals can solve. The entailments of each metaphor should have been examined more clearly within defined populations. We could then show if these associations are drastically different from each other, and we could shift our frames to metaphors shown to elicit the associations we are most interested in.

The study detailed here also differed from Thibodeau and Boroditsky in the form of response collection. Likert scales were used here, in keeping with the source of the survey questions, but Thibodeau and Boroditsky used open-ended responses with coding into two categories. Using Likert scales allowed for more differentiation between distinct causes and solutions, however there were no significant differences found. The experiment could be repeated as a closer iteration of the 2011 study on crime metaphors, with an open-ended question after the paragraph that could be coded into binary causes: individual or society. Should we find significant differences between frames using this method, it would show an essential difference between the two forms of questioning when applied towards gathering data about framing.

The findings of Thibodeau and Boroditsky could also be a result of chance, and therefore not reproducible. This is always a possibility, though it would take similar studies to build support for this option, such as the one published by Steen et al. in 2014. It bears mentioning that the studies used as examples here may be disproven over time if their results cannot be repeated.

Obesity may be a very different issue, in terms of framing, than past issues that have been studied, such as crime. Although an obese BMI is not easy to ascertain using only sight, being overweight is a condition that is visually perceptible in public. With such a large percentage of the population affected by obesity, it is very likely that participants have personal exposure to this health issue, whether through family connections, friendships, or professional work. It would be relevant in future studies to ask about how much exposure people have had to the issue of obesity in order to see if this is a factor in susceptibility to framing, cause attribution, and support for public policies.

The only significant influences found in this study were sex and political affiliation. Thibodeau and Boroditsky found an effect apart from political affiliation when studying the politically charged issue of crime, so there was precedent suggesting the interpretation of a large societal problem could be subject to the influence of a framing metaphor. In the case of obesity and this study, it is possible that political affiliation was an overwhelming factor, and so the influence of the framing metaphor was not seen.

Political leaning and sex were not the focus of the survey, but their influence does show that participants had pre-existing attitudes towards the subject matter. Sex and political affiliation are longstanding, extensively studied, variables. Brief framing, of the kind found in this experiment, was not found to interact with them. Framing must be continually reinforced through prioritized metaphors, while sex and social interaction are continually present in the lives of participants. They could be seen as permanent frames around identity and problem solving, but it is more

likely they can be effectively studied as phenomena apart from a framing effect. However, the demonstrated effect of sex and political affiliation does show that the survey was answered differently within different groups.

Given that the frames of "infectious epidemic" and "calorie math" produced no measurable differences in obesity interpretation, we can also ask why these two phrases are widely used. Are these phrases, in fact, ineffective at guiding the public's opinion towards personal cause, societal cause, and policy formation? If we could find more potent and effective phrases and metaphors using similar methodologies, the case for speaking differently about obesity would be even stronger. Based on the results of this study, health institutions and public officials should explore and popularize different, more effective ways of communicating the causes and solutions for obesity. Showing the ineffectiveness of two contemporary phrases is at least motivation to find metaphors and frames that do matter and carry some rhetorical weight.

While the lack of significant differences between the frame conditions here is disappointing, this study still showed a simple and easily replicable way of testing the framing of an important public health issue. In addition, this study suggests future experiments; there are several related inquiries that, using a similar methodology, could be attempted in a timely and very affordable way.

Appendix A: Survey

Is English your native language? (Have you spoken English since early childhood?)
- ❍ Yes (1)
- ❍ No (2)

Disclosure

You are invited to participate in a research study conducted by Ryan Hofer from Portland State University. If you decide to participate, you will be asked to read a paragraph and then answer a series of questions. Please answer all questions by yourself. The data will be sent directly to the researcher and all information will be kept confidential with no disclosure of your identity. Your participation is entirely voluntary. You are free to withdraw from the survey at any time. This project is overseen by Portland State University and being conducted in partial fulfillment of the requirements for an M.S. Degree. I am the principal investigator of this project and I may be contacted at rphofer@gmail.com, or please feel free to contact the Human Subjects Research Review Committee, Office of Research and Strategic Partnerships, Market Center Building, Room 620, Portland State University, (503) 725-4288 or 1-877-480-4400 should you have any questions.

