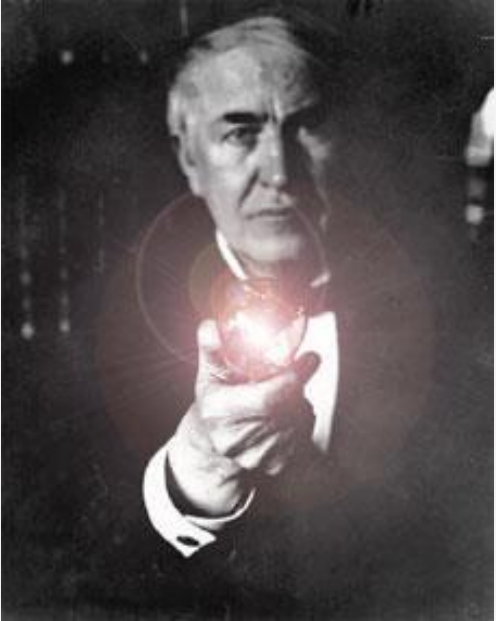


Are Entrepreneurs “Touched with Fire”? ^[1]

Updated April 17, 2015 ◇ Pre-publication manuscript

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I have a lot of illnesses. I don't talk about it much, for a variety of reasons. I feel ashamed to have an illness. (It sounds absurd, but there still is an enormous stigma around being sick.) I don't want to use being ill as an excuse. (Although I sometimes wonder how much more productive I'd be if I wasn't so sick.) And, to a large extent, I just don't find it an interesting subject. (My friends are amazed by this; why is such a curious person so uncurious about the things so directly affecting his life?)

<http://nymag.com/daily/intelligencer/2013/01/aaron-swartz-reader-in-his-own-words.html>

⇒.....Ovik Banerjee ✕ Paul Castle ✕ Matt Berman ✕ Steven Good ✕ Steve Jobs ✕ Glen Mueller ✕ Kari Kairamo ✕ Heinz Prechter ✕ Autumn Radtke ✕ Eric Salvatierra ✕ Alan Schram ✕ Carsten Schloter ✕ L'Wren Scott ✕ Jody Sherman ✕ Aaron Swartz ✕ Qinggen Wang ✕ Susie Steiner ✕ Ilya Zhitomirskiy..... ✕ "A diagnosis is not a disease." – Thomas Szasz, M.D.

We honor the memories of our brilliant, brave and beloved entrepreneurs whose missions will never be accomplished. We seek to understand the causes of their strengths and vulnerabilities, hoping that application of this knowledge will empower future entrepreneurs to prevail.

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Abstract

Importance: Entrepreneurs create the vast majority of new jobs, pull economies out of recessions, introduce useful products and services, and create prosperity. Therefore it behooves us to understand the cognitive, affective, and behavioral strengths and vulnerabilities of entrepreneurs. Prior research has identified the personality traits of successful entrepreneurs, but little is known about the nature of their mental health characteristics or those of their families.

Objective: To investigate the prevalence and characteristics of mental health conditions among entrepreneurs and their first-degree family members.

Method: Research procedures were approved by the UC Berkeley institutional review board. In this study, 242 entrepreneurs and 93 demographically matched comparison participants took an anonymous on-line self-report survey to assess their engagement in entrepreneurship, and their individual and family mental health history. Differences between the two groups, and the first-degree relatives of asymptomatic members of both groups, were assessed for statistical significance using chi-square tests and t-tests.

Results: Self-reported mental health concerns were present across 72% of the entrepreneurs in this sample, a proportion that was significantly higher than that of the comparison group. Entrepreneurs reported significantly more symptoms than the comparison participants, as 49% reported having one or more lifetime mental health conditions, 32% reported having two or more lifetime mental health conditions, 18% reported having three or more lifetime mental health conditions, and 23% reported being asymptomatic members of highly symptomatic families. The entrepreneurs were significantly more likely to report a lifetime history of depression (30%), ADHD (29%), substance use conditions (12%) and bipolar diagnosis (11%) than were comparison participants. Groups did not differ in rates of anxiety, with 27% of entrepreneurs and 26% of non-entrepreneurs reporting anxiety concerns. Asymptomatic entrepreneurs described their first-degree relatives as experiencing significantly more mental health conditions than did the asymptomatic comparison participants, including depression, ADHD, substance use conditions, and anxiety.

Limitations: Limitations of the data include reliance on self-report measures, possible selection bias, vulnerability to shared method variance and comparison group differences, and the reliance on a cross-sectional design.

Conclusions and relevance: The findings of this study are important because they suggest an underlying relationship between entrepreneurship and many of the affective, cognitive, and behavioral differences associated with mental health conditions. Current findings add to a growing body of work suggesting that mental health symptoms, in individuals and their family members, may co-occur with highly advantageous and adaptive outcomes that benefit both the individual and society. Understanding the strengths and vulnerabilities associated with personal and familial mental health histories may contribute to improved entrepreneurial outcomes, and to the development of protective resources for entrepreneurs. These findings have programmatic and policy implications for business education, executive coaching, large employers and human resource managers, health policy, social policy, and macroeconomic

policy practitioners, and for mental health advocates. Policies and programs to properly insure and care for people with a wealth of notions (those with mental health conditions) may be synchronized with policies and programs that empower their admirable relatives (the entrepreneurs) to create the wealth of nations.

Manuscript overview: This report begins by describing the role of neurobehavioral propensities and traits in the evolutionary and macroeconomic context of entrepreneurship. Subsequently we discuss prior research related to the relationship between entrepreneurship and mental health differences, followed by describing the methods and findings of the current study. The paper concludes with a review of limitations of the data, and a discussion of their implications.

Evolutionary and Macroeconomic Context

Why entrepreneurship matters

Entrepreneurship matters more than ever in today's interdependent, competitive, volatile global economy. Creative and innovative entrepreneurs drive regional and national social and economic growth, create the vast majority of new jobs, and stand as the critical last firewall against recessions and catastrophic events produced by national and global economic volatility [2-4]. From 1980 through 2005 almost all American net job creation occurred in firms less than five years old. During the depths of this American recession, entrepreneurs and their young companies produced nearly 8 million of the 12 million jobs created in 2007 [5]. Contemporary economies cannot function without entrepreneurs.

The mindset and mental health of the entrepreneurs we depend upon are thus an important social and economic resource. What gives entrepreneurs this special power? Neurodiversity and neuroplasticity produced by eons of evolution has delivered a class of founders, co-founders, and self-employed individuals who have the cognitive, emotional, and behavioral propensities, traits, strengths, and vulnerabilities required to think different and act different in ways that matter for our economy. It behooves us to understand these differences.

Entrepreneurship and its legacy in the human saga

Venturing and innovation have accelerated the separation of humanity from every other animal species. Hominins, the family of primates that includes humans, improved upon primitive technologies used for hunting, fishing, cooking, clothing, and shelter between one million and 500,000 years ago. These technologies, and their corresponding material culture, allowed our ancestors to obtain, store, prepare, and consume more protein and omega-3 fatty acids derived from fish and animals, which in turn fueled a rapid expansion in brain size [6, 7] and functioning. As food technology innovations allowed our brains to quadruple in size, our journey departed from that of our primate cousins.

Within the last 100,000 years our human ancestors, challenged by jungles, deserts, floods, and ice ages, developed the capacity for social cognition, emotion-infused symbolic thinking, symbolic communication, and cultural transmission through language and the arts [7-10]. The most highly evolved human abilities are supported by brain functions that underpin cognition, perception, emotion, thought, and creativity [11].

We also developed the capacity for cultural learning, instructed learning, collaborative learning [9], organized cooperation between groups [12], understanding the intentions of others [9, 13], pair bonding and partnership [14, 15], and forming expansive goal-focused networked social systems requiring structure and leadership [16].

With our enlarged and evolved human brains, our enriched human culture, our capacity for creativity, learning, partnership and teamwork, and the need to adapt to constantly changing environmental conditions, necessity became the mother of invention. Innovation, the deployment of invention, created a logarithmic cascade of accomplishment.

Maintaining the status quo (job holding) and disrupting the status quo (venturing) emerged as complimentary strategies to assure survival and reproductive success [17]. Entrepreneurship was born, allowing our species to deploy our capacity for invention and innovation in order to cope, adapt, and thrive in virtually any situation and to endure millennial environmental changes. We were all shareholders in the human endeavor at that time and, from the beginning, innovation and entrepreneurship enhanced shareholder value.

The wealth of notions and the rise of the creative class

Successive waves of innovation enabled the creation, growth, and transformation of civilization by breakthrough inventions and understandings associated with agriculture, commerce, industrialization, and information technologies. While each breakthrough created value for investors, producers, and consumers, the rate of product commodification and value erosion has accelerated in conjunction with shortening product life cycles and more rapid product introductions [18]. Ever more rapid innovation-driven value creation [19, 20] has hastened the disruption and “creative destruction” of entire economic sectors [21].

By the end of the twentieth century creativity became the driving force behind America’s explosive economic growth [22]. The creativity that drives economic growth is also a common feature of people with bipolar spectrum conditions, depression, substance use conditions, and ADHD [23-29].

Creativity and its application through venture capital, research and development, entrepreneurship, and intrapreneurship has become critical for value creation and economic expansion [22, 30] because the most successful firms disproportionately come from the earliest entrants into any new market [18]. The economic importance of creative capital now exceeds that of human capital and obsolescing material assets[31] . As the wealth of nations has come to depend upon their citizens with a wealth of notions, an elite “creative class” has emerged. Creative entrepreneurial individuals increasingly participate in the value they create for business owners [31] and become investors themselves, thus perpetuating and accelerating the cycle of entrepreneurship.

