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“Why Did I Get That Part of You?”: Understanding Addiction Genetics Through Family History

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Abstract

Scientists have sought to uncover the genetic bases of many diseases and disorders. In response, scholars defined “geneticization” to describe genetic infiltration of understandings of health and illness. In our research, we interviewed 63 individuals in addiction treatment programs to identify what form of geneticization best fits individuals’ description of their own addiction. Individuals’ narratives of their lives, which include family history and are influenced by cultural and structural factors, affect respondents’ reactions to a potential genetic basis of addiction. Most who had a family history of addiction subscribed to a notion that addiction “runs in families,” while most lacked a family history of addiction used this fact to reject the notion of genetic inheritance of addiction. We conclude that, though we see elements of several different versions of geneticization, Nikolas Rose’s version, that genetics affects peoples’ perceptions of addiction in small but important ways, best describes our respondents’ views.

Keywords

Addiction; Substance use; Behavioral genetics

Introduction

Numerous efforts seek to uncover the genetic and biological bases of addiction (Bierut et al. 2007; GENEVA Consortium 2012; Thorgeirsson et al. 2010), and these efforts implicate different metabolic pathways and areas of the brain in substance use disorders (Treutlein and

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Rietschel 2011; Cao, LaRocque, and Li 2013; Gelernter et al. 2014, 2015). Though the United States' National Institute on Drug Abuse has reported that around 50% of the risk for addiction is genetic (National Institute on Drug Abuse 2007; Szalavitz 2015), cutting edge genetic investigations, as well as difficulties replicating genetic findings, affirm the complexity of the phenotypes and genotypes that provide that risk, with a large number of causal risk variants contributing small effects (Hart and Kranzler 2015; Reilly et al. 2017; Schuckit 2014).

A genetic understanding of addiction is consistent with cultural ideologies that privilege individual-level causes of illnesses, as well as therapies and prevention strategies focusing on an individual's body and choices (Link and Phelan 1995). However, these genetic researchers accept the importance of the environment (Thomas 2010; Vrecko 2010), and social science research affirms the effect of structural variables, like economic inequality and poverty, on addiction (Acker 2010; Draus 2009; McLoyd 1990; Hill, Ross, and Angel 2005). Yet, evidence suggests that when media focus on biological roots of addiction, they omit contextual structural and environmental information (Dingel, Karkazis, and Koenig 2011; Ostergren et al. 2014), and focusing on the biological seems to direct media attention to individual pharmaceutical treatments and away from treatment strategies that take the wider context into account (Ostergren et al. 2014).

Internationally, while little research has been done exploring lay individuals' sentiments about the utility and validity of genetic effects on addiction, evidence indicates geographic variation exists. For example, in interviews, Morphett and others found that Australian smokers largely rejected a biological model of smoking and believed it would increase the stigma associated with smoking (Morphett et al. 2017). Studies exploring either other psychiatric diagnoses (like schizophrenia) or other traits with a strong environmental effect (like heart disease) also suggest significant variation. For example, in Scotland, Edward Hall did not find a straightforward geneticization of heart disease (Hall 2005). In contrast, in a London sample, (Callard and others 2010) found that gene talk was a scaffold that supported a family narrative of family mental illness.

Addiction is not only strongly influenced by contextual factors, but is a behavioral trait. Behavioral genetics -- the genetic influence of traits or behaviors that more typically are under the jurisdiction of psychologists -- include mental disorders, or traits like intelligence or aggression (Parens 2004). Further, addiction is highly stigmatized compared to other diseases interrogated for their genetic roots (Phelan and Link 2012; Pescosolido et al. 2010), in part because those with a substance use disorder are perceived to be weak-willed and responsible for their use (Lloyd 2013; Crisp et al. 2005; Schomerus et al. 2011). In contrast, a genetic basis of diseases and disorders is considered to be more ingrained and less under one's control (Campbell 2010; Keane 2002; Lubman, Yucel, and Pantelis 2004; Schreiber and Hatrick 2002). Though some scientists have endorsed a "disease of the brain" model of addiction, which includes a genetic component, as a way to reduce blame and stigma from individuals (Duenwald 2003; Dackis and O'Brien 2005), research does not indicate that stigma has been reduced as a result of such biological framing (Phelan and Link 2012; Pescosolido et al. 2010).

