BEHAVIORAL HEALTH STIGMA:
BREAKING THE CODE WITH STIGMA INDEX

by

by

Farah Tokmic

A dissertation submitted to the faculty of
the University of North Carolina at Charlotte
in partial fulfillment of the requirements
for the degree of Doctor of Philosophy in
Software and Information Systems

Charlotte

2018

Approved by:

_____

Dr. Mirsad Hadzikadic

_____

Dr. Mohamad Shehab

_____

Dr. Samira Shaikh

_____

Dr. James R. Cook

ABSTRACT
FARAH TOKMIC. Behavioral Health Stigma: Breaking the code with Stigma Index
(Under the direction of DR. MIRSAD HADZIKADIC)

Social labeling of people with behavioral health disorders falls under the umbrella of "stigma" and plays a key role in limiting the access to behavioral healthcare. Currently, the U.S. spends an estimated $201B on behavioral health disorders every year, making it the number one most expensive medical condition. In any given year, 43.8M Americans experience a behavioral health disorder. More than half of them receive no treatment mainly because of their fear of being socially disgraced or stigmatized against. The lack of a scalable and analytical approach to monitor stigma over time makes it difficult to compare findings across contexts. This research establishes the Stigma Index, an innovative analytical tool, that allows for (a) measuring behavioral health stigma uniformly and systematically over time, and (b) comparing the prevalence of stigma in different populations. Machine learning classification was conducted and resulted in eight questions that are used to aggregate sentiments towards individuals with behavioral health disorders. To compute the Stigma Index, the relative scores for each of the eight index questions are first derived from the percentage difference between favorable and unfavorable responses and then summed into a composite measure. To validate the tool, changes in Stigma Index were monitored and used to capture real-life differences in stigma levels across different populations. This first of its kind computational approach to standardize the measurement of stigma offers promising applications to improve policy objectives that (1) ensure the social inclusion of behavioral health consumers, and (2) promote effective population-based interventions in reducing behavioral health stigma.

AKNOWLEDGMENTS

I would like to begin by thanking everyone who supported me and inspired me to successfully complete my Ph.D. degree.

To Dr. Hadzikadic, thank you so much for your continuous support of my Ph.D. journey, your patience, and your immense knowledge. I still remember the first time we met in your office when I expressed my strong interests in working with you. I knew right then you are the ideal advisor whom I would have the privilege of working with. Your ability to help me see the big picture in every situation has instilled the confidence in me that I needed the most to keep going.

To Dr. Cook, thank you so much for supporting me through every stage of my Ph.D. journey. You were there for me in successful, challenging and stressful times. You encouraged me to keep working hard. You believed in me and offered me a lot of your time just to ensure I am able to carry on with my research. I deeply cherish every advice you gave me.

To Dr. Shehab and Dr. Shaikh, thank you for the feedback you gave me towards my research. Your input has been key to fine-tune my project.

To Dr. Tcheremissine, I had the honor and pleasure of working with you over the past three summers. Thank you for every opportunity you offered me to promote my research project.

To Chuck, thank you so much for being there for me in moments of celebration and tribulation. I enjoyed the many conversations we had discussing about life! You might not have seen what impact our conversations had on me. I want you to know that every time we met, I was reminded to remain optimistic about the human race.

v

To Othelia, it's a pleasure to be your friend and colleague. Our collaboration to publish our first manuscript means a lot to me. I highly respect your work ethics. Thank you so much for all the time you spent giving me advices and listening to me.

To my friend Sandy, I am so blessed that our paths have crossed. I will forever remember our discussions that helped me see the light at the end of the tunnel! You are a wonderful and caring person and I want to thank you so much for everything you have done to lift me up and give me the energy I needed to believe that tomorrow is always another day!

To UNCC, thank you so much for granting me the Graduate Assistant Support Plan (GASP) award. Receiving this award helped me channel all my energy towards making my research a success.