Theory Development and Literature Review

Is there a link between the entrepreneurial mindset and mental health?

Who in their right mind would choose to be an entrepreneur? The barriers to success are virtually unlimited and most startups fail as a result. Entrepreneurs have lower initial earnings, lower earnings growth, lower long-term earnings [32], greater work stress, and more psychosomatic health problems than employees [33]. Why would anyone voluntarily accept the longer work hours, fewer weekends and holidays, more responsibility, chronic uncertainty, greater personal risk and struggle, and greater investment of emotional and physical resources required to be an entrepreneur instead of the security and long-term rewards of having a career [34]? By conventional standards choosing to be an entrepreneur is an exercise in bad judgment. However entrepreneurs are not dissuaded by knowing that many are called but few are chosen. Optimistic and confident by nature, entrepreneurs who close their firms, whether by choice or due to business failure, repeatedly create new ones – often at the same time that they are abandoning their last business [35, 36]. Entrepreneurs clearly have different decision-making priorities than their employed peers.

While much is known about the personality traits of successful entrepreneurs [37-40], little is known about the mental health characteristics that may be associated with entrepreneurial success and failure. Reports about entrepreneurs who commit suicide (see Suicide references) inspired the authors to wonder if entrepreneurial capacities, strengths, and vulnerabilities might be associated with mental health conditions. The overlapping signature features of both entrepreneurship and mental health conditions provide an important research focus.

Mental health among entrepreneurs

Mental health is as essential for knowledge work in the 21st century as physical health was for physical labor in the past. Creativity, ingenuity, insight, brilliance, planning, analysis, and other executive functions are often the cognitive cornerstones of breakthrough value creation by entrepreneurs. Yet despite the importance of cognition, affect, and behavior in entrepreneurship, there is very little research about the relationship between entrepreneurship and mental health issues.

Several popular books and case studies have suggested the importance of pursuing research on entrepreneurship and mental health. For example, several authors have described the prevalence of bipolar spectrum conditions [41, 42], obsessive-compulsive disorders, and other more severe conditions [27, 43] among business tycoons. A related literature on mental health differences in leadership has discussed the occurrence of bipolarity, depression, sociopathy, and psychosis among political and military leaders [42, 44-46].

Empirical research

The limited research that does exist suggests that broad-ranging mental health issues do not influence overall measures of well-being among entrepreneurs. In contrast, elevations of specific syndromes among entrepreneurs have been noted.

As an example of a relatively broad-band approach, in one nationally representative study of German individuals, 149 entrepreneurs (defined as self-employed individuals with or without employees) did not differ from age- and gender-matched employed comparison participants in

prevalence rates of affective disorders, anxiety disorders, or alcohol abuse. The entrepreneurs showed a lower incidence of lifetime mental health diagnoses and higher life satisfaction than the employed participants [34].

Parallel findings were obtained in a study of self-reported anxiety, self-esteem, hostility, sociability, life satisfaction, and morale among 235 entrepreneurs (self-employed participants with or without employees) and a matched group of employed Canadians living in metropolitan regions. The study found no significant mental health or job satisfaction differences between employed and self-employed groups [33, 47].

Entrepreneurs and salaried employees in the UK were also found not to differ on the Goldberg Health Questionnaire measures of psychological well-being [48]. Similarly, a study of 238 entrepreneurs and 288 managers in the United States showed no differences on measures of depression, anxiety, and anger [49].

Taken together, the null findings of these empirical studies suggest the need to reconsider models. Here, we consider two more specific models. First, it has been argued that entrepreneurs may derive a mental health protective benefit from the buffering role of social support and a high level of control over their work – a high-demand, high-control work environment [33, 47], and indeed, a positive correlation has been observed between social support and mental health among entrepreneurs [33, 47]. Self-employed survey participants devoted more time engaged in voluntary social and professional organizations [34]. The buffering role of social support received by entrepreneurs was also validated by a British study of entrepreneurs compared with employees [48].

A related set of studies suggests that there may be a greater occurrence of a few key mental health conditions among entrepreneurs. We cover these next.

ADHD: Several authors have cited a relationship between entrepreneurship and Attention Deficit Hyperactivity Disorder (ADHD). In a 16-year prospective study of 91 children with ADHD and 95 comparison participants, Mannuzza and colleagues determined that 19% of probands (participants with ADHD), versus 5% of controls, owned and operated their own business as adults [50]. Verheul and colleagues studied 10,000 students and found that those with ADHD-like behavior had higher entrepreneurial career intentions compared to the others [51]. Dimic and Orlov found significantly higher values in entrepreneurial tendency measures, and a significantly higher marginal probability of being entrepreneurs among 103 ADHD participants in a survey that included 167 comparison participants [52]. Nicolaou and colleagues note that dopamine receptor genes have been associated with sensation seeking, novelty seeking, entrepreneurship, and ADHD [53].

Bipolar spectrum traits and conditions: Akiskal et al. studied 263 professionals affiliated with an outpatient psychiatric practice. They found that of the seven job classifications studied (physicians, lawyers, managers, industrialists, architects, journalists, and artists), self-made industrialists (entrepreneurs) had the highest rates of hyperthymic traits of all the groups studied, which was three times the rate found in the comparison group [54]. Hyperthymic traits include the tendency to experience positive moods and emotions, and dispositional positive affects, which have been linked to a variety of both positive and negative outcomes among entrepreneurs [55]. One of the current authors recognized the concordance between

personality traits associated with successful entrepreneurs, and those associated with bipolarity [56]. However investigation of this relationship failed to demonstrate a main effect, indicating that such a relationship, if any, is more nuanced, moderated, and indirect [57].

Addiction: The addictive behavior patterns of serial entrepreneurs have come to the attention of researchers. “Entrepreneurship addiction,” the compulsion to create and grow new ventures, has been compared to other behavioral addictions such as workaholism and Internet misuse. Psychological, emotional, cognitive and physiological aspects of entrepreneurship may activate neural reward circuits, disinhibit and reinforce the compulsive and addictive behavior of entrepreneurs who may be predisposed and vulnerable to addiction [58, 59].

Mental health conditions associated with propensities required for entrepreneurship

Several mission-critical entrepreneurial propensities and traits are also clinical features of bipolarity, depression, ADHD, and substance use conditions, suggesting the possibility that these conditions may be more prevalent among entrepreneurs.

- ***Creativity and innovativeness:*** Creativity is the foundational cornerstone of business innovation [60] because entrepreneurs must generate novel ideas for innovative new businesses [61]. The proclivity to innovate is a main driver of the intention to become an entrepreneur [62]. Additionally, there is a significant relationship between innovativeness and the intention to become an entrepreneur, business creation, and business success [39, 62]. In today’s knowledge economy, the ability to innovate dictates the wealth generation capacity of a resource, a business, and an economy. Innovation makes companies more adaptive to change and enhances business performance [63, 64]. This is why “innovate or die” has become the mantra of the business establishment [65].

Researchers have identified a relationship between creativity and mental health conditions including psychosis [27, 66, 67], bipolarity [24, 46, 67-70], depression [24, 27], ADHD [25] and substance abuse [27-29, 66].

- ***Goal attainment and achievement motivation:*** Goal attainment has a direct effect on venture growth [37]. Achievement motivation is significantly correlated with the choice to become an entrepreneur, with business creation, and business success [38, 39, 71].

Several studies have indicated a correlation between bipolarity and high achievement [72-74]. Bipolarity has been linked to having ambitious goals, expecting to succeed, goal engagement and zealous pursuit, striving, and goal attainment [75-77].

- ***Risk Propensity:*** Risk propensity is correlated with business foundation [71]. A meta-analysis of personality differences between entrepreneurs and managers reported in 12 large studies found that the risk propensity of entrepreneurs is greater than that of managers, and that the largest differences are found among the entrepreneurs whose primary goal is business growth, rather than family income [78]. Similarly, a personality study of 500 top-level executives found that the most successful executives were the biggest risk takers [79].

Risk propensity and risk taking are features of bipolarity, substance use conditions, and ADHD [80-87].

The authors considered it reasonable to wonder if the endowments and vulnerabilities associated with entrepreneurship may also be associated with the mental health conditions identified in the research cited above.

Hypothesis 1: The prevalence of ADHD, bipolarity, depression and substance use conditions among entrepreneurs is likely to be significantly greater than among a normal comparison sample.

Co-occurring mental health conditions among entrepreneurs

The authors could not identify prior research addressing the co-occurrence of mental health conditions among entrepreneurs. The co-occurrence of mental health conditions is common and has been studied in several large samples. The National Comorbidity Survey Replication interviewed a representative sample of 9,282 English-speaking American adults to determine the lifetime and 12-month prevalence of mental health conditions. This study found a 46% lifetime occurrence of any mental health condition, an 18.3% lifetime occurrence of one mental health condition, a 27.7% lifetime occurrence of two or more conditions, and a 17.3% lifetime occurrence of three or more conditions[88].

This same study found a 26.2% 12-month occurrence of any mental health condition, a 14.4% 12-month occurrence of one mental health condition, a 5.8% 12-month occurrence of two mental health conditions, and a 6% 12-month occurrence of three or more mental health conditions [88].

Since we postulate that the prevalence of mental health conditions may be higher among entrepreneurs, and since co-occurrence is contingent upon occurrence, we would expect a higher rate of co-occurring conditions among entrepreneurs as well.

