

Cracks in the Brain

Enhancing Albertans' Understanding
of the Developmental Causes of
Addiction

A FRAMEWORKS RESEARCH REPORT

Michael Erard • March 2012

About FrameWorks Institute:

The FrameWorks Institute is an independent nonprofit organization founded in 1999 to advance science-based communications research and practice. The Institute conducts original, multi-method research to identify the communications strategies that will advance public understanding of social problems and improve public support for remedial policies.

The Institute's work also includes teaching the nonprofit sector how to apply these sciencebased communications strategies in their work for social change. The Institute publishes its research and recommendations, as well as toolkits and other products for the nonprofit sector, at www.frameworksinstitute.org.

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INTRODUCTION

The research presented here was conducted by the FrameWorks Institute for the Alberta Family Wellness Initiative, supported by the Norlien Foundation. The metaphor development and testing process described here was part of a larger effort to advance more effective ways to communicate about the complex interactions between genetic and environmental factors that increase some individuals' susceptibility to addiction. This particular report presents a new way to explain some of the most recent findings from addiction science. Specifically, it concerns the emerging consensus that the susceptibility to addiction comes both from biological factors (what is commonly understood as "predisposition") and the impact of toxic stress and negative environments on a child's developing brain. FrameWorks designed and tested a set of simplifying models from which one metaphor, that of *Brain Faultlines*, emerged as effective in creating, extending, and expanding Albertans' understandings of how addiction happens and, by extension, what can be done to more effectively address this issue. This metaphor research is part of a larger project that seeks to apply this and other frame elements, such as values, to communicate the importance of environments for early child development and raise support for more effective addiction prevention and treatment programs.



There are other stressors in your life but they can be emotional stressors that can develop faultlines, as well. So these faultlines I envision looking like mini earthquake lines, those can change as our stressors and things that happen over our lifetime.

- Persistence Trial Participant

Simplifying models are metaphorically based frame cues that fundamentally restructure the ways that people talk and reason about issues. As such, these metaphorical communications tools are useful ingredients in efforts to shift the interpretational frameworks that people access and employ in processing information. By fortifying understandings of abstract or complex phenomena like the interactions between biological systems and environmental experiences, simplifying models can strengthen Albertans' abilities to understand why provincial policies related to substance use and abuse might be desirable. As understanding expands, it becomes easier to think about prevention and treatment for addiction, as well as a host of policy initiatives that focus on improving processes of early child development.

Following FrameWorks' multi-disciplinary and iterative approach to communications research (Strategic Frame Analysis^{TM1}), we have unpacked and distilled people's understandings of what addictions are and how they develop. We have also focused, in previous research, on how Albertans' understandings of the components and concepts of child development are shaped by a shared set of assumptions and understandings – what anthropologists call “cultural models.”² These shared assumptions are what allow individuals to navigate their social worlds and make sense of the experiences and information they

encounter. As part of their functional role in meaning-making, cultural models can sometimes work to constrict available interpretations and make some messages “harder to think” than others.³

The public discourse around substance use and abuse, addiction, its aftermath and its treatment is laden with metaphorical language. (The cultural models from which this discourse derives are discussed at length in previous FrameWorks reports.⁴) Some of this language represents folk understandings of these processes; some of it represents breakthroughs from an earlier age of addiction science; some of it comes from approaches to addiction treatment that have become highly visible in the culture (such as Alcoholics Anonymous). Examples of this language include talking about “short circuits,” “baggage,” “hitting rock bottom,” and “addictive personalities,” though a plethora of other resources in the English language also exist. They are not necessarily incorrect in a technical sense. However, these existing metaphorical devices provide insufficient resources for the following:

- Explaining, illustrating or pointing people toward the relationship between distal and proximate causes of addiction.
- Helping people talk about the underlying neural processes that are shared by substance and process addictions.
- Explaining susceptibility as anything other than a genetic predisposition, even though (as FrameWorks has found in its research on epigenetics⁵) people are generally unable to explain how genes and environments/experiences interact, and have difficulty seeing “genetic predisposition” as anything but genetic determinism.

FrameWorks' goal was to design a metaphor that would fill these (and other) conceptual gaps, providing advocates, educators and policymakers with a tool capable of delivering key understandings from the neuro-developmental perspective on addiction.⁶

The topic of addiction is particularly ripe for reframing, most notably because of the gulf between experts' understandings and the cultural models which non-experts deploy.⁷ Recent brain-based scientific developments have widened this gulf, yet they also present new opportunities for strategic communications. The key lies in effectively and efficiently communicating the *causes* of addiction. As has been shown by a body of social science scholarship including previous FrameWorks' research, how people understand the causes of addiction shapes their reasoning about effective treatments.⁸ Among experts, the process of child development represents a new direction for understanding the causes of addiction. As it turns out, a developmental perspective on addiction offers a way around difficulties in defining addiction, understanding its causes and proposing effective prevention and treatment programs.

- A developmental approach softens the biological determinism of the strict biomedical account (in which individuals have genetic predispositions to addiction), yet retains the powerful contributions of neurological and genetic sciences.
- A developmental approach makes visible the patterns among the trajectories of individual addicts' lives, without erasing the emotionally powerful biographical particularities through which people often commonly understand their own and others' experiences.
- A developmental approach makes visible patterns of addiction across substances and between substances and activities (e.g., gambling, sex, etc.), an approach that helps move reasoning away from attributing some addictive quality to a narrow set of substances.

Conversely, FrameWorks' research suggests that without new ways to think about addiction and its causes, Albertans will be largely unable to access and productively employ the science of addiction in how they think about provincial policies and programs. The simplifying model described in this report constitutes a strategic communications tool that makes the developmental process of acquiring an addiction more visible and thinkable. In this way, our research shows that the model helps channel public thinking away from culturally dominant but unproductive ways of thinking that inhibit consideration of more effective public solutions.

We note that even the best simplifying models cannot accomplish everything that needs to be done in reframing a complex issue like addiction. Other frame elements (Values, Messengers, Visuals, Tone, Causal Chains, Social Math, and additional simplifying models⁹) need to be tasked with addressing other routine misdirections in public thinking. Toward that end, this report is one in a series of explorations designed to identify effective elements of an addiction narrative.

EXECUTIVE SUMMARY

FrameWorks' simplifying model research process demonstrated that one simplifying model, *Brain Faultlines*, offers a powerful resource for changing how Albertans talk and think about what causes addiction. It is a highly communicable and durable simplifying model that enabled participants to talk more articulately about addiction and its causes and disrupted other, less productive modes of reasoning. At each stage of the research process, *Brain Faultlines* demonstrated its promise and was far stronger than other candidate simplifying models. It is provided here.

Brain Faultlines

We can think about how addiction happens in the same way that faultlines sometimes result in full-blown earthquakes. Like a faultline in the earth, people's brains can develop small cracks. These faultlines can form in a number of ways. In some cases, they appear as the brain develops. They can also develop over time as people experience toxic stress and don't have supportive relationships. Other times, people may have been born with faultlines. But just because there is a faultline doesn't mean there will be an earthquake. Faultlines are triggered by factors and experiences that turn them into earthquakes, which can do a huge amount of damage. We know that there are things we can do help prevent faultlines from developing in the first place and things that we can do to minimize the chances that existing faultlines will turn into earthquakes. There are also things we can do once earthquakes or addictions have happened to prevent damage from happening again.

- The major achievement of *Brain Faultlines* is to get people to re-locate addiction. Using this simplifying model, they remove addiction from the self and make it a matter of the brain. In other words, *Brain Faultlines* eliminated the common and extremely problematic explanation of addiction, that an individual's lack of willpower is a major cause of addiction. *Brain Faultlines* does this because geological forces are not associated with what humans do. As a result, research participants were less likely to talk about the role of an individual's agency in avoiding or preventing addiction or securing successful treatment. In this way, the metaphor shifted the way that participants assigned responsibility for addiction, from individual responsibility (which is the default sense) to more nuanced perspectives involving social and systemic notions of causation and remediation. Given that the belief in individual responsibility has a propensity to block support for public policy as a solution to social issues, this last function was a major strength and utility of the model.

- *Brain Faultlines* was also very effective in enabling people to understand and discuss addiction as the result of an interaction among factors that are internal and external to the individual. These interactions – for instance, between environments and experiences and biology – are crucially important for understanding addiction (as well as a range of other issues), and yet, as FrameWorks research has documented, Albertans (and Americans) have significant difficulty in thinking about non-deterministic, contingent causal processes.