Paragraph One

Please read this paragraph and be ready to give your opinion. Today in America, obesity is an infectious epidemic and the results are obvious. According to the CDC, about one-third of U.S. adults (33.8%) are obese, and approximately 17% (or 12.5 million) of children and adolescents aged 2—19 years are obese. The World Health Organization states that obesity is a major risk factor for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer. The cost of obesity in America is about 73 billion dollars a year, but obesity is usually preventable. We need to find the causes of obesity, and figure out how to solve this problem.

Paragraph Two

Please read this paragraph and be ready to give your opinion. Today in America, obesity is simple calorie math and the results are obvious. According to the CDC, about one-third of U.S. adults (33.8%) are obese, and approximately 17% (or 12.5 million) of children and adolescents aged 2—19 years are obese. The World Health Organization states that obesity is a major risk factor for a number of chronic diseases, including diabetes, cardiovascular diseases and cancer. The cost of obesity in America is about 73 billion dollars a year, but obesity is usually preventable. We need to find the causes of obesity, and figure out how to solve this problem.

<u>Cause Questions</u>

There is too much advertising for unhealthy food.
Strongly Disagree (1)

Disagree (2)
Neutral (3)
Agree (4)
Strongly Agree (5)

Healthy food is too expensive for many people.
Strongly Disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly Agree (5)

There are not enough healthy food options in restaurants and supermarkets.
Strongly Disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly Agree (5)

For this question, mark Neutral and Strongly Agree. (reading check question)
Strongly Disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly Agree (5)
There are not enough safe and affordable places for people to exercise.
Strongly Disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly Agree (5)

There is a lack of information on healthy food choices.
Strongly Disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly Disagree (5)

There is a lack of information about the content of foods in restaurant and supermarkets.
Strongly Disagree (1)
Disagree (2)
Neutral (3)
Agree (4)

Strongly Agree (5)

Most people lack the willpower to diet regularly.
Strongly Disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly Agree (5)

Most people lack the willpower to exercise regularly.
Strongly Disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly Agree (5)

Most overweight people lack self-control.
Strongly Disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly Agree (5)

Most overweight people don't view their weight as a problem.
Strongly Disagree (1)
Disagree (2)
Neutral (3)
Agree (4)
Strongly Agree (5)

Solution Questions

Answer the following questions based on your support for these changes in public policies.

Have zoning laws requiring that all new residential and commercial developments include sidewalks and other safe paths to encourage physical activity.
Strongly Oppose (1)
Oppose (2)
Neither (3)
Support (4)
Strongly Support (5)

Require warning labels on foods with high sugar or fat content, indicating that such foods may be addictive.
Strongly Oppose (1)

Oppose (2)
Neither (3)
Support (4)
Strongly Support (5)

Require restaurants to list the calorie count and fat content of all items on their menus.
Strongly Oppose (1)
Oppose (2)
Neither (3)
Support (4)
Strongly Support (5)

Require TV stations to provide free air time for public service announcements on healthy eating and exercise in proportion to the food advertising they carry.
Strongly Oppose (1)
Oppose (2)
Neither (3)
Support (4)
Strongly Support (5)

Have the government require that restaurants and fast food establishments prepare their foods using the healthiest ways of cooking even if this drives up the costs of a meal.
Strongly Oppose (1)
Oppose (2)
Neither (3)
Support (4)
Strongly Support (5)

Require grocers to add a surcharge to high-sugar, high-fat foods and use the revenues to reduce their prices for fresh fruits and vegetables.
Strongly Oppose (1)
Oppose (2)
Neither (3)
Support (4)
Strongly Support (5)

Impose a tax on junk food similar to existing government taxes on cigarettes and alcohol.
Strongly Oppose (1)
Oppose (2)
Neither (3)
Support (4)
Strongly Support (5)

Require health insurers to charge higher premiums for policyholders who are overweight or fail to exercise regularly, allowing them to reduce premiums for everybody else.
Strongly Oppose (1)
Oppose (2)
Neither (3)
Support (4)
Strongly Support (5)

Demographic Questions

What is your age in years?

What is your sex?
Male (1)
Female (2)

What is your height in inches? (5 feet = 60 inches, 6 feet = 72 inches)

What is your weight in pounds?