Hypothesis 2: Entrepreneurs will report a greater number of mental health conditions than will participants in a comparison sample.

Do asymptomatic entrepreneurs come from asymptomatic families?

Many entrepreneurs may have no mental health conditions. Could these asymptomatic entrepreneurs be the high-functioning, well-adjusted, and resilient ambassadors of families with a higher-than-expected prevalence of mental health conditions? If this is the case, the families of asymptomatic entrepreneurs may be burdened by excessive mental health challenges while the asymptomatic entrepreneurs may be blessed with just enough of the creativity, energy, optimism, and other advantageous mental health qualities that empower them to succeed, without being burdened by more extreme mental health symptoms that result in disability.

Little is known about mental health conditions among the families of entrepreneurs. Of some relevance, though, is the fact that previous research has shown that first and second-degree family members of bipolar probands are high achievers across several domains that are important for entrepreneurship. Higier and her colleagues found that when compared to bipolar probands and normal controls, the unaffected identical twins of people with bipolar disorder demonstrate superior cognitive and interpersonal traits that would seem highly important for entrepreneurship, including enhanced social ease, confidence, assertiveness, intelligence, verbal learning, verbal fluency, extraversion, sociability, optimism, and resilience [89].

Coryell et al. found that the first-degree relatives of bipolar probands, including relatives with bipolar spectrum conditions, had significantly higher educational and occupational achievement than the close family members of people with other mental health conditions [72]. Other studies conducted over the last 100 years have reached similar conclusions [73, 74, 76, 90-92].

Creativity and innovativeness are foundational aptitudes of entrepreneurs. The close family members of bipolar probands have been shown to have high levels of creativity [23, 68]. First-degree relatives of people with bipolar disorder, schizophrenia, anorexia nervosa, and autism have been shown to be overrepresented in the scientific and artistic occupations [66]. Male relatives of people with schizophrenia were shown to be overrepresented in a listing of prominent people [93].

Drawing on the findings of heightened accomplishment and creativity in families of those with mental health conditions, we assessed the possibility that unaffected entrepreneurs may come from families with a significant prevalence of mental health conditions.

Hypothesis 3: The first-degree relatives of asymptomatic entrepreneurs are likely to have significantly more mental health conditions than the first-degree relatives of asymptomatic comparison participants.

Methods

Research procedures were approved by the UC Berkeley institutional review board.

Participants

All participants completed online informed consent and verified that they were at least 18 years of age. Participants were from two primary recruitment groups: 1) a mixture of undergraduate psychology students and MBA graduate students plus business school faculty members recruited through the research participation pools of a large public university, and 2) entrepreneurs recruited through study advertisements posted on entrepreneurship websites, newsletters, at entrepreneurship conferences, meet-up groups and organizations, and viral outreach marketing. Entrepreneurs were defined as business founders or co-founders, with or without employees, including founders and co-founders of not-for-profit organizations (social entrepreneurs).

The study was advertised as a study of entrepreneurship and personality. All measures were completed online. Participants completed multiple measures, including items not described here.

The first recruitment group, undergraduate psychology students and MBA graduate students/faculty, signed up through university websites listing multiple studies. This study was characterized as an online survey of entrepreneurship and personality. Undergraduate psychology students received course credit for participation. Students were offered alternative assignments if desired. MBA graduate students and faculty members were paid \$15 for study participation. Total survey duration for this group was one hour. Additional measures not described here were also included. After excluding 8 psychology and 6 MBA participants for failing catch items (e.g. “please select two as your answer”), 76 MBA student and faculty pool participants, and 149 psychology students participated.

The second recruitment group consisted of entrepreneurs who were recruited through study advertisement and outreach marketing. The total duration of the measure taken by entrepreneurs was 10-15 minutes. Twelve participants were excluded for failing catch items.

The combined sample was predominantly male (70.5%). Average age was distributed: 22.7% between the ages of 18-30 years old, 25% between the ages of 31-39 years old, and 24.5% between the ages of 41-49 years old. Regarding ethnicity, participants identified as 72.9% Caucasian, 12.8% Other, 10% Asian, 3.8% Middle Eastern, and 0.5% African American.

Participants from either recruitment group who endorsed, “Have you ever been self-employed, a business founder, or a business co-founder (including non-profit businesses)?” were categorized as entrepreneurs ($n = 242$). Participants who did not endorse this question served as the comparison participants in the comparison (“control”) category ($n = 93$).

Measures

The Family Index of Risk for Mania (FIRM) [94] is a self-report measure of psychiatric history for self and 1st (parents, siblings, or children) and 2nd (aunts, uncles, grandparents) degree family members. Higher scores on the FIRM denote the presence of higher levels of familial psychopathology. The measure was originally validated in a study of pediatric bipolar disorder,

showing a significant relationship between pediatric bipolar and family diagnoses. Cronbach’s alpha, due to the questionnaire design, is not a useful measure [94].

For this study, participants also indicated whether they had experienced these conditions. Participants were asked about personal or family diagnoses of ADHD, substance use conditions, bipolar disorder, depression, or anxiety. In addition, the FIRM assessed for a history of suicide attempt/completion and psychiatric hospitalization among the participants and their family members. The ADHD and anxiety items were added to the original FIRM items for this study.

The FIRM further separated the entrepreneurial and comparison participants: entrepreneurs who reported having a mental health diagnosis (n = 119), entrepreneurs who did not report having a mental health diagnosis (n = 116), non-entrepreneurs who reported having a mental health diagnosis (n = 30), and non-entrepreneurs who did not report having a mental health diagnosis (n = 63). The entrepreneurs and non-entrepreneurs without a mental health diagnosis were further separated by the presence of a 1st degree family history of mental health diagnoses as reported by participants.

Analysis Plan

To determine whether entrepreneurs and the non-entrepreneurial comparison group differed in either their personal psychiatric or family psychiatric histories, we conducted a series of chi-square tests and t-tests. Where p values are less than .05, these tests suggest that differences between entrepreneurs and the comparison sample are larger than what we might expect from chance variation alone, and so are labeled as statistically significant. When p values are greater than or equal to .05, these tests suggest that group differences might simply reflect chance.

Results

Figures in this report
Are Entrepreneurs Touched with Fire?
1. Respondents that report having any lifetime mental health condition
2. Lifetime prevalence of mental health conditions among entrepreneurs
3. Lifetime prevalence of co-occurring mental health conditions among entrepreneurs
4. Incidence of psychiatric hospitalization and suicidality among entrepreneurs
Do Asymptomatic Entrepreneurs come from Asymptomatic Families?
5. Prevalence of any mental health condition among first-degree relatives of asymptomatic entrepreneurs
6. Prevalence of mental health conditions among entrepreneurs and their first-degree relatives
7. Prevalence of specific mental health conditions among first-degree relatives of asymptomatic entrepreneurs
8. Number of co-occurring mental health conditions among first-degree relatives of asymptomatic entrepreneurs
9. Incidence of hospitalization or suicide among first-degree relatives of asymptomatic entrepreneurs

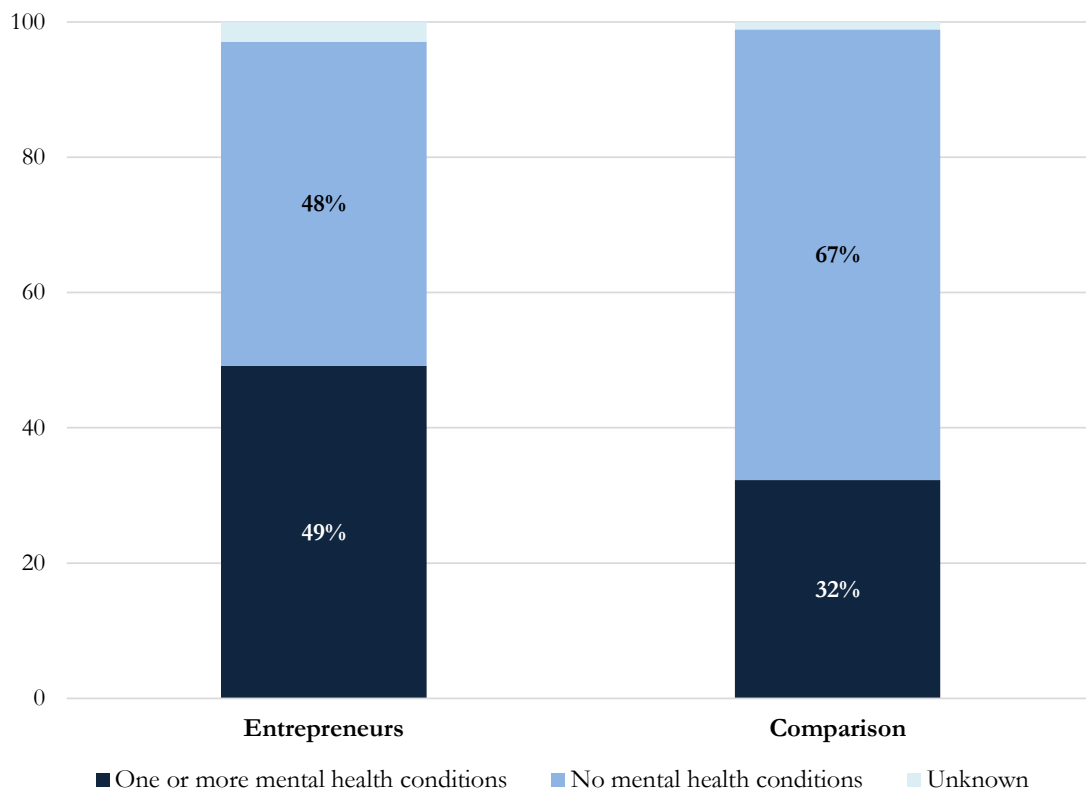
Are Entrepreneurs Touched with Fire?