- In Persistence Trials, a qualitative metaphor testing and refinement method, we saw how *Brain Faultlines* gave participants a narrative tool for describing their own and others' experiences in terms of common processes that align with scientific explanations.

- Among its narrative advantages was the terminology it provided people for disentangling what is behaviorally visible from what is physiologically invisible. It does this through the set of associations between a susceptibility to addiction and the geological vulnerability of a faultline.

- Another of its assets is how people easily related the consequences of an earthquake to the results of an addiction, whether in terms of damage to social relationships or of actual damage to structures in the brain.

- It also gave people a way to explain how one person will become addicted but another won't: because they do or do not possess these faultlines. This is achieved through the folk understanding that earthquakes cannot occur without a faultline.

- Consistent with expert notions of comorbidity, the notion of "cracks" in the brain led people to wonder about a link between mental illness and addiction.

- By focusing people on "triggers," *Brain Faultlines* inoculated against the implicit understanding that substances are inescapably and immediately addictive. In other words, not every substance, debilitating event, or even mental illness is a trigger to the same extent for everyone in the same manner.

- Furthermore, *Brain Faultlines* helped people to appreciate that there are brain-based physiological generalities across addiction experiences, whether the addictions involve substances or processes.¹⁰

- Despite researchers' initial concerns, the metaphor avoided moral explanations for addiction and evocations of shame. It was anticipated that "faultlines" might re-trigger moral discussions or reinforce the sense in which addiction is a moral issue, because it contains the word "fault." In six hours of conversation from Persistence Trials with 24 individuals, this

association emerged one fleeting time, proving neither sticky nor damaging to the usefulness of the simplifying model.

WHAT IS A SIMPLIFYING MODEL?

A simplifying model can be thought of as a bridge between expert and public understandings – a metaphor that presents a concept in a way that the public can readily deploy to make sense of new information, channeling the way they think and talk about a particular topic. More specifically, FrameWorks defines a simplifying model as a research-driven, empirically tested metaphor that captures and distills a concept by using an explanatory framework that fits in with the public’s existing patterns of assumptions and understandings (cultural models).¹¹ A simplifying model renders a complex and/or abstract problem as a simpler analogy or metaphor. By pulling out salient features of the problem and mapping onto them the features of concrete, immediate, everyday objects, events or processes, the model helps people organize information into a clear picture in their heads. This has the potential to make people better critical thinkers and more careful media consumers who are ultimately better situated to think about how policy impacts social issues like addiction.

On the basis of this theoretical perspective, FrameWorks has built a robust, reliable protocol for determining what an effective simplifying model looks like and how it behaves.¹² An effective simplifying model:

- (1) improves understanding of how a given phenomenon works;
- (2) creates more robust, detailed and coherent discussions of a given target concept (e.g., child development, child mental health);
- (3) is able to be applied to thinking about how to solve or improve a situation;
- (4) inoculates against existing dominant but unproductive default patterns of thinking that people normally apply to understand the issue;
- (5) is highly communicable, moving and spreading easily among individuals without major breakdowns or mutations; and finally,
- (6) is self-correcting. When a breakdown in thinking does occur, people using the simplifying model can re-deploy it in its original form, where it is able once again to clarify key aspects of the issue.

WHY ADDICTION AND DEVELOPMENT NEED A SIMPLIFYING MODELS

When they design and test simplifying models, FrameWorks researchers employ the results of earlier qualitative research, cultural models theory and an understanding of the communications challenges presented by the particular topic. We conceived of the ways that a simplifying model must work on the specific issue of addiction as following.

- The simplifying model should enable people to understand that biological predispositions for addiction do not determine outcomes.
- The simplifying model should also enable people to understand how the experiences that children have can shape these predispositions.
- The simplifying model should provide a framework for talking about the interaction between development and genetics; and thus
- It should help people explain how it is that one person can become addicted and another will not, even given the same amount of exposure to a certain substance or activity.
- The simplifying model should channel people's talk and reasoning away from characterizing addicts as personally or morally weak or lacking in willpower.
- It should give people resources for telling stories about themselves or other people they know that employ explanations of causation that are consistent with the science.
- It should be applicable to both substance and process addictions.
- It should give people a sense about what can be done about addiction, both in terms of

Below we briefly discuss the process by which FrameWorks' researchers identified, developed and empirically tested the power of the *Brain Faultlines* simplifying model in broadening public understanding of how addiction happens. We then present the findings from this research and conclude with specific recommendations about how best to deploy this communications tool in messaging about addiction. We provide Appendix A for more about the specifics of the research methods employed.

WHY WE TEST SIMPLIFYING MODELS

Most people can easily identify metaphorical language and even generate useful comparisons in order to explain, teach or argue points and ideas. Yet metaphors are also integral to human thought at much deeper levels that evade conscious detection and reflection. Each metaphor exists in an internalized web of other meanings that are not always initially apparent; some of these meanings, along with culture-specific interpretations and default cognitive preferences,

may ultimately endanger the very purpose that we want a metaphor to serve. Because of this potential for metaphors to have unintended negative effects in relation to communications goals, FrameWorks tests its simplifying models and the metaphors at their core in order to observe and measure the *actual* directions that metaphors take in social interaction and discourse. These tests allow us to "see around the first bend" – to observe what happens to metaphors as they live and breathe in complex cultural, political and linguistic ecologies. Testing metaphors further enables us to avoid subjective responses to metaphors and inoculate against arguments about a metaphor's effectiveness based on from-the-hip assessments of "what most people think" or "what most people know." That is, testing metaphors in more realistic ecologies allows us to see their actual effects on cognition and meaning-making and to avoid metaphor "popularity contests" and armchair predictions.

A final reason for testing is that many of the most persistent metaphors that we use in our daily language have evolved over long periods to fit their cultural circumstances and be usable by human brains. We use them because they are present in our language and our culture, and they are present in our language and culture because they have outlasted or proven themselves to be more "fit" than other related attempts. Because issue advocates do not have the luxury of long periods to see what might emerge "naturally," the best alternative is to compress the evolutionary schedule to produce a metaphor with immediate cognitive and social "fit." Our methods of testing simplifying models are designed with these considerations in mind.

HOW SIMPLIFYING MODELS ARE TESTED AND IDENTIFIED

Phase 1: Mapping the Gaps

FrameWorks' research team first conducts two types of interviews: cultural models interviews and expert interviews. Cultural models interviews are conducted with members of the general public and are designed to gather data that, through qualitative analysis, reveal the underlying patterns of assumptions – or cultural models – that members of the public apply in processing information on a given topic. Expert interviews are conducted with researchers, advocates and practitioners who possess an "expert" or technical understanding of the given phenomenon. These interviews are designed to elicit the expert understanding of the issue. Comparing the data gathered from these two types of interviews reveals the gaps that exist between how experts and average Albertans understand and approach issues.

Phase 2: Designing Simplifying Models

FrameWorks' research team then analyzes transcripts of the interviews conducted in Phase 1 to generate a list of metaphor categories that capture salient elements of the expert understanding in metaphors accessible to the general public, using approaches to metaphor

from cognitive linguistics and psycholinguistics. The result of the design process is a list both of metaphor categories (e.g., “Allocation,” “Connection”) and multiple candidate simplifying models in each category (e.g., “Popcorn Brain,” “Short Circuit”). The initial simplifying models generated from this phase are listed in Appendix A.

Phase 3: Testing Simplifying Models

FrameWorks tests the candidate simplifying models in multiple research formats, beginning with On-the-Street Interviews with around four dozen individuals. These are followed by experimental surveys given to a sample of 2,000 participants; these surveys test the candidate models on measures of issue understanding and metaphor application. Finally, we take the most effective simplifying model candidates into a final phase of qualitative testing, Persistence Trials, that mimics the game of telephone, with six individuals per trial. With these we can see how well the simplifying models hold up in social interaction as they are used and shared. At each stage, we use our findings to winnow our selections as well as refine the simplifying models that remain. What results is a detailed data about which simplifying model works and why.

THE WINNER: AN EFFECTIVE SIMPLIFYING MODEL FOR ADDICTION

Employing the research process outlined above, FrameWorks’ research team identified, refined and empirically tested seven broad simplifying model categories and a total of 13 iterations across those categories. One of these simplifying models emerged as an effective tool both for countering dominant patterns of thinking about how addictions happen and encouraging less-dominant but useful patterns to come to the fore: *Brain Faultlines*.