What is your race?
White (1)
Black, African American, Negro (2)
Asian (3)
Pacific Islander (4)
Other (5)

What is the highest level of education you have completed?
Less than High School (1)
High School or GED (2)
Some College (3)
Bachelor's Degree (4)
Master's Degree or higher. (5)

What is your marital status?
Single, never married (1)
Married or Legal Domestic Partnership (2)
Separated (3)
Divorced (4)
Widowed (5)

Generally speaking, do you consider yourself to be a Democrat, a Republican, an Independent, or something else?

Republican (1)
Democrat (2)
Independent (3)
Something Else (4)

On a scale from 1 to 7, where 1 means very liberal, 4 means moderate or middle of the road, and 7 means very conservative, which of the following do you usually think of yourself as?
1 - Very Liberal (1)
2 (2)
3 (3)
4 - Moderate (4)
5 (5)
6 (6)
7 - Very Conservative (7)

Thinking about all members of your family that live in your household, what was your overall household income in the past year, meaning the total pre-tax income from all sources?
Less than $25,000 (1)
$25,000 or more but less than $50,000 (2)
$50,000 or more but less than $75,000 (3)
$75,000 or more but less than $100,000 (4)
$100,000 or more (5)

Appendix B: Tables

Table 15 - Personal Cause Correlations
(N=376; * = p<.05, ** = p<.01, *** = p<.001; Significance is 2-tailed)

	Diet	Exercise	Self-Control	Problem
Diet Pearson Corr.	1	.611***	.492***	.124*
Exercise Pearson Corr.	.611***	1	.454***	.220***
Self-Control Pearson Corr.	.492***	.454***	1	.257***
Problem Pearson Corr	.124*	.220***	.257***	1

Table 16 - Personal Cause Reliability A

Crohnbach's Alpha	**C.A. based on standardized items**	**N**
.680	.692	4

Table 17 - Personal Cause Reliability B

	Mean	**Minimum**	**Maximum**	**Range**	**Max/ Min**	**Variance**	**N**
Item Means	3.670	3.051	4.045	.995	1.326	.204	4

Table 18 - Personal Cause Reliability C

	Scale Mean if Item Deleted	**Scale Variance if Item Deleted**	**Corrected Item-Total Correlation**	**Squared Multiple Correlation**	**Cronbach's Alpha if Item Deleted**
Diet	10.72	4.368	.541	.434	.567
Exercise	10.64	4.323	.577	.416	.547
Self-Control	11.06	3.885	.536	.307	.561
Problem	11.63	4.927	.247	.084	**.756**

Table 19 - Personal Cause Questions

Question	Frame	N	Mean	Std. Deviation	Std. Error Mean
Diet	"Epidemic"	189	3.95	.883	.064
Diet	"Math"	187	3.97	.826	.060
Exercise	"Epidemic"	189	4.11	.827	.060
Exercise	"Math"	187	3.98	.842	.062
Self-Control	"Epidemic"	189	3.63	1.031	.075
Self-Control	"Math"	187	3.61	.985	.072
Problem	"Epidemic"	189	3.05	1.009	.073
Problem	"Math"	187	3.05	.996	.073

Table 20 - Societal Cause Correlations

(N=376; * = p<.05, ** = p<.01, *** = p<.001; Significance is 2-tailed)

	Advertising	Rest Opt	Places	Choices Info	Rest Info
Advertising Pearson Corr.	1	.311***	.163*	.246***	.355***
Rest Opt Pearson Corr.	.311***	1	.316***	.435***	.515***
Places Pearson Corr.	.163*	.316***	1	.392***	.314***
Choices Info Pearson Corr.	.246***	.435***	.392***	1	.560***
Rest Info Pearson Corr.	.355***	.515***	.314***	.560***	1

Table 21 - Societal Cause Reliability A

Crohnbach's Alpha	C.A. based on standardized items	N
.742	.738	5

Table 22 - Societal Cause Reliability B

	Mean	Minimum	Maximum	Range	Max/ Min	Variance	N
Item Means	3.157	2.745	4.008	1.263	1.460	.254	5

Table 23 - Societal Cause Reliability C

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Advertising	11.78	12.796	.358	.150	**.745**
Rest Opt	12.86	10.550	.557	.325	.677
Places	13.04	11.796	.403	.184	.735
Choices Info	12.89	10.486	.586	.383	.665
Rest Info	12.58	10.207	.630	.431	.648