How many entrepreneurs report having mental health conditions (ADHD, Alcohol/Drugs, Bipolar, Depression, Anxiety)?

Among the entrepreneurs in this study, 119 reported having a mental health condition whereas 116 did not. Among the non-entrepreneurs, 30 reported having a mental health condition whereas 63 did not.

Figure 1

Respondents that report having any lifetime mental health condition
percent of total respondents



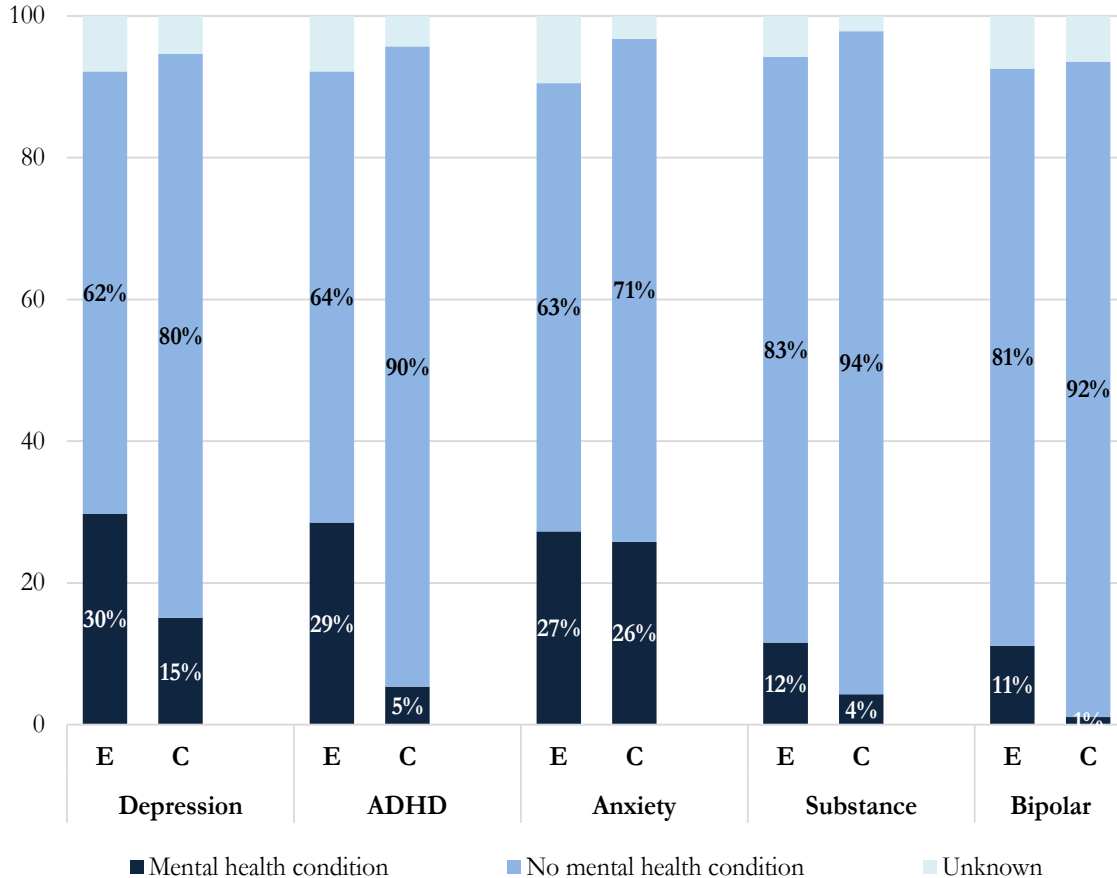
Notes: Entrepreneur sample size: 242; comparison sample size: 93.

Entrepreneurs in the study were significantly more likely to report having a lifetime history of any mental health condition than participants in the comparison group ($X^2=8.67$, $n=327$, $p<0.01$). As Figure 1 illustrates, almost half of the entrepreneurs reported having a lifetime mental health condition, as compared with 32% of the non-entrepreneurs.

Which mental health conditions do entrepreneurs report having?

Figure 2 displays the prevalence of five common mental health conditions among the entrepreneurs and comparison group participants in this sample.

Figure 2
Lifetime prevalence of mental health conditions among entrepreneurs
percent of total respondents



E = Entrepreneurs C = Comparison Participants

Notes: Entrepreneur sample size: 242; comparison sample size: 93.

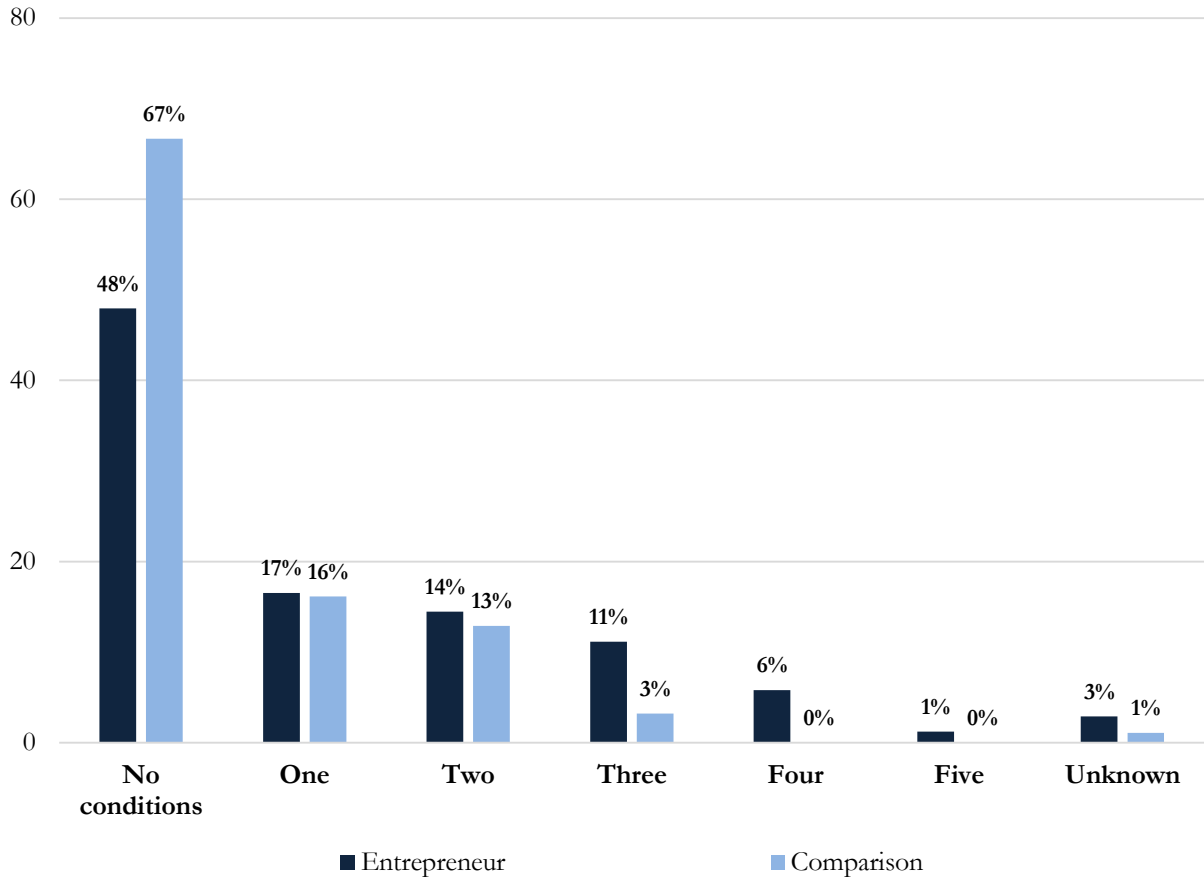
Entrepreneurs in the study reported significantly higher rates of ADHD ($X^2=21.71$, $n=310$, $p<0.01$), substance abuse ($X^2=4.48$, $n=319$, $p=0.03$), depression ($X^2=8.46$, $n=311$, $p<0.01$), and bipolar disorder ($X^2=9.09$, $N=311$, $p<0.01$) than comparison participants. As illustrated in Figure 2, entrepreneurs did not report significantly higher rates of anxiety than did participants in the comparison sample ($X^2=0.62$, $n=305$, $p=0.43$).

How many co-occurring mental health conditions do entrepreneurs report having?

In light of the greater prevalence and diversity of mental health conditions experienced by the entrepreneurs in this sample, the authors sought to determine the extent to which entrepreneurs were likely to have *several* mental health differences.