What *Brain Faultlines* Contributes to the Public Understanding

Brain Faultlines makes broad-ranging contributions to public discussions about addiction and its causes by 1) bringing public understandings of the causes of addiction closer to expert ones and 2) inoculating against dominant ways of thinking about addiction.

The strengths of *Brain Faultlines* come mainly from its geological associations, in the sense that:

- Faultlines underlie and are not visible from the surface.
- Faultlines, however, can be identified; warning signs mark their presence.
- Faultlines become earthquakes because of causes that are beyond human agency.

- Faultlines come in varying sizes and states of readiness; they can also grow over time.
- The right cause can trigger a faultline and cause an earthquake.
- Though a faultline is present, an earthquake is not inevitable.
- Once identified, a faultline provides a constraint on adaptiveness.
- Earthquakes cause tremendous damage, so avoiding them is desirable.
- The consequence of earthquake damage is a loss of function (e.g., cities, communities, regions and/or societies do not work).
- This loss of function is remediable.

Below we review the development of this simplifying model through the iterative research process. We discuss the general effects of the most promising simplifying model; summarize the empirical evidence that demonstrates its explanatory power; and describe the specific strategic advantages it confers when employed in communications on addiction more generally, on addiction in the context of early child development and on prevention and treatment policies.

Finally, we describe some of the finer points of using *Brain Faultlines* that should inform the practice of potential users of this simplifying model, concluding with specific directions for applying it.

I. General Effects

Each stage of research confirmed the salience of the *Brain Faultlines* simplifying model. Salient parts of the metaphor include:

- that brains can have underlying susceptibilities;
- that these susceptibilities have a number of sources, including periods of structural development;
- that the presence of these susceptibilities are beyond an individual's control;
- that, to become problematic, susceptibilities require proximate triggers;
- that susceptibilities are predictive of problems but do not guarantee them; and
- that susceptibilities can be recognized and managed.

FrameWorks' previous research uncovered several dominant cultural models that Albertans use to define addiction and conceive of its causes. The cultural models that were determined to derail the desirable conversations about addiction were the following.

- *There are proximate triggers of addiction, such as access or escapism.* Albertans assumed that a likely scenario for the development of an addiction was when an

individual who has experienced derailed development, later experiences more proximate triggers.

- *There is a perceived continuum of control.* Albertans held a spatial continuum model to conceptualize issues of control and addiction. At one end of the continuum, an individual is understood to have complete control over their behaviors and actions, while at the other end there is a complete absence of control. Addiction is caused when an individual reaches a *tipping point* on this continuum.
- *Some things are just too addictive.* Albertans shared a very top-of-mind assumption that a specific set of drugs – crack cocaine, heroin and methamphetamines – are so powerful that their consumption quickly leads to a chemical dependency that is difficult if not impossible to break.
- *Damage done is damage done.* Albertans displayed a shared assumption that, once individuals become addicted, symptom management is the only recourse for them. In short, addiction is incurable.
- *The power of will.*¹³ According to this assumption, willpower is the ultimate causal factor. Individuals with willpower are able to avoid or “overcome” addictions, and those without willpower are not.
- *Addiction is a moral phenomenon.* Related to the willpower assumption, discussions with Albertans also revealed a powerful evaluative assumption about those who are or who become addicted. Albertans shared a deep and highly implicit understanding that addicts are those who have made “bad” choices and “poor” decisions. In other words, they are those who lack discipline in upholding the moral values of self-control and self-respect.
- *Every addiction is different.* Another dominant implicit understanding, observed in past FrameWorks research,¹⁴ was the notion that each individual is so different, with unique biographical trajectories and biologies, that addictions can really *only* be understood on a case-by-case basis. Consequently, there is little that can be said by way of common processes and underlying systems.

Brain Faultlines moved people’s talking and reasoning away from these cultural models by structuring different ways of looking at these vulnerabilities and their outcomes.

II. Evidence from On-the-Street Interviews

In On-the-Street Interviews conducted with 54 people in two locations in Calgary, Alberta, FrameWorks researchers tested the ability of nine candidate simplifying models to enable more articulate and scientifically consonant discussion about how addiction happens. Informants were asked a series of open-ended questions about the definition and causes of addiction as well as possible solutions to this issue. They were then exposed to one of the candidate simplifying models, and were asked a second series of open-ended questions that,

using different language so as not to seem tautological, paralleled the initial, pre-model set. In analysis of video data from these interviews, two researchers coded pre-exposure footage to analyze patterns in unprimed responses, looking specifically at the implicit assumptions that were shaping these responses across informants. Post-exposure answers were analyzed to determine the ways in which the simplifying models both were and were not effective in structuring more scientifically consonant definitions and understandings of causation and remediation. This analysis also looked to isolate the reasons *why* the models were having their respective effects. The results of this analysis were used to winnow and refine the set of candidate models before the next research phase.

In pre-exposure discussions – that is, in responses before being exposed to one of the simplifying models – participants employed the same dominant cultural models of addiction described above and in FrameWorks’ earlier Map the Gaps report.¹⁵ The willpower model (that addiction is caused by the absence of willpower, and can only be remediated by the imposition of will) was particularly dominant in shaping informant answers in the On-the-Street Interviews, as is apparent in the following quotes.

Informant: *Probably sometimes [they are] a bit responsible themselves for falling into the addiction, but once it's got them, it's a problem.*

Moderator: *So there's some responsibility for falling into it –*

Informant. *Absolutely. If somebody is addicted to cigarettes, [they] chose to have those first few drags and rip the s*** out of their throat and become addicted to cigarettes. Alcohol, they chose to have enough alcohol to become addicted to it, but once they're addicted, they're addicted.*

Informant: *There has to be more focus on control. Self-control and discipline, I think. Because really, when it comes down to addiction, when you want to quit something, as far as addiction goes, you have to want it for yourself.*

Informant: *I believe there are individuals who had certain things happen in their lives that affect them psychologically, and they make a decision to try drugs, to use therapy for themselves by taking the drugs.*

At this stage, it was apparent that the most effective simplifying models were working on or inoculating against people’s default notions of agency and responsibility. That is, after participants were exposed to one of the more successful models, discussion of addicts' self-control, choice and responsibility was either absent or explicitly denounced. This suggests that the metaphor had displaced or disrupted the patterns of thinking and assumptions that participants were accustomed to employing in reasoning about addiction. *Brain Faultlines*

was one such simplifying model. Analysis of On-the-Street Interview data revealed a list of other key assets of the *Brain Faultlines* simplifying model. These included:

1. The model connected internal and external causal factors and forced informants to acknowledge both in explanations of causation. When asked about what causes addiction after being exposed to the *Brain Faultlines* metaphor, participant responses approximated scientific explanations of causation: that addictions are the result of an interplay between genes, biology and environmental factors. Here is one participant's understanding of the model.

Participant: *Basically, what it says is...either [there's] an outside force or a brain injury or as a child something happens that makes the brain do whatever it does. When its paths are changed it doesn't let people handle stress the same ways somebody else would. And then also the stress further on in life, and they don't have the coping mechanisms or they don't have the support, and somebody comes along and that option is suddenly put in front of them. I don't know if it's a weaker-brained person or if the neurotransmitters aren't shooting in the same place. I've heard the whole frontal lobe scenario. I don't know if people are more prone or if outside stresses come in.*

2. The model brought a previously absent understanding into play: that susceptibility predicts, but does not guarantee, the outcome of addiction. Prior to exposure to the metaphors, participants took a more deterministic view on genetic and biological causes of addiction. They tended to explain that addicts were born addicts; thus, other than developing steely willpower, there was little that they (or anyone else) could do. After being exposed to the metaphor, participants frequently talked about the idea of “susceptibility” as a way of discussing genes, biology and outcomes. They explained that, like a faultline in the earth, predispositions could develop but required more proximate triggers to manifest. In this way, participants explained that a predisposition to addictive behaviors does not guarantee an addiction outcome. The metaphor’s ability to structure this highly nuanced point was impressive and was taken as a major strength of the model.

3. The model structured conversations of the role of stress in the formation and triggering of addictions. The role of stress in addiction was largely absent from unprimed responses in the On-the-Street Interviews. However, following exposure to the *Brain Faultlines* metaphor, stress emerged as a prominent feature in participant responses. More specifically, participants tended to focus on the fact that stress could be a factor that both causes the formation of faultlines and triggers these features when present.