Geneticization

An emphasis on genetic etiology reappeared in the 1990s with the mapping of the human genome. During this time, Abby Lippman coined the term “geneticization” to describe the ongoing process where “differences between individuals are reduced to their DNA codes”; most disorders and behaviors are defined, at least in part, by genetic origin; and increased advocacy to adopt genetic technologies to manage health problems (Lippman 1992, 1470). Since then, many scholars have built upon and refined the idea of geneticization, rejecting deterministic forms of geneticization. They argue that while geneticization has infiltrated lay conceptions of health and illness, Lippman’s framework oversimplifies the ways genetic knowledge affects how individuals think about diseases and behaviors (Novas and Rose 2000; Rose 2007; Brekke and Sirnes 2011; Easter 2014).

Enlightened geneticization

Adam Hedgecoe, in his analysis of clinical and scientific discourse about schizophrenia, coined the term “enlightened geneticization” to articulate a “reasonable, non-extremist” version of geneticization that accepted (but also downplayed) non-genetic factors (Hedgecoe 2001, 875). In other words, Hedgecoe found that those researching a genetic basis of schizophrenia reject the notion that schizophrenia is caused by one gene. They accept genetic complexity and environmental factors as important, if hard to define and measure, but still put the main causal factor as genes.

Hedgecoe’s research is constructed around researchers and was not originally about individual identity. However, it constructs genetics at the center, which is a framework that *could also* be found in lay individuals thinking about diseases with a known genetic component. For example, consistent with enlightened geneticization, Featherstone et al. argue that an increasing reliance on genetics has shifted how we think about familial risk, with a range of other traits – physical resemblance, personality types, skills, and talents – being used to predict genetic risk of disease. They go on to argue that genetic inheritance provides an answer to questions about “why me?” and “why this disease?” In other words, genetics allows individuals to create an aura of certainty in an uncertain environment.

Biological citizenship

Nicolas Rose argues that Lippman’s extreme form of geneticization leads us astray from the ways genetic knowledge shifts conceptions of identity and causation (Novas and Rose 2000; Rose 2007; See also, Brekke and Sirnes 2011; Easter 2014). While Rose perceives that we are becoming “biological citizens” with rights, duties and expectations, this transformation is not following the pathway of either strong geneticization or enlightened geneticization. Instead, Rose (2007, 253) believes that “in all manner of small ways, ... things will not be quite the same as they were,” since increasingly biological forms of knowledge shape our understanding of ourselves. This process redirects narratives in subtle ways, with genetic knowledge being woven into existing personal stories (Easter 2014; Brekke and Sirnes 2011; Rose 2007).

Rose’s theory differs from Hedgecoe’s in that while biology sits at the center for both, Rose’s is more flexible, with a focus on how individuals are able to incorporate genetic

information in a variety of unpredictable ways, and not always with genetics at the center and contextual variables at the side. Novas and Rose (2000) argue that identities are plural and multiple, with biomedical identities, including those based in genetics, finding “their place among a bewildering array of other identity claims and identificatory practices, sometimes taken up, by subjects or by others, in a rewriting of identity in biological terms, sometimes vehemently contested” (Novas and Rose 2000, 491). In other words, while the idea of enlightened geneticization wholly emphasized genetic bases of health and illness, the notion of “biological citizenship” takes genetics as increasingly central but still only one of many ways that individuals simultaneously define themselves.

Consistent with Rose’s theory, evidence indicates that the lay public does not passively accept information about genetics, but instead process messages in a complex, critical, and culturally-mediated way (Dingel et al. 2017; Hammer et al. 2012; Easter 2014; Brekke and Sirnes 2011; Chilibeck, Lock, and Sehdev 2011). Narratives that involve genetic explanations do not replace beliefs, but instead support existing narratives of family disorder (Callard et al. 2010; Condit 2010). For example, Chilibeck et al. (2011) found that, for many families with known genetic risk factors for Alzheimer’s disease, which provide statistical estimate of risk, knowledge about family history was more important and meaningful to them than genetic test results.