Figure 3
Lifetime prevalence of co-occurring mental health conditions among entrepreneurs

percent of total respondents

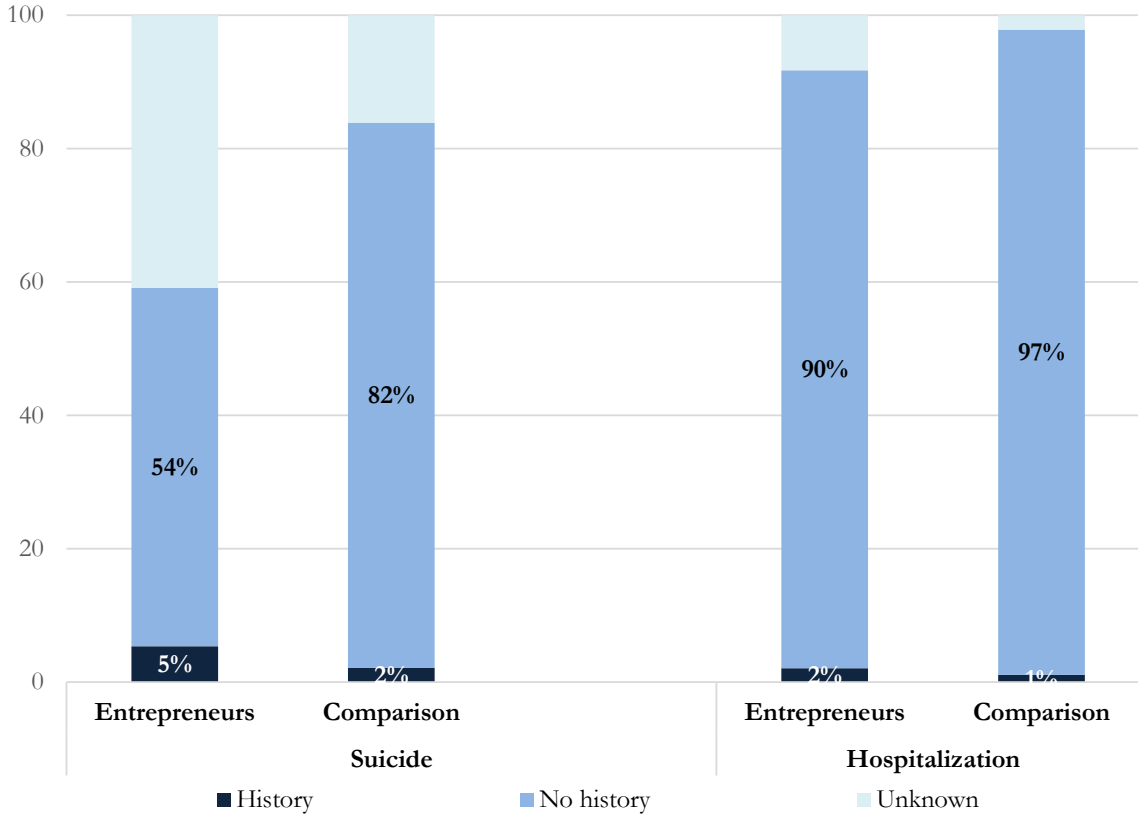


Notes: Entrepreneur sample size: 242; comparison sample size: 93.

Figure 3 illustrates that the entrepreneurs in this sample reported significantly more co-occurring mental health conditions than were the comparison participants. ($t(175)=4.01$, $N=328$, $p<0.01$). In this sample 32% of entrepreneurs reported two or more co-occurring mental health conditions, and 18% reported three or more co-occurring conditions.

How many entrepreneurs report a history of psychiatric hospitalization and/or suicidality?

Figure 4
Incidence of psychiatric hospitalization and suicidality among entrepreneurs
percent of total respondents



Notes: Entrepreneur sample size: 242; comparison sample size: 93.

Very few entrepreneurs or comparison participants reported either suicide attempts or psychiatric hospitalization, and – perhaps as a result of the low base rates – groups did not differ significantly on either outcome. Entrepreneurs (n=13) and comparison participants (n=2) who reported suicidality did not differ in their endorsement of co-occurring mental health conditions (p=0.13). This question awaits further study.

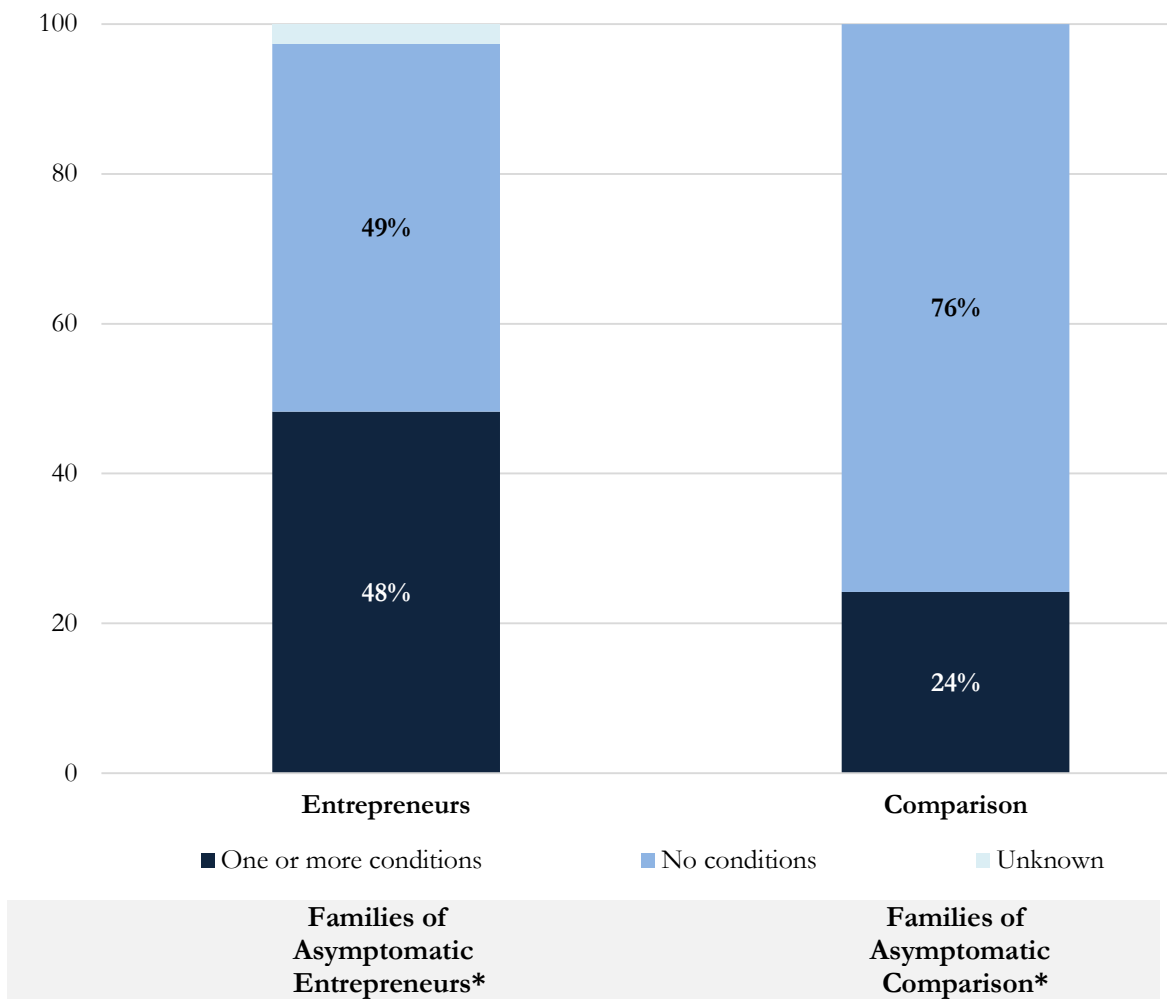
Do Asymptomatic Entrepreneurs come from Asymptomatic Families?

The authors sought to determine the presence of mental health conditions among the first-degree relatives of the asymptomatic entrepreneurs in this study.

How many asymptomatic entrepreneurs report mental health conditions among their first-degree relatives?

Figure 5

Prevalence of mental health conditions among first-degree relatives of asymptomatic entrepreneurs
percent of asymptomatic respondents



*Prevalence as reported by study participants.

Notes: Asymptomatic entrepreneur sample size: 116; asymptomatic comparison sample size: 62.

Figure 5 illustrates that the asymptomatic entrepreneurs in this sample were twice as likely to report one or more mental health conditions among their first-degree relatives than were the asymptomatic comparison participants, a difference that was statistically significant ($X^2=10.68$, $n=175$, $p<0.01$).

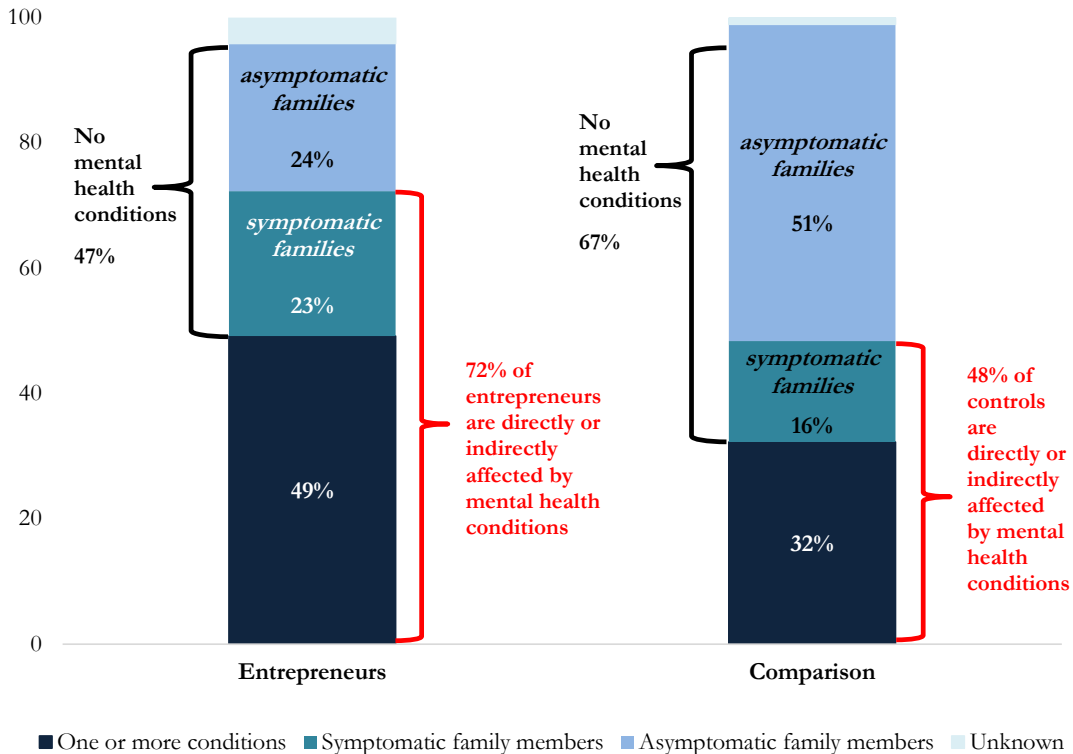
Figure 6

Figure 6 illustrates the prevalence of mental health conditions among entrepreneurs and their immediate families.