Table 24 - Societal Cause Questions

Question	Frame	N	Mean	Std. Deviation	Std. Error Mean
Advertising	"Epidemic"	189	3.98	1.039	.076
Advertising	"Math"	187	4.03	.978	.071
Rest Opt	"Epidemic"	189	2.90	1.236	.090
Rest Opt	"Math"	187	2.95	1.186	.087
Places	"Epidemic"	189	2.77	1.206	.088
Places	"Math"	187	2.72	1.131	.083
Choices Info	"Epidemic"	189	2.92	1.220	.089
Choices Info	"Math"	187	2.88	1.153	.084
Rest Info	"Epidemic"	189	3.23	1.214	.088
Rest Info	"Math"	187	3.19	1.162	.085

Table 25 - Policies Correlation Table
(N=376; * = p<.05, ** = p<.01, *** = p<.001; Significance is 2-tailed)

	Rest.	Grocers	Tax	Ins.	TV	Menus	Labels	Zoning
Restaurants Pearson Corr.	1	.344***	.358***	.059	.375***	.307***	.410***	.272***
Grocers Pearson Corr.	.344***	1	.681***	.367***	.319***	.186***	.388***	.278***
Tax Pearson Corr.	.358***	.681***	1	.371***	.356***	.214***	.341***	.253***
Insurance Pearson Corr.	.059	.367***	.371***	1	.148*	.025	.148*	.037
TV Pearson Corr.	.375***	.319***	.356***	.148*	1	.384***	.385***	.320***
Menus Pearson Corr.	.307***	.186***	.214***	.025	.384***	1	.429***	.327***
Labels Pearson Corr.	.410***	.388***	.341***	.148*	.385***	.429***	1	.264***
Zoning Pearson Corr.	.272***	.278***	.253***	.037	.320***	.327***	.264***	1

Table 26 - Policies Reliability A

Crohnbach's Alpha	C.A. based on standardized items	N
.772	.773	8

Table 27 - Policies Reliability B

	Mean	Minimum	Maximum	Range	Max/ Min	Variance	N
Item Means	3.300	2.782	4.059	1.277	1.459	.273	8

Table 28 - Policies Reliability C

	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Squared Multiple Correlation	Cronbach's Alpha if Item Deleted
Restaurants	23.56	28.508	.473	.279	.747
Grocers	23.50	26.160	.619	.519	.719
Tax	23.62	25.623	.619	.514	.718
Insurance	23.54	30.329	.270	.181	**.786**
TV	22.96	28.425	.510	.296	.741
Menus	22.34	31.159	.402	.279	.759
Labels	22.83	28.191	.531	.340	.737
Zoning	22.46	31.161	.378	.192	.762

Table 29 - Policies Questions

Question	Frame	N	Mean	Std. Deviation	Std. Error Mean
Restaurants	"Epidemic"	189	2.82	1.250	.091
Restaurants	"Math"	187	2.86	1.229	.090
Grocers	"Epidemic"	189	3.05	1.338	.097
Grocers	"Math"	187	2.76	1.296	.095
Tax	"Epidemic"	189	2.88	1.398	.102
Tax	"Math"	187	2.68	1.385	.101
Insurance	"Epidemic"	189	2.95	1.348	.098
Insurance	"Math"	187	2.78	1.395	.102
TV	"Epidemic"	189	3.54	1.209	.088
TV	"Math"	187	3.34	1.159	.085
Menu	"Epidemic"	189	4.02	1.031	.075
Menu	"Math"	187	4.10	.850	.062
Labels	"Epidemic"	189	3.64	1.228	.089
Labels	"Math"	187	3.51	1.142	.084
Zoning	"Epidemic"	189	3.92	1.059	.077
Zoning	"Math"	187	3.97	.909	.066

Table 30 - ANOVA between Frame and Gender

Group	N
"Epidemic"	189
"Math"	187
Male	233
Female	143

Table 31 - Dependent Variable: Agreement with Public Policies

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	1.393[a]	3	.464	.817	.485
Intercept	3867.321	1	3867.321	6809.529	.000
Frame	.793	1	.793	1.396	.238
Sex	.322	1	.322	.566	.452
Frame * Sex	.065	1	.065	.114	.735
Error	211.269	372	.568		
Total	4307.797	376			
Corrected Total	212.662	375			

a. R Squared = .007 (Adjusted R Squared = -.001)