Participant: *Putting a faultline in your brain to predispose you to addiction, whether it's drugs, alcohol, food, anger, a sexual addiction.*

Possibly you could be predisposed to have that – you know, your childhood, your background, experience in life, where you are. Traumas. A serious accident, for example. And they can be triggers that trigger a faultline and then you succumb to a[n]...addiction and basically activate the faultline. How this could be valuable is that once you recognize that, then you can do preventative measures and rehab and...basically nip it in the bud so that it doesn't become more serious.

4. The metaphor was highly “sticky.” Following exposure to the metaphor, a number of words associated with *Brain Faultlines* echoed throughout the interviews. Participants adroitly incorporated the language of *Brain Faultlines* into their discussions of addiction, which had the positive effects described above in restructuring and aligning thinking with the science. The terms that emerged as most “sticky” included:

- trigger
- faultline
- crack
- pressure
- stress
- earthquake

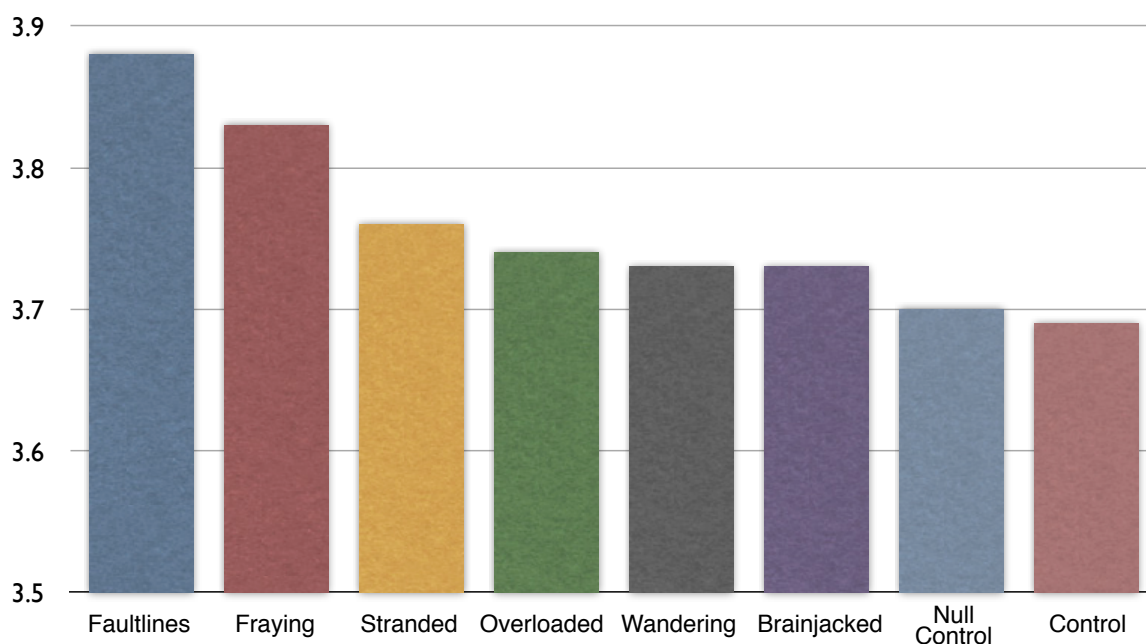
III. Evidence from the Quantitative Experiment

Using the results from On-the-Street Interviews to winnow the set of metaphors and refine existing iterations, FrameWorks designed a large-scale quantitative survey to test and demonstrate the varying efficacy of the simplifying models with statistical accuracy and power. In the experiment, we measured two things:

- General comprehension of the metaphor (understanding).
- Applicability of the metaphor to thinking about various aspects of addiction (definition, causation, remediation).

Brain Faultlines emerged from the experiment as the most effective simplifying model, producing higher scores than the other tested metaphors. Results from the experiment showed that people identified what “faultlines” were (geological weaknesses that tend to lead to earthquakes). Perhaps most importantly, given the highly implicit nature of the work of a simplifying model in structuring understandings, the experiment showed that the model was applied in thinking about addiction and restructured understandings about key aspects of addiction. These two measures (understanding and application) were aggregated into an Overall Effectiveness score for each simplifying model, which are presented in Figure 1.

Figure 1: Overall Effectiveness



Statistical analysis showed that the difference between *Brain Faultlines* (3.88) and the two control primes (3.70 and 3.69) was statistically significant. The controls are described in more detail in Appendix A.

IV. Evidence from Persistence Trials

FrameWorks researchers brought *Brain Faultlines* to Calgary, where we held four Persistence Trials with a total of 24 participants.¹⁶ In the intense social interaction of this Persistence Trials method, *Brain Faultlines* continued to demonstrate power as a communications tool.

Persistence Trials produce rich data about simplifying models because this venue gives participants a way to interact with and use the simplifying model in actual social discourse. In a Persistence Trial, an initial pair of participants is presented the simplifying model, first as text and then orally by the researcher. The participants then discuss the simplifying model with the moderator and teach it to a subsequent pair of participants, after being given a few minutes alone to discuss it and plan their presentation. Following the “transfer,” the second pair explains the simplifying model to a third pair. Finally, the first pair returns to hear the transmitted model from the third pair. This last step allows us to see whether the model has

“persisted” over the session and to enlist participants in explaining any changes that occurred to the model. With written consent from all participants, these trials are video-recorded from start to finish, allowing FrameWorks’ researchers to capture and analyze several different forms of social interaction involving the simplifying model being tested.

Data from Persistence Trials are analyzed along several lines: if and how participants can apply the simplifying model; whether and how the model inoculates against unproductive cultural models; whether and how it self-corrects; and the degree to which it is communicable. The design of these sessions also affords the opportunity to observe several types of interactions (researcher/pair, between individual participants, between groups of participants), which provides valuable insight into how the simplifying model is articulated, as well as its thinkability. In these terms, the specific advantages of the *Brain Faultlines* simplifying model are as follows:

1. Application. Persistence Trials showed that the geological metaphor at the core of *Brain Faultlines* was widely and accurately applied in several realms, as detailed here.

Underlying susceptibilities

One of the most enduring applications of *Brain Faultlines* was the set of associations between a susceptibility to addiction and the geological vulnerability of a faultline, as evident in the following quotes.

Generation 2, Participant 1: *There are other stressors in your life but emotional stressors can develop faultlines, as well. So these faultlines I envision looking like mini earthquake lines, and they can change as our stressors and other things happen over our lifetime.*

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Moderator: *What was that idea [that you were talking about]?*

Generation 3, Participant 1: *The faultline, I thought it was a good way to look at it...you can see what's on the surface, but there are those imperceptible changes that happen over time, that eventually, come to a head. And addiction is pretty similar to that. The condition is there, may be there in everybody, but not enough of that underlying part changes enough, so most people avoid addiction.*

People also easily adapted the consequences of an earthquake to the result of an addiction, whether in terms of damage to social relationships or in terms of actual damage to structures in the brain.

Moderator: *How does that image specifically help you?*

Generation 2, Participant 1: *It brings to mind chaos.*

Moderator: *How so?*

Generation 2, Participant 1: *Well, you see, if you have an earthquake, [like in] Japan or whatever, things have just gone crazy. It totally destroys the infrastructure, which makes sense in terms of how the brain functions. If the infrastructure is destroyed, then it's really hard to function.*

In several instances, the notion of "cracks" in the brain led people to wonder about a link between mental illness and addiction. Such a link is consonant with the expert opinion on issues of comorbidity. These mentions echoed some of the On-the-Street Interviews, where people brought up a link between addiction and mental health as well.¹⁷

Causation is complex

One of the greatest strengths of *Brain Faultlines* is the way it consistently structured understandings that addictions arise as a result of an *interaction* between factors. Namely, there must be a "trigger" that acts on a pre-existing susceptibility, and those susceptibilities can be both genetic as well as acquired through experience. In short, *Brain Faultlines* was applied to talk about how susceptibility to addiction can be an existing physical feature of the brain, *or* that it can develop in the brain as a result of a person's experiences over time. Furthermore, such features in the brain, in and of themselves, do not "cause" addiction, but rather causation is the interaction between the faultline and more proximate triggers. "Stresses" and "pressure" were the two most frequently identified triggers, though also mentioned were a vulnerability in the brain (a "shortcircuiting"), exposure to substances/behaviors and (in only one case) an emotional void.

The work that the simplifying model does is significant in getting people to appreciate the impact of environments and experiences and their interaction with biology. This is particularly true when viewed in relation to previous FrameWorks research, where we documented the incredible difficulty that Albertans (and Americans) have in thinking about interactional causal processes.¹⁸ Moreover, participants were able to apply the dynamic nature of faultlines to thinking and talking about addiction. Faultlines can increase, widen or intensify, but they can also diminish.