Figure 6

Prevalence of mental health conditions among entrepreneurs and their first-degree relatives

percent of total respondents



Notes: Entrepreneur sample size: 242; comparison sample size: 93.

Asymptomatic entrepreneurs with symptomatic families constitute 23% of the entire sample of 242 entrepreneurs. Asymptomatic entrepreneurs with asymptomatic families constitute only 24% of the entire study sample of 242 entrepreneurs.

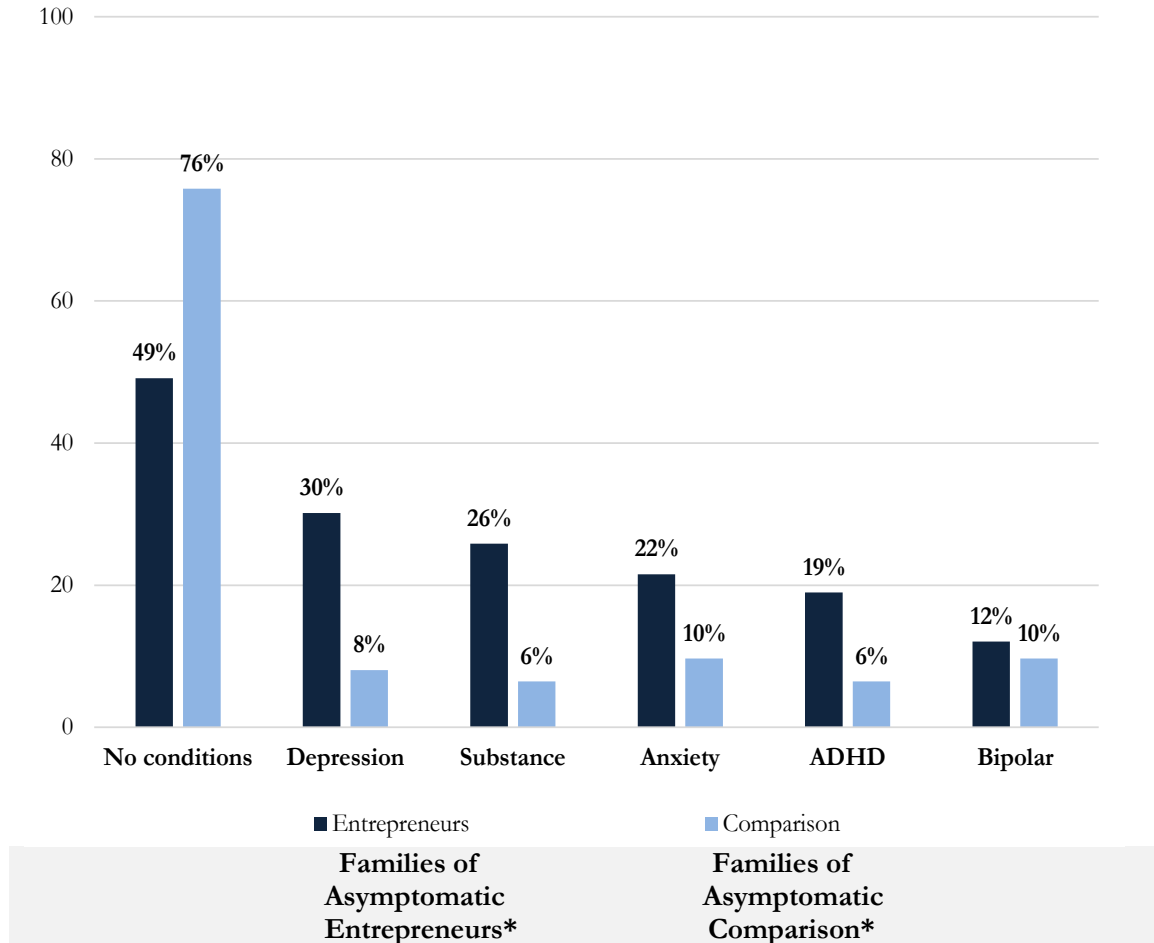
Reviewed in conjunction with the results displayed Figure 1, 72% of the entrepreneurs in this sample either reported a personal mental health history (49%) or were asymptomatic yet reported a family mental health history (23%). By contrast, 48% of the comparison participants in this sample reported a personal mental health history (32%) or were asymptomatic yet reported a family mental health history (16%).

Which mental health conditions do asymptomatic entrepreneurs report among their first-degree relatives?

Figure 7

Prevalence of specific mental health conditions among first-degree relatives of asymptomatic entrepreneurs

percent of asymptomatic respondents



*Prevalence as reported by study participants.

Notes: Asymptomatic entrepreneur sample size: 116; asymptomatic comparison sample size: 62.

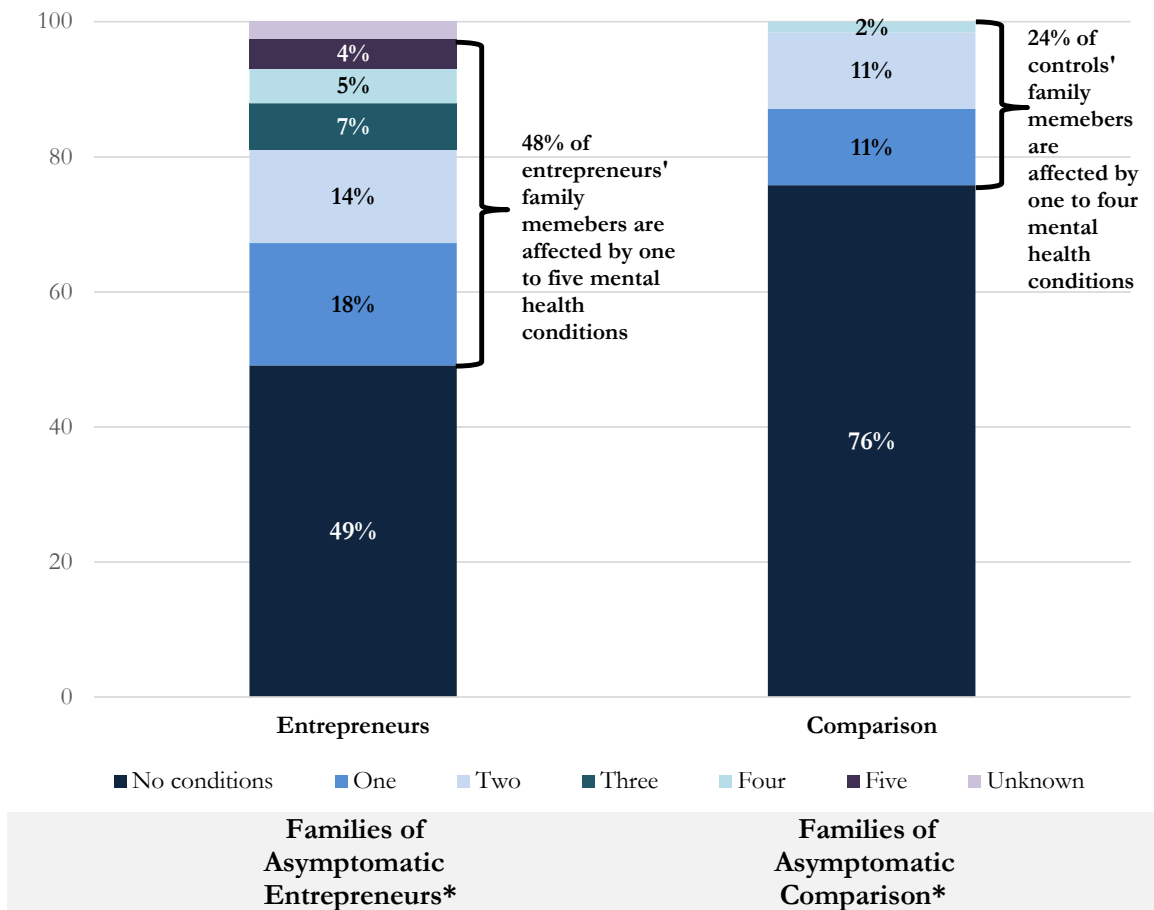
Figure 7 illustrates the significantly greater reported prevalence of family mental health conditions overall ($X^2 = 9.31, n=175, p<0.01$), family depression history ($X^2 = 13.91, n=166, p<0.01$), family history of ADHD ($X^2 = 7.28, n=159, p<0.01$), substance use conditions ($X^2 = 12.16, n=165, p<0.01$), and anxiety ($X^2 = 5.53, n=164, p=0.02$) among the first-degree relatives of asymptomatic entrepreneurs compared to the relatives of asymptomatic comparison participants.