After geneticization

Other scholars imagine what happens “after geneticization” (Arribas-Ayllon 2016; Meloni 2014; Weiner et al. 2017). Building upon Rose, Hedgecoe, and others, Arribas-Ayllon argues that sociology has turned away from concepts of genetic determinism: we are “after geneticization” in the sense that geneticization is only a starting point, not an ending point, of analysis. Sharpening a conception of “after geneticization,” Maurizio Meloni, (2014) argues that we are in the midst of a complete boundary renegotiation between the disciplines of “biology” and “sociology” resulting in a better understanding of the profound connection between the biological and social realms (Meloni 2014). Weiner et al. (2017) agree that such a shift is taking place, and go on to ask why, given this scientific shift, genetic imagery persists. They believe that this “genetic imaginary” – which is in some ways parallel to Conrad’s (2001a) notion of genetic optimism, where genetic bases of disease will be found and the results of such discoveries will be medically (and culturally) positive, persists because of its alignment with individualistic notions of health and disease, with the social and collective context of illness obscured.

Paper overview

We explore the ways that people seeking treatment for addiction conceptualize addiction genetics in the context of heredity, and how genetic knowledge infiltrates their perception of their own addiction. There is a dearth of qualitative studies that explore the ways geneticization affects lay individuals’ understanding of *behavioral* genetic information, like addiction. Addiction is also a unique disorder because of its high level of stigmatization, and because it is considered by the general population to be largely under individual control. In this paper, we ask how a sample of those with substance use disorders make sense of genetic information in the context of addiction. What forms of geneticization do we see in

individuals' narratives? How does a societal perception of addiction as something under one's control mesh with genetics, which are outside of one's control? How does geneticization co-exist with uncertainty? Are we "after" geneticization, as Arribas-Ayllon (2016) suggests? Does geneticization extend to patients' understanding of their own addiction? We find that though elements of enlightened geneticization exist, Rose's notion of biological citizenship best captures the way individuals in our sample talk about a genetic basis of their own addiction.

Methods

Setting, sample, and recruitment

With approval from the treatment centers' institutional review boards (when available), as well as that of our own institutions', we interviewed 63 participants from five different treatment programs in Minnesota, U.S.A. (See Table 1). Three of the programs were part of public health care systems, one was in a private, non-profit hospital, and one was part of a philanthropic non-profit organization. Treatment programs were selected to obtain a socio-economically, racially and ethnically diverse sample spanning urban and rural areas. The treatment sites offered group and/or individual therapy sessions, and most also combined these with pharmacological treatments. While the treatment sites varied in their educational approach to substance use, most included materials that emphasized a biological basis of addiction.

Participants were recruited using a flier, which contained a phone number they could call to schedule an interview at their convenience. Before each interview, the interviewer obtained informed consent; in most cases verbal consent was obtained, except in cases where their treatment center's IRB required written consent. The interviewer also asked for self-reported demographic information, including age, race, and occupation. Interviews were done in private rooms at the treatment centers. Interviewees were compensated for their time.

Interviews were conducted by one of four trained interviewers. Participants ranged in age from 25 to 73, with an average age of 47.5. The participants were in treatment for alcohol use (32%), smoking cessation (46%), or a combination, including in some cases illicit drugs (22%).

Data collection and analysis

We conducted semi-structured interviews lasting 30 to 45 minutes. Interviewees were asked about a variety of topics (see Table 2). Interviews yielded a cornucopia of information that cannot be adequately addressed in a single paper; in this paper, we focus our analysis on individuals' knowledge of genetics and addiction. We recorded and transcribed the interviews, uploaded them into the qualitative analysis software N'Vivo, and used qualitative content analysis to analyze the transcripts (c.f., Clarke 2005; Corbin and Strauss 2008). Each transcript was coded independently by two members of the research team using both questions of interest and categories that emerged from the interviews. Coding discrepancies were discussed until consensus was reached. We refined themes by continually referencing our evolving analysis against the original interviews to maintain validity, and taking care to

identify and present the full range of responses (Clarke 2005). Like much qualitative research, our goal was not generalizability, but instead to begin to map out the breadth of responses for our topic.