Differences between individuals

In unprimed (i.e., pre-model exposure) sections of On-the-Street Interviews, as well as in earlier open-ended cultural models work, FrameWorks research documented people's difficulty in generalizing about addiction. "Each addiction is different," we heard. As our

participants reasoned, each person falls into addiction for their own specific biographical reasons. The implication of this discourse is clear: when addiction becomes so individualized, people have difficulty seeing both the common processes of addiction causation and the generalizable strategies of remediation. Experts would say that there are brain-based physiological generalities across addiction experiences,¹⁹ which *Brain Faultlines* assisted people in conceptualizing, as in the following.

Moderator: *How might it help you explain two individuals?*

Participant 1: *There's different faultlines across the earth....There's lots of pressure that builds up between two plates, which is different in all circumstances. So there are different faultlines across the globe. So any of the triggers that cause that final shift to happen are different in all these different faultlines. So you could apply that to different individuals. You could apply it to different addictions, whether it's a behavioral addiction or an addiction to some sort of substance. Those are different things, those are different faultlines.*

Brain Faultlines was also applied as participants talked about the differences between someone who isn't addicted and someone who is. One participant in a Persistence Trial talked about her work in a juvenile court with troubled defendants; it struck her as ironic that she had rebelled with substances as a teenager but had never gotten into trouble. The other participant offered, "Maybe you didn't have the earthquake yet." She responded, "Maybe there hasn't been a trigger that has led me to that."

It is also worth noting that on the quantitative survey, a question about commonalities across individuals proved the most challenging for people. One interpretation for this is that it is very difficult for people to think generally about addiction. Yet of all the candidate simplifying models, *Brain Faultlines* was most able to move people's answers in the desired direction (to choosing to agree with the statement, "There are common patterns across individuals in how the brain responds to addiction.") Thus, we were not surprised to see a similar performance in the Persistence Trials, as well.

2. Inoculation. One of the biggest challenges for the simplifying models in the domain of addiction was to prevent the incursion of powerful default cultural models that Albertans readily and persistently apply in thinking about addiction. On a number of fronts, *Brain Faultlines* showed a surprising degree of inoculative power in relation to these dominant cultural models. By "inoculation," we mean that after being exposed to and engaging with the simplifying model, instances in which the dominant cultural models could be seen exerting power in shaping discussion and responses were either non-existent or highly infrequent.

Against the “addiction is a moral phenomenon” cultural model

Significantly, analysis of Persistence Trial data showed *no* mention of addiction as a sign of a person's moral failure. In general, the conversations were devoid of the critical evaluations of "good" or "bad" choices that were observed in unprimed conversations in Cultural Model Interviews and On-the-Street Interviews.

Against the “power of will” cultural model

One particularly potent challenge in reframing addiction in Alberta is the way the issue is subsumed by individualist understandings and discourses, in which people "choose" to become addicted or remain addicted because they lack willpower or have not "chosen" help. *Brain Faultlines* was highly effective in enabling people to understand and discuss addiction as being the result of an interaction between internal and external factors. This did not mean, however, that the notion that people become addicts in order to fill some void in their lives was totally squelched. There was at least one instance where a participant reasoned that someone who had tried crack cocaine but had not become addicted had consciously decided, "I don't want to be a crack-head." However, the prevalence of these instances was significantly reduced from other unprimed research contexts in which FrameWorks has documented participant responses to open-ended questions about addiction.

Here two participants take the metaphor even further, using *Brain Faultlines* to discuss a feedback loop by which the addiction damages internal neural structures, which in turn influence addictive behaviors. This is a highly nuanced discussion and the ability of the metaphor to generate such discussion suggests its power as a translational tool. We must note here that discussions such as these were entirely absent from unprimed discussions of addiction observed across other qualitative methods.

Participant 2: *Plates shift, which causes the earthquake. That's the chaos, right? So you're looking, so the chaos would be the addiction and the behaviors and...*

Participant 1: *It destroys the infrastructure...the wiring?*

Participant 2: *So the earthquake kind of breaks the...*

Participant 1: *The wiring...the receptors...the receptors in the brain. When the earthquake happens, the receptors...I'm trying to think about how when the plates shift, the receptors, they're not working. I know that your receptors aren't working. I think that would be the earthquake, when your receptors aren't transmitting.*

Participant 1: *Yeah. Yeah.*

Against the “damage done is damage done” cultural model

A frequent tendency in unprimed discussions was for Albertans to assume that “genetic” predispositions obviate addiction outcomes. In other words, when Albertans see genes as a cause of addiction, they assume a highly deterministic sense in which “if you got it (the gene), you got it (the addiction).” Such thinking does not align with the science that clearly positions a more nuanced, multi-factoral and interactional understanding of the role of genes in addiction outcomes. *Brain Faultlines* inoculated against the deterministic understanding of genes and gave participants a powerful cognitive tool with which to see that, in fact, addiction is the result of a more complex interaction between biological factors and environmental ones.

Against the “some substances are just too addictive” cultural model. In addition, by focusing people on “triggers,” *Brain Faultlines* inoculated against the implicit understanding that substances are inescapably addictive – that someone using a particular substance is doomed, by the mere qualities of the substance, to “fall down that hole.”

Against the “every addiction is different” cultural model

A major attribute of *Brain Faultlines* is the way that it inoculated against another of the highly unproductive dominant cultural models described above. Participants applied the metaphor to talk about common processes that underlie a range of addictions – both substance and process addictions. As noted above, participants in early stages of research had difficulty talking about addiction as a process and addicts as a population. In a similar way, they drew distinctions between substance and behavioral addictions and were frequently resistant to discussions of an underlying process that could be used to understand “addictions.” *Brain Faultlines* was successful in pushing this individualistic cultural model out of mind by replacing it with a powerful understanding of a common process that underlies and can be used to think about all addictions.

Participant 1: *Are we talking about substance addiction?*

Participant

2: *It could be anything.*

Participant 1: *Okay.*

Participant 2: *People have all kinds of different addictions.*

Participant 1: *I guess when I hear the word addiction, I think of drugs, alcohol. That sort of thing.*

Participant 2: *It could be food, it could be medicine, it could be –*

Moderator: *So you think faultlines covers the whole range of things?*

Participants nod.

Participant 3: *So it could be anything.*

Participant 2: *Yeah.*

Participant 3: *Interesting.*

3. Self-correction. Self-correction refers to a simplifying model's ability to "snap back" to its initial form following a deterioration or mutation of the concept in discussion. At times, one structural feature of the metaphor may be forgotten, drop out of conversation, or devolve into an alternative formulation. For instance, participants may forget that faultlines are geological features that are sites of potential earthquakes. An important measure of a simplifying model's strength, self-correction occurs, for example, when this feature (that faultlines occur when tectonic plates meet each other) falls out of conversation and then re-asserts itself in subsequent discourse *without being re-cued by the moderator*. When communicated in the public sphere, simplifying models are likely to break down. Therefore, it is important that a concept have sufficient internal coherence to recover from such devolutions – to encourage people to arrive at key entailments despite partial or inaccurate communication of the simplifying model.

In the following example, a Generation 3 participant is asked to unpack the idea of faultlines. Given how degraded the model had become over the previous two transmissions, one might expect he would fumble with an explanation. To the contrary, he brings the metaphor and all of its ramifications back to life, mainly from the title.

Moderator: *What would the addiction be?*

Generation 3, Participant 1: *If you have these two plates in the ground and they rub against each other and they build pressure and they shift. So maybe this idea is that with the right set of conditions, then it triggers the faultline and it causes the shift and it goes from not addicted to addicted.*

In this next instance, someone saved the usefulness of the model by appealing to another aspect of how earthquakes work. The first speaker has contested the metaphor, finding it inapplicable, but the second person brings up another aspect of the metaphor, thereby returning it to usefulness.

Generation 3, Participant 1: *Earthquakes don't happen gradually. I think that addictions can happen gradually.*

Generation 1, Participant 1: *But you can have tremors. People can see signs. They can see signs that they're going through addictive [periods] but it's not, it hasn't caused their lives to be upside down yet. The faultline hasn't broken. San Francisco hasn't fallen in the ocean yet....but I'd think there are still signs out there to read.*

4. Communicability. Communicability refers to the faithfulness of the transmission of the simplifying model among the participants. Analyzing video of Persistence Trials, FrameWorks researchers look for the repetition of exact language and key ideas and the stability of the central metaphor. In this way, communicability and self-correction are somewhat antithetical concepts – where a model is perfectly communicable, it would not devolve and require self-correction. But a perfectly, 100% communicable model is not a realistic expectation, as both our research and knowledge of communications practice can attest. Still, different models are communicable to different degrees, and therefore communicability is one metric used to measure the effectiveness of a simplifying model.