However, among those who were asymptomatic, entrepreneurs and comparison participants did not report significant differences in the rates of familial bipolarity ($X^2 = 0.59, n=164, p=0.44$).

How many mental health conditions do asymptomatic entrepreneurs report among their first-degree relatives?

To further characterize diversity of mental health conditions among the families of asymptomatic entrepreneurs and comparison participants, the authors assessed the number of family mental health conditions among the first-degree relatives of the non-affected entrepreneurs.

Figure 8
Number of co-occurring mental health conditions among first-degree relatives of asymptomatic entrepreneurs
percent of asymptomatic respondents



Notes: Asymptomatic entrepreneur sample size: 116; asymptomatic comparison sample size: 62.

Figure 8 illustrates that asymptomatic entrepreneurs reported a significantly greater number of mental health conditions within their families on average than did the asymptomatic comparison participants ($t(175)=4.11, p<.01$).

As shown above, asymptomatic entrepreneurs reported a higher percentage of family members with the following compared to the asymptomatic comparison participants:

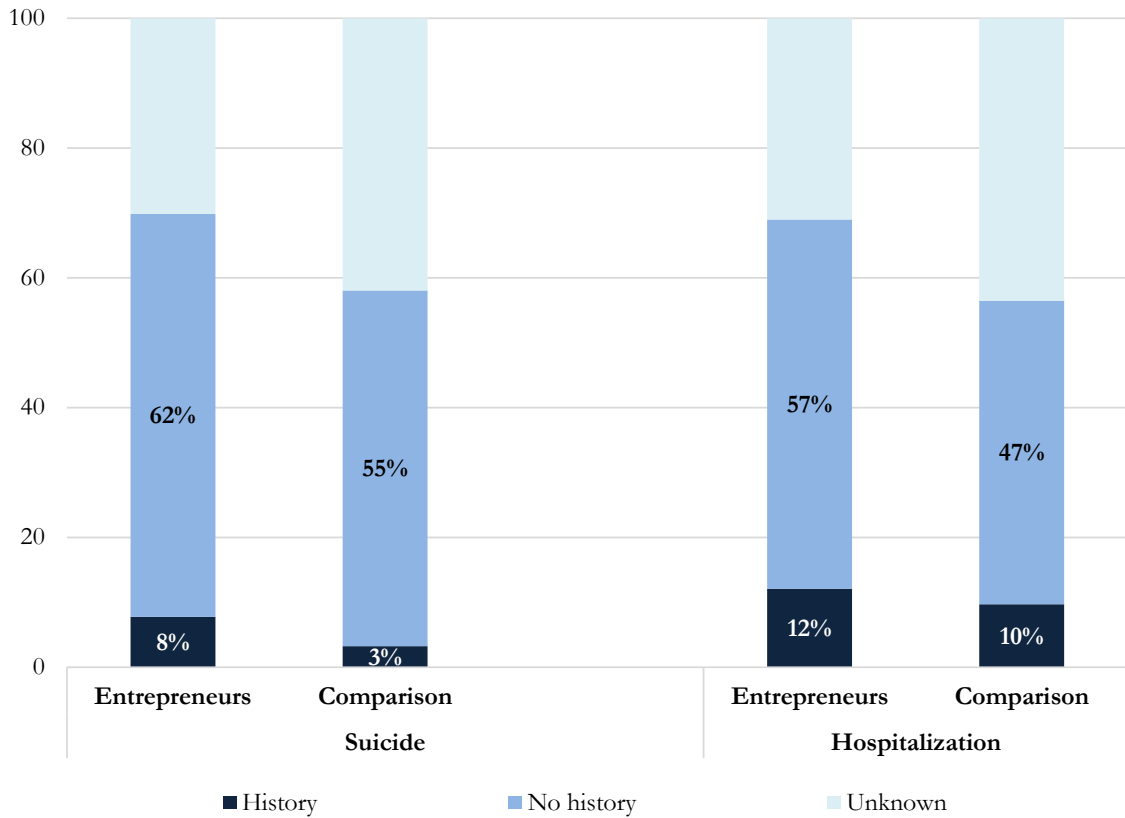
- One or more mental health conditions (48% of asymptomatic entrepreneur families vs. 24% of asymptomatic comparison participant families),
- Two or more mental health conditions (30% of asymptomatic entrepreneur families vs. 13% of asymptomatic non-entrepreneur families),
- Three or more mental health conditions (16% of asymptomatic entrepreneur families vs. 2% of asymptomatic non-entrepreneur families), and
- Four or more mental health conditions (9% of asymptomatic entrepreneur families vs. 2% of the asymptomatic non-entrepreneur families).

How many asymptomatic entrepreneurs report psychiatric hospitalization or suicidality among their first-degree relatives?

The authors sought to determine if the relatives of asymptomatic entrepreneurs were more likely to have been hospitalized or suicidal than were the relatives of asymptomatic control participants.

Figure 9
Incidence of suicide and hospitalization among first-degree relatives of asymptomatic entrepreneurs

percent of asymptomatic respondents



Families of Asymptomatic Entrepreneurs – Families of Asymptomatic Comparison*

*Incidence as reported by study participants.

Notes: Asymptomatic entrepreneur sample size: 116; asymptomatic comparison sample size: 62.

Groups did not differ in the family rates of hospitalization or suicidality, perhaps due to the low base rates of these concerns.

Discussion

Limitations of the Data

The results reported herein are limited by reliance on self-report measures, vulnerability to shared method variance, possible selection bias, comparison group characteristics, and study design considerations. In light of these limitations, the current findings must be considered highly preliminary.

Reliance on self-report measures: Perhaps the most important limitation of this study is the reliance on self-report measures of personal and family mental health history, which may be subjective, and will be limited by awareness of family concerns, understanding of psychiatric terms, as well as willingness to describe potentially stigmatizing information [95, 96]. Accordingly, it will be critical for future research on this subject to include interview-based diagnostic assessments.

Several studies indicate that self-report mental health surveys underestimate the lifetime prevalence of mental health conditions [97], including the rates of ADHD [98], bipolar spectrum conditions [99], depression [100], and alcoholism [101]. A related concern is that most of the items used to assess mental health in this study have not been validated.

Shared method variance: The reliance on self-report for both psychopathology and entrepreneurship dimensions increases vulnerability to inaccuracies caused by shared method variance, which may have amplified the reported correlations. That is, people who tend to answer yes to most questions would perhaps skew findings to suggest a larger correlation between entrepreneurship and mental health concerns[102].

Selection bias: A third shortcoming of this study is that the entrepreneur participants may have been attracted by, or interested in the mental health issues being examined. The survey was distributed by mental health professionals affiliated with academic departments of psychiatry and psychology, and recruitment included community outreach through clients and talks. One author is recognized for his interest in mental health dimensions of entrepreneurship; another is recognized for her interest in bipolar disorder. This may have produced a higher response rate from entrepreneurs with an interest in, or history of mental health issues. Future research could control for this by assessing the differences between responders and non-responders, or by using a registry-based approach to data collection in which priming, recruitment channels, and non-response are not methodological issues.

Validity of the comparison group: This study relied upon a convenience comparison sample. On average, comparison participants may have been younger than the entrepreneurs. Since more entrepreneurs may have reached or passed the median age of onset for substance use conditions (age 19-23 years) and mood conditions (age 25-32 years), lifetime mental health conditions among the comparison sample may be underreported [88]. In addition to age, the comparison participants were drawn from a prestigious school, and so may also have had fewer mental health issues by virtue of this signal of academic success. In two ways, then, the comparison sample may have underestimated rates of mental health conditions, and so inflated group differences in mental health. Future research would do well to include a demographically matched comparison group of employees from the same economic sectors as the

entrepreneurs, which may yield more accurate results.

Study design limitations: Our cross-sectional design precludes accurate consideration of whether mental health conditions precede or follow entry into entrepreneurship. This prevents understanding the direction of any effects pertaining to the relationship between entrepreneurship and mental health differences.

The limited scope of this study also precludes understanding specific strengths and vulnerabilities of entrepreneurs with mental health propensities and conditions, as well as the strengths and vulnerabilities of asymptomatic entrepreneurs with a positive family mental health history. Furthermore, this study did not address the relationship between mental health and entrepreneurial outcomes over time. Therefore there is a gap in our longitudinal understanding of how mental health propensities, differences, and conditions may confer strengths and advantages, as well as vulnerabilities and liabilities at different points of the entrepreneurial journey and the life cycle of a firm.

The data reported herein did not address the mental health-related adverse early life experience of entrepreneurs, or the impact of growing up in a family with parents or siblings who are challenged by a mental health problem. It remains possible that adversity in childhood is a source of strength in adulthood. One researcher has indicated that adverse early life events have a priming effect on resilient individuals who later become adult leaders and entrepreneurs [42]. Understanding such interactions is important yet beyond the scope of the research findings presented here.

Each of these limitations suggests a need for replication and further study conducted with more sophisticated methodologies. This need is accentuated by the critical economic importance of entrepreneurship

Interpretation

Despite the limitations cited above, the findings of this study are important because they suggest an underlying relationship between entrepreneurship and self-reported personal and family mental health conditions. This is the first study to assess the prevalence and co-occurrence of mental health conditions among entrepreneurs and among the first-degree family members of asymptomatic entrepreneurs. Understanding the influence of these conditions will complement the findings of an established literature about the personality characteristics of successful entrepreneurs. Both mental health differences and personality traits appear important for understanding entrepreneurial affect, cognition, behavior, and outcomes.