Results

The story of addiction in the family

Family history.—Consistent with existing literature (Condit 2010), most of our sample (over 80%) situated their addiction within a context of a family history of addiction – for them, addiction “runs in families.” While accepting that their substance use disorder is a disease, it did not always follow that respondents adopted a geneticized view of their addiction; some implicated environmental factors. Like a majority of our participants, Mike, in treatment for alcohol and nicotine, creates a narrative that bases addiction based in learned behavior and genetic inheritance:

Well, I imagine some of it has to do with ... your DNA or whatever, but, some of it, too, is you do what you see. Monkey see, monkey do kind of thing. ... I have seen it in families where it is usually a celebratory use. They are always celebrating, you know, trees turning color ... or else people were just dismal. ... But...I have it on both sides of my family (Mike).

For Mike, there is no conflict between affirming both environment and genetics as causal factors of addiction. Like other interviewees, Mike seamlessly weaves these understandings into his family history, which in turn actively shapes his understanding of a genetic basis of addiction. This method of talking about genetics is less deterministic than Hedgcock’s “enlightened geneticization” and more in line with Rose’s notion that genetics affects our perceptions in small but important ways. Yet, in our sample we did not see respondents blurring the line between biology and environment, as Meloni (2014) suggests.

Many respondents equated a family history of addiction with genetics, explicitly rejecting or marginalizing the role of environment:

I saw both my parents drink and I knew I wasn’t going to be a drinker and so I made that decision ahead of time. I don’t want to be like you. ... [My brother] drank from the time he was 17 ‘till he was 45 and died from alcohol. So that does go to show you that it is a disease that can be passed on through your genes. But I think I made a conscious effort to withdraw from that (Irene, in treatment for smoking cessation).

For Irene, her family history is central to her understanding of addiction genetics; she uses her brother’s inability to quit as evidence that alcoholism can be passed through one’s genes, and adopts a geneticized view of addiction that largely omits environmental factors. And yet, she indicates that she made a “decision” and a “conscious effort” not to be an alcoholic, which emphasizes choice and implicitly rejects the power of genetics, while maintaining an individual-level thinking about addiction.

Logical consequences of familial genetics.—Framing addiction as part of a family history results in a variety of stressors. For example, nearly all our participants responded

with acute concern when asked about the possibility of their children or young relatives inheriting addictive tendencies. Some participants described behaviors in children that both caused concern and confirmed for them that genetics can pattern behavior that increases the risk of addiction:

I have 3 sons, they are 12, 14 and 15 and my 14-year-old, I already see addictive tendencies in him and he has never used – I mean to my knowledge he has never used. ... [For him,] one is not enough. ... [My 14-year-old] is like, Coke, they really like Coca-Cola in the refrigerator. He will go and he will take 6 cans and the other two will take one (Nora, in treatment for alcohol).

This statement focuses attention on the individual-level, though it's unclear if it's "choice" or biology driving this ingrained tendency. However, for many respondents, the idea that one could uncover predispositions for addiction provided hope that addiction could be avoided with careful education and choices, thus reinforcing the notion that genetic knowledge comes with a social requirement to act on that knowledge to maintain or improve one's health (Rose 2007).

Of those in our sample, Floyd, the only respondent to identify solely as Native American¹, struggles most with the notion of a genetic conception of addiction, in part because of his awareness of racist stereotypes associating Native Americans with alcoholism. Others may associate "genetics" with families, but for Floyd, these racist discourses associate genetics with both family and race. For him, at stake in debates about genetics and addiction is how all Native Americans are perceived. Though he described most members of his immediate family as alcoholics, he resists a notion that alcoholism is inherent in Native Americans, and then goes on to describe larger racist practices that he and his ancestors face(d):

I hear people say just because I'm Native I'm automatically alcoholic or something like that. ... So many native men, they realize, you know when they get out there everybody is such racism [sic]... Then we tend to get excluded [from public resources and jobs] so many of them just give up and just go to drinkin' ... People just give up ... It is a social exclusion because I have no people left. My people were murdered and my people were executed (Floyd, multiple substances; currently in treatment for opiates but self-reported previously being addicted to other substances, including alcohol).