Brain Faultlines was generally highly communicable between generations of participants; the central concept (of a place where tectonic plates come together) was widely recognized. Furthermore, different parts, or “entailments,” of the metaphor were readily available: “earthquakes,” “triggers,” “stress,” “pressure,” “falling down into,” “a weakness in the body” and “open someone up to addiction.”

One concern about *Brain Faultlines* was the possibility that it might cue shame, given that the simplifying model's title contains the word “fault.” While a legitimate concern in theory, our research with actual Albertans suggests that in practice this is not a frequent entailment of the model. The “fault” association did not come up at all in the On-the-Street Interviews. In the Persistence Trial environment, it was raised by only one participant (out of 24), and did not demonstrate any power in shaping the conversation. In other words, when the idea of personal “fault” was elicited it did not cue the dominant cultural models that we feared it might precipitate. The *Brain Faultlines* model was strong enough to absorb this potentially derailing interpretation – a sign of a powerful and productive metaphor.

USING BRAIN FAULTLINES

Our research shows that the *Brain Faultlines* simplifying model stands to make a significant contribution to framing the science of addiction. The metaphor proved to be highly understandable, applicable, communicable, self-correcting and effective in inoculating against dominant cultural models that limit or misdirect public understanding on this issue. For these reasons, FrameWorks confidently offers this new strategic frame element to aid in reframing the public conversation about addiction in Alberta.

We add two notes of caution, however, in the application of simplifying models in general and of *Brain Faultlines* more specifically. First, the simplifying model suggested here was tested both for its underlying concept and with respect to the highly targeted linguistic execution of the concept. Therefore, the emerging simplifying model represents both an

effective metaphor and an effective linguistic packaging of that metaphor. A certain latitude and flexibility in the use and application of *Brain Faultlines* is to be expected, even encouraged. Despite the potential for flexibility in its use, however, we must emphasize again that the specific concept and language that appear in the report have empirically demonstrated effectiveness. We do not claim to know the results or effectiveness of using alternative but related concepts or dramatically different linguistic packagings.

We conclude with a set of notes that advocates should keep in mind when they set out to use *Brain Faultlines* in communications. First, here is the text of the model:

Brain Faultlines

We can think about how addiction happens in the same way that faultlines sometimes result in full-blown earthquakes. Like a faultline in the earth, people's brains can develop small cracks. These faultlines can form in a number of ways. In some cases, they appear as the brain develops. They can also develop over time as people experience toxic stress and don't have supportive relationships. Other times, people may have been born with faultlines. But just because there is a faultline doesn't mean there will be an earthquake. Faultlines are triggered by factors and experiences that turn them into earthquakes, which can do a huge amount of damage. We know that there are things we can do to help prevent faultlines from developing in the first place and things that we can do to minimize the chances that existing faultlines will turn into earthquakes. There are also things we can do once earthquakes or addictions have happened to prevent damage from happening again.

The following are specific recommendations for how to most effectively deploy the model in communicating about addiction.

1) The following are important elements of the model to include for maximum conceptual impact.

- **Faultlines are located in structures of the brain.** They are not literal cracks or fissures, but rather represent structural susceptibilities to addiction.
- **Faultlines can develop or exist for multiple reasons.** They may be a result of genetics, but they can also arise through the course of development (particularly as young people's brains develop), and can also be acquired later in life.
- **An addiction is an earthquake.** Setting this part of the metaphor is very important, especially in the sense of its consequences – earthquakes and addictions cause damage.

- **Not all faultlines become an earthquake.** In other words, though some brains are more susceptible than others to addiction, they are not predestined for addiction, but rather require contextual triggers, which can be addressed through policy and programs.
- **The stresses that can cause faultlines to develop are not everyday stresses (i.e., a hard day at work) but toxic stress.** Intensive stress over a long duration causes the body to be flooded with negative physiological effects and can cause faultlines.
- **Faultlines are dynamic.** Preexisting susceptibilities can become more or less dangerous based on context and experiences.
- **There are specific strategies for addressing the situation.** The responses to faultlines should be to minimize the potency of triggers and the damage that an earthquake might cause.
- **Damage can be repaired and prevented.** Earthquake damage, though undesirable, can be repaired and steps can be taken to prevent further damage.

2) Users may expect that someone will raise an objection to the word "fault" in "faultlines." The response should be that this association came up only once in Persistence Trials, with 24 participants, across six hours of conversations. Users should also explain that enough of the geologic earthquake connotations come along with the simplifying model to resolve any ambiguity in favor of the uncharged term. Along these lines, it should also be noted that the term "faultlines/fault lines" appears both as one word and as two; we recommend the single word usage as a strategy to further guard against the perjorative interpretation.

3) FrameWorks research suggests that *Brain Faultlines* can be used in conjunction with other FrameWorks simplifying models related to early child development. More specifically, the research presented here suggests certain narrative synergies between *Brain Faultlines* and FrameWorks simplifying models of *Brain Architecture* and *Toxic Stress*.

More specifically, Brain Architecture has proven effective in Alberta as a way to talk about the basic science of brain development – that brains develop over time, that the building materials (a child's experiences) have direct impact on the forming structures of the brain, and that building the foundational components of the structure during early development has long-term implications for subsequent development and outcomes. We believe that Brain Architecture is a powerful tool to use before *Brain Faultlines* as a way to establish a working understanding of the process of neuro-development. This will help concretize the understanding that faultlines can develop as the brain's architecture is being built and will thus deepen and further instantiate the ability of faultlines to suggest multiple possible sources of susceptibility – in this case, as a product of negative experiences during early periods of a child's development.

Furthermore, how negative experiences and their effect on developing brains can serve as proximate triggers for addictions is a notion that can be concretized through the use of the Toxic Stress simplifying model. In this report, we showed several ways in which this would work. Toxic Stress has proven an effective concept in a number of ways. Among them is a way to create a robust understanding that not all stress is the same, and that some stresses can cause harmful biological reactions that result in physical damage to the brain's developing architecture. Therefore, on the issue of addiction, Toxic Stress can play the role of the "bad guy" in the developing narrative. It both helps to form faultlines and acts as the trigger on existing susceptibilities.

Together these three simplifying models suggest an emerging narrative that integrates three consonant metaphorical constructs: *Brain architecture is built during development. Toxic stress that occurs during development, especially at early and particularly sensitive developmental windows, can lead to the formation of faultlines in this developing brain. Faultlines, once developed, may also be activated by toxic stress, which can serve as the trigger for addictive behaviors.*

This outline, of course, requires further development of each of its constituent models as is laid out above from *Brain Faultlines* (for more on Brain Architecture and Toxic Stress visit <http://www.frameworksinstitute.org/ecd.html>). The point to emphasize is that together, these three frame elements form a tight and convincing narrative that, with other frame elements such as values,²⁰ can be used to translate the science of addiction and communicate more effectively about public policies and programs in this area.

ENDNOTES

¹ For more about SFA, see <http://www.frameworksinstitute.org/sfa.html>

² Quinn, N., & Holland, D. (1987). Culture and cognition. In D. Holland & N. Quinn (Eds.), *Cultural models in language and thought* (pp. 3-40). New York, NY: Cambridge University Press.

³ See: Lévi-Strauss, C. (1963). *Totemism*. Translated by Rodney Needham. Boston, MA: Beacon Press; and Lévi-Strauss, C. (1966). *The savage mind*. Chicago, IL: University of Chicago Press.

⁴ Kendall-Taylor, N. (2010a). *Rounding up the associations: How perceptions of addiction are recruited*. Washington, DC: FrameWorks Institute; O'Neil, M. (2010). *Changing addiction from a "sin problem": Peer discourse sessions on addiction: A FrameWorks research report*. Washington, DC: FrameWorks Institute.

⁵ Erard, M., Kendall-Taylor, N., Simon, A., & Davey, L. (2010). *More to genes than that: Designing metaphors to explain epigenetics*. Washington, DC: FrameWorks Institute.

⁶ For more on the key messages from this science see: Kendall-Taylor, N. (2010a), op. cit. .