Reconceptualizing mental health differences: A surprising 72% of the entrepreneurs in this sample reported a personal (49%) or family (23%) mental health history. This suggests an opportunity to reconceptualize mental health differences in a way that is not confined by the limits of a disease model. Mental health conditions are referred to as “disorders” and co-occurrence is referred to as “comorbidity” in the illness-oriented psychiatric literature. However the focus on a disease model does not address the adaptive benefits and positive outcomes that may be related to mental health conditions. The findings presented above suggest that a broad and complex array of interacting cognitive, affective, and behavioral differences associated with individual and co-occurring mental health conditions may also be associated with

entrepreneurship. Some of the positive outcomes produced by symptomatic entrepreneurs in this sample, and asymptomatic entrepreneurs from symptomatic families, include invention, innovation, company formation, and job creation. Given that the vast majority of the job-creating, value-creating entrepreneurs in this study sample are affected by individual and/or family mental health issues, the strict focus on a disease model seems reductionistic and misleading.

Instead of viewing a diagnosis as a disease [103-105] it can be viewed as a description of a set of empowering traits and personal endowments that are coupled with vulnerabilities and risk factors. If properly managed, these endowments can result in significant social and personal benefits. If the vulnerabilities prevail, adverse individual and social consequences may ensue.

Prevalence and co-occurrence of mental health conditions among entrepreneurs: This study identified a significant prevalence and co-occurrence of a range of reported mental health conditions among the study participants. Hypotheses 1 and 2 were confirmed by the findings in this study:

- **Hypothesis 1:** The prevalence of ADHD, bipolarity, depression and substance use conditions among entrepreneurs is likely to be significantly greater than among a comparison population.

Entrepreneurs in the study reported experiencing a significantly greater prevalence and diversity of mental health differences than the comparison participants. They were significantly more likely to report having a lifetime history of any mental health condition (49%), depression (30%), ADHD (29%), substance use conditions (12%), and bipolarity (11%) than were comparison participants. Twenty seven percent of the entrepreneurs also reported a lifetime history of anxiety, although this was not significantly different from the prevalence of anxiety among the comparison group.

- **Hypothesis 2:** Entrepreneurs reported significantly more mental health conditions on average than did participants in the comparison sample.

Symptomatic entrepreneurs in this study also reported a significantly greater number and diversity of co-occurring mental health conditions than were reported by symptomatic comparison participants. While 49% of entrepreneurs in this sample report having any mental health condition, 32% of the entrepreneurs report having two or more mental health conditions and 18% report having three or more mental health conditions. The impact of these mental health differences with entrepreneurial outcomes remains to be studied.

Family history of mental health conditions: This study also sought to determine the extent to which asymptomatic entrepreneurs come from families with mental health issues. Hypothesis 3 was also confirmed by the findings of this study.

- **Hypothesis 3:** The first-degree relatives of asymptomatic entrepreneurs are likely to have significantly more mental health conditions than the first-degree relatives of asymptomatic comparison participants.

The first-degree family members of asymptomatic entrepreneurs were reported to exhibit significantly more mental health conditions than were the first-degree relatives of asymptomatic comparison participants. Specifically, the first-degree family members of asymptomatic entrepreneurs in this sample were significantly more likely to manifest one or more mental health conditions, and to be affected by depression, ADHD, substance use conditions, and anxiety than were the first-degree relatives of asymptomatic comparison participants; 30% of non-affected entrepreneurs report two or more mental health conditions among their first-degree relatives and 16% report three or more mental health conditions among their first-degree relatives.

Mental health differences directly or indirectly affect 72% of the entrepreneurs in this sample, including those with a personal mental health history (49%) and family mental health history among the asymptomatic entrepreneurs (23%). Asymptomatic entrepreneurs with asymptomatic families constituted only 24% of the entrepreneur participants. (Data on this issue was missing for 4% of the entrepreneurs surveyed.)

High rates of family mental health conditions have been previously reported in the context of creative and high-achieving relatives of bipolar probands. Mental health conditions that occur among first-degree family members of asymptomatic entrepreneurs may be associated with (or confer) propensities, characteristics, and subthreshold features that are adaptive and advantageous to the asymptomatic entrepreneurs themselves without causing disabilities. This would be parallel to the finding that symptomatic bipolar relatives of symptomatic bipolar probands are also high-achievers [72].

Understanding these complex family history patterns is warranted. One possibility is that the cognitive, affective, and behavioral propensities associated with these conditions may foster the pursuit of entrepreneurship under the right environmental circumstances. Further work is needed to understand how these same qualities might provide benefits and challenges to both symptomatic and asymptomatic entrepreneurs at different stages of the entrepreneurial journey.

Suicidality risk: One objective of this study is to begin to understand factors that may be associated with suicidality among entrepreneurs as a basis for developing protective interventions and resources. There were only 13 suicidal entrepreneurs in this study, comprising 5.4% of the entrepreneur participants, so this remains a major goal of future research.

Mood spectrum conditions: Depression was the most frequently reported mental health condition among the entrepreneurs in this study; 30% reported a positive lifetime history of depression. Bipolarity, which includes both depressive and hypomanic or manic states, was reported by an additional 11% of entrepreneurs. Family history of depression was also quite common among the entrepreneurs. Our findings, then, dovetail with popular press articles discussing the prevalence and impact of depression among entrepreneurs [for example, see 106]. Since depression also commonly co-occurs with other conditions reported by the entrepreneurs including ADHD, mania, substance abuse, and anxiety, further study of mood spectrum conditions among entrepreneurs is warranted. Given the strong ties between a family history of mania and accomplishment, mania will be a particularly important target for further investigation.

How do mental health and personality characteristics affect entrepreneurial outcomes?

Additional related issues beyond the scope of this study are also relevant for future investigation. Entrepreneurs, investors, and academicians alike have an interest in identifying predictors of entrepreneurial success and failure. One issue that requires further examination is the relationship between mental health conditions, personality features, and entrepreneurial outcomes in the context of differing environmental circumstances. Due to sample size and resource limitations the authors were unable to address the relationship between personality features that are known to be associated with entrepreneurial success and the mental health conditions that may occur among entrepreneurs and their families in ways that enhance, interfere with, or otherwise modify entrepreneurial outcomes.

Given the critical importance of entrepreneurship to contemporary economies, the results of this study support a valid case for additional research to replicate and further address the questions and issues that were raised in this report.

Policy Implications

The findings presented above suggest that some implications for entrepreneurs, business education, executive coaching, corporate human resource management, macroeconomic policy, health policy, and mental health advocacy deserve consideration.

Business education and executive coaching: This study suggests the possibility of developing more effective business education and executive coaching programs and resources for entrepreneurs by taking mental health risk and success factors into consideration. Limitations of the current study leave open many questions related to identifying modifiable risk factors associated with psychiatric hospitalization, suicidality, and other preventable adverse life outcomes among entrepreneurs. Conversely, questions remain to be addressed regarding how entrepreneurs may build upon their unique strengths and advantages associated with their personal and/or family mental health situations. Understanding these risk factors and advantage factors may be particularly relevant for business school programs, incubators, and accelerators that are tasked with the education and training of entrepreneurs at an early stage of their careers. Business schools and incubators are uniquely positioned to offer self-awareness and vulnerability resistance resources to emerging entrepreneurs. Such resources could include confidential screening for treatable mental health symptoms and conditions. Current curricula devoted to human factors, organizational behavior and entrepreneurship may be augmented in ways that help MBA students and nascent entrepreneurs understand and build upon their personality and mental health propensities by developing risk management and strength building strategies. Executive coaching and self-management resources could also identify, and help to strengthen, mental health-related entrepreneurial success factors.

Large employers and human resource managers: Innovation and “intrapreneurship” are essential to sustained corporate success [30, 107-110], and innovative, entrepreneurial employees with mental health differences may have a critical role in achieving these business results. However, large corporations have focused on the disability costs of employees with mental health differences with less regard for the benefits that may accrue when these employees are retained and managed properly [41, 111-113]. Psychiatrically “disabled” employees may be the very same and critically important people who contribute

disproportionately to the paradigm-shifting innovation and breakthrough value creation that is necessary for the sustained success of large enterprises [114-117]. Alternate human resource strategies may empower creative, risk-tolerant, entrepreneurial employees with mental health differences to add both incremental and game-changing value that offsets or overshadows costs related to disability and management issues[116, 118-121].

Policy and advocacy: From the perspective of macroeconomic, social and health policy, the findings in this study suggest that the people whom we admire and depend upon for creating jobs and prosperity, and the people whom we marginalize for being different (mentally ill) may spring from the same gene pool. Empowering some people with mental health issues, the entrepreneurs, while stigmatizing and marginalizing others, including their first-degree relatives, may thus constrain our talent pool and have limited net social utility.

Destigmatizing people with mental health differences, and understanding the strengths and vulnerabilities associated with the mental health differences of entrepreneurs, may inform more evolved healthcare, social, and macroeconomic policies that add value to the lives of the people who add value to our lives. Governments may create social value by improving the circumstances of the symptomatic families whose entrepreneurial kin create economic value as they generate solutions, jobs, and prosperity. In order to produce social and economic gain, policies and programs to properly insure and care for marginalized people with a wealth of notions (those with mental health conditions) may be synchronized with policies and programs that empower their admirable relatives (the entrepreneurs) to create the wealth of nations.

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