Later in the interview, his ambivalence about a genetic basis for addiction bubbles over:

You know? So I think that gene crap is bull crap. I suppose it is because I suppose it is partially true because my whole family is alcoholics. So I suppose it is partially true – yah, I suppose it is true! (Floyd).

Floyd points to structural factors in his own addiction – racism, lack of access to jobs, the near genocide of his people—causes of stress, which does increase risk for addiction (Hill, Ross, and Angel 2005; Redonnet et al. 2011). He also points, indirectly, to the "drunken Indian" myth, a belief that Native Americans are biologically predisposed to addiction. It is consistent with these structural factors that Floyd adamantly rejects genetic findings as "bull

¹Four respondents identified as "Native American" and some other race, either Black/African American or white.

crap.” Yet, the genetic discourse wields significant power to direct focus and, when employed, guides Floyd’s focus from structural factors onto heredity, when he accepts the genetic frame because his “whole family” is alcoholic.

No white respondents struggled with their family history with such apparent turmoil. For these respondents, the geneticized narrative of addiction is woven into the story of their family without concern that it implicates the behaviors of a larger group. Like many other white respondents, Mary’s description of her family history of addiction is much less fraught with distress:

My first thought when I really started looking into it my first thought was, oh, great, because every other cousin and son and daughter of my grandparents drank. Not all of them were alcoholics. It would just be me and my uncle. So my thought process was, “*Great! Wonderful! We have wonderful genes running in our family.*” (Mary, in treatment for alcohol, italics indicate words said with sarcasm)

Though Mary clearly does not relish the notion of a genetic predisposition to addiction running in her family, her statement is less intensely emotional than Floyd’s, and more typical for our sample.

Determinism and uncertainty

Scholars have long expressed concerns that geneticization will cause the lay public to adopt an overly-deterministic understanding of addiction (c.f., Lippman 1992; Ostergren et al. 2014). In fact, of those with a family history of addiction, many misconceptualized the potential genetic basis of addiction in an overly deterministic way, undermining notions that “post-geneticization” has reached this population. For example, Joe, in treatment for alcohol, described having a “50% chance” of having an addiction problem if a parent or relative had it. Other respondents, like June, used this conception of genetic determinism as a way to question a genetic basis of addiction.

I’m addicted to smoking, [but] not because it was passed along to me. Because I have family members who don’t smoke, so it is like, why don’t they if I do—if we have the same genes? (June, in treatment for tobacco).

But Julia pointed out that the flip side of genetic determinism—environmental determinism—fell short because of similar logic. June does not understand why people with the same genes would have different predispositions to addiction, while Julia does not understand why people growing up in the same house would.

I mean, if it is true that there is a gene in you that can react differently...my sister and I grew up in the same house and the same parents and the same everything and she drinks sometimes but she didn’t turn out with a problem like I did. So, maybe there is something to [a genetic predisposition to alcoholism]. (Julia, in treatment for alcohol).

Both of these respondents use the presence and pattern of addiction in their own family to either support or reject genetics as a basis of addiction. They are exploring uncertainty and feeling out the relationship between genetics and environment. Yet, unlike what we might

see from a post-geneticization analysis, they maintain a distinction between genetics and environment.

“*Why did I get that part of you?*” Many patients grappled with patterns of how addiction emerged in their family. Though some, like Mary who above decried the “wonderful genes running in our family,” did not find it odd that addiction emerged in some family members and not others, many respondents were confused by the randomness:

It is more likely to have dependency on alcohol is what they had told us. But, yah, I don’t know, it is weird because there is like 5 kids in my family and, me and my brother both, are alcoholics right off. I mean we have so many issues whenever we drink. And the other three, my one sister she drinks just once in a great while and has no problems. And my other brothers are the same way. They drink and never have problems. So it is kind of like, okay, how did we get this lucky gene? ... It is like, *why did I get that part of you?* And that is what my kid said to me: Why do I get that part? (Kay, emphasis added, in treatment for alcohol).