⁷ Ibid.

⁸ Ibid.

⁹ For an overview, see <http://www.frameworksinstitute.org/ezone8.html> and www.frameworksinstitute.org/assets/files/PDF/framingpublicissuesfinal.pdf. For more on causal chains, see <http://www.frameworksinstitute.org/ezone31.html>. For more on tone, see <http://www.frameworksinstitute.org/ezone17.html>

¹⁰ Kendall-Taylor, N. (2010a), op. cit.

¹¹ Quinn, N. (2005). *Finding culture in talk: A collection of methods* (p. 3). New York, NY: Palgrave Macmillan.

¹² Kendall-Taylor, N. (2010). *An empirical simplifying models research process: Theory and method*. Washington, DC: FrameWorks Institute.

¹³ O'Neil, M., op. cit.

¹⁴ Kendall-Taylor, N., Erard, M., Simon, A., & Davey, L. (2010). *Air traffic control for your brain: Translating the science of executive function using a simplifying model*. Washington, DC: FrameWorks Institute; Kendall-Taylor, N., McCollum, C., & Manuel, T. (2009). *Caught between osmosis and environments: Mapping the gap between the expert and the public understandings of the role of executive function*. Washington, DC: FrameWorks Institute; Lindland, E., & Kendall-Taylor, N. (2011). *People, polar bears, and the potato salad: Mapping the gaps between expert and public understandings of environmental health*. Washington, DC: FrameWorks Institute.

¹⁵ Kendall-Taylor, N. (2010a), op. cit.

¹⁶ *Overloaded* was also tested in two Persistence Trials because of its overlap with a conceptual domain currently used to describe addiction ("wiring in the brain"). In general, Persistence Trials showed that *Overloaded* quickly spiraled into unproductive directions. Though the iteration was based on the metaphor of wiring in the brain, the discussion did not stay focused on the brain.

¹⁷ In several research projects as well as this one, we have noticed that people who appear to be articulating a simplifying model that works make a lot of gestures with their hands. With *Brain Faultlines*, people frequently put their two flattened hands together, rubbing their edges. This apparently signified the friction between two tectonic plates, even though people did not typically use the word "tectonics."

¹⁸ Kendall-Taylor, N. (2010). *Experiences get carried forward: How Albertans think about early child development*. Washington, DC: FrameWorks Institute; Kendall-Taylor, N. (2011). *"Anyone can do it...wake up, rise up and get some gumption": Mapping the gaps between expert and public understandings of resilience and developmental outcomes*. Washington, DC: FrameWorks Institute; Kendall-Taylor, N., & McCollum, C. (2009). *Determinism leavened by will power: The challenge of closing the gaps between the public and expert explanations of gene-environment interaction*. Washington, DC: FrameWorks Institute.

¹⁹ Kendall-Taylor, N. (2010a), op. cit.

²⁰ Simon, A. (2011). *Can redirecting values increase support for addiction policies and related issues? A FrameWorks research report*. Washington, DC: FrameWorks Institute.

APPENDIX: THE METHODOLOGICAL APPROACH TO IDENTIFYING AND TESTING SIMPLIFYING MODELS

I. PHASE 1: MAPPING THE GAPS

In the first phase of this simplifying models research process, FrameWorks employed an interview method called cultural models interviewing. Using a detailed interview guide, interviewers asked questions aimed at getting at how average Albertans understand the causes of addiction.

More generally, cultural models interviews reveal the cognitive “terrain” on a given issue by focusing on the implicit patterns of assumptions – or cultural models – which individuals employ to process incoming information on an issue. These patterns are the “mental bins” into which people try to fit incoming information and represent both potentially productive and damaging ways of making sense of information. To uncover the gaps in understanding on the target issue, the findings from cultural models interviews were held up to data gathered from addiction experts. FrameWorks calls this process “mapping the gaps.”

II. PHASE 2: DESIGNING SIMPLIFYING MODELS

After identifying the gaps in understanding, the second phase of the simplifying models research process aimed to generate a set of candidate simplifying models that were then empirically explored and tested in the third research phase. The result of the design process is a list of both metaphorical categories (e.g., “Balance”) and multiple iterations or “executions” of each category (e.g., “Riptide,” “Vertigo,” “Stranded,” “Wandering”). FrameWorks’ linguist analyzes all of the transcripts from the “mapping the gaps” phase of the research process, and then generates a list of metaphor categories that represent existing conceptual understandings that can be recruited and metaphorical language and concepts that the experts and general public share. The linguist generates metaphor categories that capture the *process* element (how the thing works) of the expert understanding in metaphors that, given the data gathered from the general public, have the potential to be easily visualized and incorporated into thinking about the issue under consideration.

FrameWorks researchers who are specialized in cultural models and cognitive theory conduct a cognitive analysis of the model categories, which examines the *expected* public response to the metaphors based on cultural models theory and existing FrameWorks research on cultural models that Albertans employ in understanding addiction. Researchers then use this analysis to review the metaphor categories, adding new possibilities and suggesting ones to be cut. At this stage, researchers also compare the candidate metaphors to the data from the initial cultural models interviews. Metaphor categories that contain elements or aspects of models found to be damaging or distracting in the public’s thinking about the topic are eliminated

from the candidate list. On the other hand, simplifying model categories containing elements of more productive cultural models are highlighted as particularly promising.

During the process of designing candidate simplifying models, FrameWorks also assesses the models' abilities to be incorporated into practice by journalists and advocates/practitioners. In some cases, this practical assessment has suggested that some candidate models are too provocative or problematic to pass into the public discourse. These models are removed from the working list. The refined list is then returned to the linguist, who begins to compose iterations or executions of the categories on the list. The list of categories and iterations is sent back to FrameWorks' researchers for additional revisions.

III. PHASE 3: TESTING SIMPLIFYING MODELS – THREE TESTS OF MODEL EFFECTIVENESS

TEST I: ON-THE-STREET INTERVIEWS

As the initial opportunity to test candidate simplifying models, On-the-Street Interviews present an ideal opportunity to gather empirical data on the effectiveness of candidate simplifying models: which specific elements of the models are functioning well, and which aspects are less successful in clarifying concepts and shifting perspectives.

The metaphors are written up as “iterations,” paragraph-long presentations that cue the listener/reader to two domains of meaning, one that is typically referred to as the “source,” the other, as the “target.” In the metaphorical statement “encyclopedias are goldmines of information,” the source domain of meaning is “goldmine” and the target is “encyclopedias.” In FrameWorks' terms, “encyclopedias” is the target because it is the object or process that the application of knowledge about goldmines is meant to illuminate.

Iterations on the following metaphors were brought to this stage: Rodeo Brain, Carnival Brain, Short Circuit, Overwired, Faultline, Riptide, Open Windows, Brain Static and Popcorn.

In 2011, FrameWorks tested a total of nine candidate simplifying models in two locations in Calgary, Alberta. Each candidate model was presented orally, in separate interviews, to six informants in each location for a total of six interviews per model, comprising a data set of 54 ten-minute interviews. All informants signed written consent and release forms, and interviews were video- and audio-recorded by a professional videographer. The nine models represented executions of seven different candidate simplifying model categories. Data from the interviews were used to winnow and refine categories as well as to refine the individual executions of metaphors within categories.

Subjects

A total of 54 informants were recruited on site in the two locations. A FrameWorks researcher approached individuals on the street or walking through a mall and asked if they would be willing to participate in a short interview as a part a research project on “issues in the news.” The recruiting researcher paid particular attention to capturing variation in gender, ethnicity and age.

Data on each informant’s age and party affiliation, as self-identified, were collected after the interview. Efforts were made to recruit a broad range of informants. However, the sample is not meant to be nationally representative. Although we are not concerned with the particular nuances in how individuals of different groups respond to and work with the simplifying models tested in these interviews, we recognize the importance of between-group variation, and take up this interest in quantitative testing of simplifying models – where the virtues of quantitative sampling techniques can effectively and appropriately address issues of representativeness and across-group variation.

The Interview

FrameWorks had the following goals in designing and conducting On-the-Street Interviews: (1) identify particularly promising simplifying model categories; (2) refine those categories with more mixed results; and (3) eliminate highly problematic categories, in which the underlying *concept* created problems that could not be overcome by refining existing or designing new executions. FrameWorks’ approach to this winnowing process is highly conservative to assure that only the most unproductive categories – those that are beyond repair – are eliminated.