Table 32 - ANOVA Between Frame and Political Party

Group	N
"Epidemic"	189
"Math"	187
Republican	53
Democrat	171
Independent	131
Something Else	21

Table 33 - Dependent Variable: Agreement with Personal Cause

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	4.870[a]	7	.696	1.602	.134
Intercept	2752.365	1	2752.365	6335.940	.000
Frame	.069	1	.069	.158	.691
Politics	2.633	3	.878	2.020	.111
Frame * Politics	2.320	3	.773	1.780	.150
Error	159.861	368	.434		
Total	5229.625	376			
Corrected Total	164.731	375			

a. R Squared = .030 (Adjusted R Squared = .011)

Table 34 - Dependent Variable: Agreement with Societal Cause

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	7.931[a]	7	1.133	1.752	.096
Intercept	1909.012	1	1909.012	2952.395	.000
Frame	.263	1	.263	.407	.524
Politics	4.671	3	1.557	2.408	.067
Frame * Politics	2.961	3	.987	1.527	.207
Error	237.948	368	.647		
Total	3994.400	376			
Corrected Total	245.879	375			

a. R Squared = .032 (Adjusted R Squared = .014)

Table 35 - Sex and Public Policies

	N	**Mean**	**Std. Deviation**	**Std. Error Mean**
Male	233	3.2758	.75216	.04928
Female	143	3.3400	.75547	.06318

Table 36 - Public Policies T-Test Between Sexes, Equal Variances Assumed

t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
					Lower	Upper
-.803	374	.422	-.06428	.08004	-.22166	.09309

Table 37 - Politics Agreement with Personal Cause

	N	Mean	Std. Deviation
Republican	53	3.7170	.62025
Democrat	171	3.6067	.67949
Independent	131	3.6908	.67356
Something Else	21	3.9405	.49311
Total	376	3.6702	.66278

Table 38 - Politics Agreement with Societal Cause

	N	Mean	Std. Deviation
Republican	53	3.0679	.81424
Democrat	171	3.2819	.77541
Independent	131	2.9905	.79980
Something Else	21	2.9905	1.02660
Total	376	3.1574	.80974

Table 39 - Politics Agreement with Public Policies

	N	Mean	Std. Deviation
Republican	53	3.1156	.75553
Democrat	171	3.4817	.66885
Independent	131	3.2071	.72933
Something Else	21	2.8690	1.12464
Total	376	3.3002	.75306

Table 40 - ANOVA between Frame and Obese BMI

Group	N
"Epidemic"	189
"Math"	187
Non-Obese BMI	294
Obese BMI	82

Table 41 - BMI ANOVA , Dependent Variable: Agreement with Personal Cause

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	2.080[a]	3	.693	1.586	.192
Intercept	3383.039	1	3383.039	7737.372	.000
Frame	.687	1	.687	1.570	.211
Obese BMI	1.095	1	1.095	2.505	.114
Frame * Obese BMI	.905	1	.905	2.069	.151
Error	162.651	372	.437		
Total	5229.625	376			
Corrected Total	164.731	375			

a. R Squared = .013 (Adjusted R Squared = .005)

Table 46 - Dependent Variable: Agreement with Societal Cause

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	.730[a]	3	.243	.369	.775
Intercept	2560.719	1	2560.719	3885.755	.000
Frame	.181	1	.181	.274	.601
Obese BMI	.006	1	.006	.009	.925
Frame * Obese BMI	.722	1	.722	1.096	.296
Error	245.149	372	.659		
Total	3994.400	376			
Corrected Total	245.879	375			

a. R Squared = .003 (Adjusted R Squared = -.005)

Table 47 - Dependent Variable: Agreement with Public Policies

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	3.671[a]	3	.1.224	2.178	.090
Intercept	2731.487	1	2731.487	4861.993	.000
Frame	.019	1	.019	.035	.853
Obese BMI	1.063	1	1.063	1.893	.170
Frame * Obese BMI	1.544	1	1.544	2.748	.098
Error	208.991	372	.562		
Total	4307.797	376			
Corrected Total	212.662	375			

a. R Squared = .017 (Adjusted R Squared = .009)

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