Kay indicates that alcoholism is the result of a “lucky” gene. While this is said with sarcasm, the use of the word “luck” implies uncertainty, randomness. “Luck,” paired with her question, “why did I get that part of you?” indicates an individual-level analysis that is inherited, but also uncertain and random; it is a “genetic lottery” with the course set at conception (King 2010). For Kay, choice seems to not be part of the etiology of addiction.

Some respondents, like Jill, accepted a genetic explanation of addiction, but found it confusing to trace the history of addiction back through her family tree:

And I’m trying to think of the alcoholics I know. There must be some that the parents or the grandparents or aunt or uncle weren’t alcoholics. I mean; it has to start someplace. You know, when no one was an alcoholic. And then they are an alcoholic (Jill, in treatment for alcohol).

It is interesting to note that Jill does not turn to contextual variables to understand where addiction began in her family; this response is consistent with a notion that geneticization obscures these environmental and contextual variables, and is consistent with enlightened geneticization. Other respondents use their family members’ personality traits to explain how addiction emerges. For example, above, Irene notes that she made a *conscious choice* not to “be a drinker.” Similarly, Lily says of her mother:

My mother was the kind, maybe, who had an alcoholic tendencies in her family but my mom was valedictorian of her class and dang, my mother was *never* going to be a loser, you know. And, for that reason, and she was *never* going to be out-of-control. You know, for those reasons, my mother would never have let it happen! I just don’t feel that it would be, if it happened she never would have lived through the part where she threw up on her shoes first! (Lily, emphasis in original, in treatment for alcohol).

Though Lily situates genetics within her family history, she seems to describe a central personality trait as a protective factor for her mother. In this way, both Lily and Irene make sense of the way addiction emerges, or fails to emerge, within specific family members in a

way uniquely relevant to behavioral genetics, and also consistent with Rose's notion of biological citizenship.

No family history

A few respondents (about 13%) reported no history of addiction in their family. One of these respondents was seeking treatment for alcohol, two others were seeking treatment for both opiate and tobacco addiction, and the remainder were seeking treatment for tobacco addiction. Two of these eight respondents, Cheri and Jessica (both in treatment for nicotine), had never heard about a potential genetic basis of addiction before their interviews and did not take a clear stand about the validity of such claims. Most used their lack of family history of addiction as a way to deny that genetics played a role in their addiction. In this way, because genetics doesn't fit in with their family history, they reject it as a causal factor. Grady, in treatment for nicotine, appears protective of his family on this count:

I like picked up my habits from my big brother and that led me to do things this way while he was doing his another way. ... My mother and father never fooled with drugs, we just got caught up. My brother, he just got caught up with the wrong people. You know, so it had nothin' to do like our family.

Only two individuals without a family history of addiction, Isaac (in treatment for alcohol) and Chip (in treatment for tobacco), believed in a genetic basis of addiction.

Everything, everything about us is genetic. I mean, it doesn't matter what it is... there is a gene somewhere that makes everything happen. So, I'm assuming there is some level that is genetic, but how that works entirely, I'm not sure. I mean, you may be, I mean there may be a genetic predisposition, but I'm not sure that can be all of it because I mean I know that there is no one going back at least two generations in my family who have had a problem – maybe it is because they couldn't afford it, I don't know. (Isaac)

Interestingly, though Isaac is focused on genetic causation, he lists an environmental factor ("maybe they couldn't afford it") as important but outside of his focus.

In summary, our findings indicate that, in general, individuals in our sample without a family history of addiction find genetic explanations of addiction to be less convincing than those with a family history of addiction. Though Isaac's statement is more in line with the idea of enlightened geneticization, the number of interviewees in this group that dismiss genetics ultimately supports Rose's notion of biological citizenship.

Discussion

In this paper, we ask what forms of geneticization appear in individuals' stories of their own addiction. Geneticization is more likely to infiltrate people's stories when it is supported by pre-existing family stories of addiction, though these understandings did not preclude a belief in the importance of environmental variables. In line with other current research into these questions, though individuals largely accepted the presence of a genetic basis for addiction, they did not adopt a strongly deterministic version of geneticization. While we can identify multiple forms of geneticization present in these interviews, including enlightened

geneticization (Hedgecoe 2001) and biological citizenship (Rose 2007), overall, Rose's theory seems to fit better than either enlightened geneticization or "post-geneticization." Most interviewees accept a genetic basis, but it doesn't always sit at the center. Yet, as a group, they also haven't moved to the "postgenetic" mode where there is a radical de-evolution of the boundary between genes and the social and environmental context.