However, winnowing is a necessary feature of a process that intentionally produces a large set of possible iterations, but that culminates in the one most effective simplifying model. More specifically, interviews were designed to gather data that could be analyzed to answer the following questions.

- A. Did the informants *understand* the model and its underlying metaphor?
- B. Did they *apply* the model to talk about the causes of addiction and to describe why one person might be addicted but another person might not?
- C. Did the model *shift* discussions away from the dominant thought patterns that characterized the initial responses?
- D. How did informants respond to the questions about addictions?

E. Did exposure to the model *lead to more articulate answers and robust, fully developed conversations* of issues that informants had problems discussing prior to being exposed to the model?

The interview began with a short series of open-ended questions that dealt with how addictions happen. The interviewer then discussed one of the candidate simplifying models using a conversational script. Following this exposure to the simplifying model, the researcher asked informants a second series of open-ended questions designed to gauge the effect of the simplifying model.

TEST II: QUANTITATIVE EXPERIMENTAL RESEARCH

After analyzing On-the-Street Interview data, FrameWorks subjected the refined set of simplifying models to an online quantitative experiment. The overarching goal of this experiment was to gather statistically meaningful data on the models' effectiveness, which provided an empirical basis for selecting one or two models that were most successful relative to a set of theoretically-driven outcome measures. In the end, experimental data were used to select and refine one model that was then taken into the final stage of the empirical testing process. The categories that emerged as successful in On-the-Street Interviews were built out to include other iterations.

Underlying: Brain Faultlines, Fraying
Balance: Overloaded, Brainjacked
Distance: Stranded, Wandering

In June 2011, FrameWorks conducted the survey, which measured the performance of six candidate simplifying models in three metaphor categories in relation to a set of outcome measures. Approximately 2,000 survey participants were drawn from a national online panel and data were weighted on the basis of gender, age, race, education and party identification to ensure that the sample was nationally representative.

Experimental Design

Following exposure to one of six “treatments” – paragraph-long iterations of candidate metaphors – participants answered a series of questions designed to measure a set of theoretically-based outcomes. Effects were compared both across and within categories, meaning that general categories were tested against other general categories, and specific iterations were tested against other iterations both within and across categories. Outcomes measured included *understanding*, *application* and *aptness*.

Treatments

In designing the survey instrument, multiple iterations were generated by a linguist as alternative representations of the larger metaphor categories. For example, the “Hidden” category included specific instantiations of “Brain Faultlines” and “Fraying,” while “Balance” contained “Wandering” and “Overloaded.”

In total, six specific simplifying model iterations were developed. Each treatment consisted of a paragraph that described the metaphor, as in the following example for “Fraying.”

Fraying

Some people say that addiction happens in the same way that small rips in a rope, a sweater or a net make it unravel all the way, break and fall apart. Like tiny rips in a rope, the brain can have small vulnerable places in its connections. Certain stressors can speed the unraveling of the net or rope so that it falls apart and can't be used anymore. These rips in the brain form as the brain develops, which means that children and adolescents go through periods when they naturally have these rips. The rips and tears can also develop when people experience stress and don't have supportive relationships. Others may have been born with some frayings that others don't have.

Among iterations, the only differences were the name of the model (e.g., Fraying), entailments and structural features specific to that metaphor and appropriate lexical items or phrases. This balance of *variation* between models and *standardization* in construction and language is designed to ensure that any differences in effect were due to differences among the models themselves, and not to some unintended confounding variable.

Outcome Measures

After receiving the treatment paragraph, participants were asked a series of multiple choice questions to test each model's performance in relation to three outcome measures: understanding, application and aptness. The numerical outcomes of this experiment were provided in the main body of this report.

Control

For this study, we added two controls for the sake of a more rigorous comparison. One control was null: people were asked to think about addiction for 15 seconds before they moved on to the questions. The second control was a neutral science-lite description prepared by FrameWorks researchers. This control paragraph is as follows.

Some people say that addiction happens in the brain for several reasons. One reason is that the brain's chemistry has been altered by exposure to some substance or behavior. People who are addicted crave substances or behaviors that have become their only method for achieving a positive psychological state. They have such a strong desire for that state that they continue to seek it even when their behavior poses a risk to their health and lives. Addiction is so pervasive because it changes the brain in ways that make it unable to assess the consequences of behavior or calculate its risks. Addiction also occurs in some people but not others because of genetic vulnerability, environmental vulnerability, increased sensitivity at certain developmental stages and stress.

As stated earlier, both controls did poorly against the leading models, *Faultline* and *Overload*.

TEST III: PERSISTENCE TRIALS

After using quantitative data to select the most effective model, FrameWorks conducts Persistence Trials to answer two general research questions: (1) *can* and *do* participants transmit the model to other participants with a reasonable degree of fidelity? and (2) *how* do participants transmit the model? In other words, the method examines how well the simplifying models hold up when being “passed” between individuals, and how participants use and incorporate the models in explanation to other participants.

The Persistence Trial

A Persistence Trial begins with two participants. The researcher presents one of the candidate simplifying models and asks the two participants a series of open-ended questions designed to gauge their understanding of the simplifying model and their ability to apply the model in discussing the target domain (here, the causes of addiction). For example, the researcher asked how the participants understood the simplifying model; checked in to see that they understood the geologic domain of the metaphor; probed about how well they could use it to explain differences among individuals; and asked how the simplifying model might suggest policies related to the prevention and treatment of addiction in Alberta. Questions and analysis were also designed to locate any terms or ideas in the execution of the model that participants had difficulty with or explicitly recognized as problematic.

After 15 to 20 minutes of discussion between the two initial (Generation 1) participants and the interviewer, Generation 1 was informed that they would be teaching the simplifying model to another pair of participants (Generation 2). Generation 1 was given five minutes to design a way of presenting the simplifying model, after which they had five minutes to present it to Generation 2. Generation 2 then had five to 10 minutes to ask Generation 1 questions about the presentation. During this time the interviewer generally allowed dialogue

to unfold naturally between the two groups but periodically probed for additional information on ideas that emerged.

Generation 1 then left the room and the interviewer asked Generation 2 an additional set of questions designed to elicit their understanding of the simplifying model and their ability to apply the concept. This questioning lasted for approximately 10 minutes, at which point Generation 2 was informed that they would be “teaching” the idea to two new participants (Generation 3). Generation 2 had five minutes to plan their presentation, after which Generation 3 entered the room and the two groups went through the same steps and questions as described above.

A Persistence Trial ends when Generation 1 returns to the room, where Generation 3 teaches the model to Generation 1 (without being told that Generation 1 is already familiar) [re??] they are allowed to debrief with Generation 2 on the direction the metaphor has taken. The interviewer then reads the original paragraph-long iteration and asks questions about its transmissibility.

For the addiction research discussed here, FrameWorks tested two candidate simplifying models (*Brain Faultlines* and *Overload*) in Calgary, Alberta in July, 2011. Each candidate model was tested in three Persistence Trials. All informants signed written consent and release forms prior to participating in the sessions, and interviews were video- and audio-recorded by professional videographers.

Subjects

A total of 36 informants participated in Persistence Trials. These individuals were recruited through a professional marketing firm, using a screening process developed by and employed in past FrameWorks research. Informants were selected to represent variation along the domains of ethnicity, gender, age, educational background and political ideology (as self-reported during the screening process).

Analysis

In analyzing data from Persistence Trials, FrameWorks sought to answer the following specific questions in relation to each simplifying model.

A. Were participants able to *apply* the simplifying model; and more specifically, what were the ways in which they applied the model?

B. Was the simplifying model *communicable*? Were Generation 1, 2 and 3’s presentations of the simplifying model faithful to the initial model presented by the interviewer? How did the groups’ presentation of the model differ from the interviewer’s presentation (i.e., did they use

different language, use different ideas related to the metaphor, emphasize different entailments, etc.)?

C. Did the simplifying model *inoculate* against dominant default cultural models? That is, did the model prevent discussions from falling back to the dominant unproductive cultural models? Furthermore, if one of these cultural models did become active, could the simplifying model prevent the discussion from veering narrowly in these perceptual directions?

D. Did the simplifying model *self-correct*? That is, if one Generation's presentation was not faithful to the original simplifying model or left out a key component, did the ensuing Generation's interpretation and/or presentation self-correct?

E. What specific *language* did the groups use in discussing the model? Was there language that participants used that was not included in the original execution of the simplifying model?

As described in the main body of this document, *Brain Faultlines* produced a number of beneficial effects on participants' talking about what addiction is and where it comes from.