While most respondents accept genetics as a basis of addiction, they also incorporated other aspects of their identity into the center of their thinking about addiction. This is consistent with Nikolas Rose (2007; Novas and Rose 2000), who points to the myriad of small ways that genetics and biomedicine direct our focus and shift our understanding of health and illness, without creating a radical breach from prior understandings. We see this focus in respondents' discussions of: how people become addicted; certain personality traits as protective or predictive of addiction; of race and ethnicity; and uncertainty. While for some, genetics sits at the center of their thinking about addiction, for most, it is one part of a complex tapestry of explanations of their lives.

For example, individuals weave elements of race and genetics in culturally-mediated ways. Structural factors of racism and past conceptions of racial inferiority may feed resistance among racial minorities to adopting genetic conceptions of addiction (Reardon and TallBear 2012). As a Native American, Floyd's strong initial rejection to being told addiction was a genetic disorder should raise awareness that people of certain ethnic and racial backgrounds may be (rightly) sensitive to being told that a disorder they have is genetic; some of these individuals may interpret such information as meaning that their race/ethnicity is genetically flawed, especially when societal stereotypes about their race are consistent with that interpretation (Abadie and Heaney 2015). In comparison, white individuals in our sample seem more likely to interpret information about a genetic basis of addiction as meaning that their *family's* genes are flawed; the negative emotional effects appeared to be minor for these individuals. This finding is consistent with the notion that white individuals are not likely to think of themselves as having a race (Dalton 1996) or, because their culture is the norm, that they are "cultureless" (Perry 2001). In other words, white respondents, as part of this perceived "norm," do not assume their genes reflect upon all white people, whereas our research suggests the possibility that respondents of color, who are more commonly identified as being part of a specific population, may assume that the public perceives their genes to represent that entire population. However, for both sets of individuals, this framing focuses attention on an individual's biology in a way that minimizes important structural factors that affect risk for addiction.

We also found that respondents who did not have a family history of addiction were less likely to believe in a genetic basis of addiction, which again emphasizes the importance of personal experience in respondents acceptance of a geneticized version of addiction, and bolsters Novas and Rose's (2000) conception of individuals weaving genetic narratives with other narratives about identity.

Our study adds useful information regarding how individuals may interpret *behavioral genetic* information. In particular, though many other studies have found that people often believe that family members who "look like" one another are more likely to share genes for

Huntington's disease (Cox and McKellin 1999) or Alzheimer's (Chilibeck, Lock, and Sehdev 2011), this finding did not emerge in our data. Several interviewees did speak about *behaviors* that they observed in children that they thought portended possible future struggles with addiction. We believe that for addiction, where observable behavior exists that is presumed to be related to the disorder (termed "addictive personality" by several interviewees), it is possible that physical similarities are not perceived to be important. Disorders like Alzheimer's and Huntington's disease have no such parallel trait or behavior that would be recognizable in childhood; individuals may thus be more likely to extrapolate from other, non-related traits.

We also see the intersection of genetics with choice, a finding that is unique to behavioral genetics. A few respondents, like Irene and Lily, talk about choice being a protective factor – making a conscious choice not to use substances. And yet, these individuals do not reduce having a substance use disorder to only a simple choice. Though Irene talks about her "conscious choice" not to become a drinker, at the same time she uses her brother's alcoholism to affirm that addiction is "a disease that can be passed on through your genes." Yet others use genes to omit choice. Like many respondents, when Kay talks about "lucky genes" or Nora talks about her child drinking Coca-Cola, they do so in a way that affirms addiction as being deeply engrained that is not adequately captured by popular notions of "choice." In most other cases, respondents use genetics in a way that sidesteps choice altogether, which, given popular notions about addiction, may be a strategy to deal with stigma (Author citation).

Another open question is how geneticization intersects with uncertainty. Featherstone et al. (2006, 82) find that families "want to know why *they* are affected by the condition and how it came to affect *their* family," and argue that examinations of extended family are rationalizations for patterns of inheritance (Featherstone et al. 2006, 82). In other words, they argue that genetic knowledge is an answer for "why me?" and "why us?" However, our respondents were much less definitive, with genetic knowledge not answering these questions. Even in the context of examinations of extended families, many in our sample continued to wonder where addiction started in their family, and why inheritance patterns proceeded as they did. This questioning undermines Featherstone et al.'s claim that genetics helps individuals to develop more robust narratives about how or why they developed substance use disorders. In our sample, geneticization and uncertainty seem to go hand in hand.

Our study has limitations. Our sample is homogenous in that all individuals were seeking treatment for an addiction. Interviewees were from one state (Minnesota), 80% were white, and all except one were native English speakers; as such, the generalizability of our sample is limited with respect to cultural, regional, and racial aspects. We did not interview individuals who have a family history of addiction but do not themselves struggle with addiction. Though we began the interview with general questions about how interviewees think about addiction, later in the interview we asked specifically about a genetic conception of addiction. Therefore, in some cases interviewees are *trying* to think of genetics when answering the question, which may have affected their answers. Despite these limitations,

our study does provide insight into how individuals may perceive behavioral genetic explanations for a trait they themselves possess.

In our sample, we found that individuals largely viewed a genetic basis of addiction through the lens of their existing knowledge of addiction in their family tree. We find elements of enlightened geneticization and biological citizenship in our sample. Of these, Rose's theory fits best because of its flexibility and acknowledgement of the way that many different aspects of identity intertwine with biological conceptions of addiction. Future research should explore these concepts among different populations, including geographic and racial diversity, as well as lay individuals not in treatment for addiction.

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Table 1:

Participant Demographics

	N(%)
Sex	
<i>Male</i>	29(46)
<i>Female</i>	34(54)
Race	
<i>African American/Black</i>	6(10)
<i>Asian American</i>	1(2)
<i>Native American/American Indian</i>	1(2)
<i>Bi-racial</i>	4(6)
<i>White</i>	51(80)
Treatment Program	
<i>Alcohol Treatment</i>	20(32)
<i>Nicotine Treatment</i>	29(46)
<i>Polysubstance Treatment</i>	14(22)
Region	
<i>Urban Minnesota</i>	25(40)
<i>Greater Minnesota</i>	38(60)

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Table 2:

Interview Topics

General Topic	Sample question(s)
Understanding of addiction in general	Can you tell me about your thoughts on how people become addicted to (alcohol/nicotine)?
Understanding of own Addiction	What things do you think might have contributed to you starting to use (alcohol/nicotine)? Are any of these more prominent than the others?
Knowledge of addiction genomics	How do you think your DNA or genes influence your addiction to (alcohol/nicotine)?
Effect of Media and Direct-To-Consumer Tests	[Show respondent a direct-to-consumer advertisement for genome wide scan for alcohol or nicotine addiction] What do you think about this? Does this ad make you think differently about your drug use?
Conception of free will	Some research studies have shown a link between a person's genes and their likelihood of developing an addiction to alcohol/nicotine. How does this kind of research linking addiction to genetics make you feel about your control over your drug use? How does a genetic influence on addiction make you think about the risk of addiction for others in your family?
New genetic treatments and tests: Benefits, Risks, Hopes and Fears	I'm interested in your thoughts on something called tailoring treatment – it's also called pharmacogenomics. This is where doctors perform a genetic test on you, look at your DNA, and then use your genetic information to try to match you with the best treatment. Have you ever heard of this before? Does it sound like this will be helpful to people with addiction to alcohol/nicotine? To you? What kind of worries might potential access to your genes cause you? Or anyone for that matter having such a test done?
Willingness to Participate in Genetic Research	Have you, or anyone you know, participated in studies looking at genes and addiction? In these studies, with your consent, your genetic information might be stored, or "banked," indefinitely and used in other studies? How would you feel about that?