To my mother Salam, you may not be in this world with me today but I choose to strongly believe, deep in my heart, that your beautiful soul is watching over me from high above. It is you who taught me how important it is to be a wise woman. It is you who taught me how to be independent, humble and brave. Mother, I have seen you through the years how much of a courageous woman you are. You have taught me that. You were a true leader and set a beautiful example of a self-made, passionate and determined woman. I still remember how you would tell me: "Never say can't. Tell me you don't want to. Tell me you don't know how to and I will show you how. But, never say can't". Thank you for being my mother and my role model in life. You have always been my inspiration and will forever be.

To my father Majed, thank you for encouraging me to never lose hope and believe in myself that I can reach the stars. You have always told me: "Big goals come with hard

work". You are absolutely right. Thank you for your radiated positive energy that illuminated the path to my success.

To my brother Wassim, thank you for everything you have done to help me stay on target to success. Your advices and the countless late-night session calls will be forever engraved in my heart and mind. You are a true leader that I look up for and I strive to be like. You taught me how to be strong and wise in moments of distress. You helped me stay collected and guided me through each step of the way. To Nadine, thank you for being there for me when I needed someone to listen. Your words have always cheered me up and helped me see sunshine throughout the way. To Majed and Reem, you are the pearls of my life and I look forward to the time I stand by you and watch you as you are crafting your way to success.

To my brother Rami, thank you for being an inspiration ever since I arrived in the United States. I still remember when you picked me up from the airport. My eyes were filled with big dreams and I all I can see in your eyes was the confidence you had in me that one day I will reach high goals. Now that I have completed my PhD studies, I want you to know that your support to me from the very beginning had a major key impact on my success. To Samar, thank you for all the tips you shared with me on how to make the journey through PhD a more pleasant one. Your advices have tremendously helped me stay optimistic.

To my sister Sara, thank you for being in my life. You are my only sister and the only sibling I have in Charlotte. I am so blessed for the opportunity that brought us to be near each other. When I really needed help, I would let it all out because I knew you would be there!

To the love of my life, Anadin, I wouldn't have been able to be where I am without you. Destiny has brought us together in a wonderful magical way. I came to Charlotte to start my PhD but you took my heart from the moment I arrived at Charlotte Douglas Airport. From the very first time our eyes met, I felt peace and comfort in your eyes. Your presence in my life is a blessing from God. You are the light of my strength and your presence by my side in every step of the way has been the reason for my perseverance to succeed and face every difficulty with a smile. Thank you for being who you are. Thank you for your love to me that knows no limit. You have picked me up so many times. You have stayed sleepless so many nights just to comfort me and give me the support I need to believe that nothing is impossible. Thank you so much for your continued support and understanding during this journey that made the completion of my PhD thesis possible. I love you.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1: INTRODUCTION
"People may hear your words, but they feel your attitude."
~ John C. Maxwell

Behavioral health is the state of mental and emotional well-being and actions that
affect wellness [1]. It is how people feel about themselves, others and their lives. It's
about their resilience to meet and handle the demands of life with appropriate coping
skills. Behavioral health is increasingly becoming a worldwide public health matter. The
well-being of societies continues to be a major challenge and an essential component of
the overall global development.

About half of Americans will meet the criteria for a behavioral health disorder
(BHD) sometime in their life with the first onset usually occurring during childhood or
adolescence years [2]. In fact, one in five adults in the United States experience a BHD in
any given year [3]. This is equivalent to approximately 43.8M Americans of which 10M
live with a serious behavioral health condition such as schizophrenia, major depression or
bipolar disorder.

Statistics about the prevalence of BHDs by diagnosis suggest that 18.1% of
Americans living with a BHD suffer from anxiety disorders (e.g. posttraumatic stress
disorder, obsessive-compulsive disorder and specific phobias), 6.9% suffer from major
depression, 2.6% suffer from bipolar disorder, and 1 percent of them suffer from
schizophrenia [3].

BHDs can affect everyone regardless of their culture, race, ethnicity, gender or
sexual orientation. According to the National Alliance on Mental Illness, American
Indians/Alaska native adults (AI/AN) is the cultural/ethnic group with the highest

percentage of BHDs (28.3%); followed by White adults (19.3%), Black adults (18.6%) and Hispanic adults (16.3%). In 2014, more than half of the 43.8M American adults (aged 18 and older) who experienced a BHD did not receive treatment. White and AI/AN adults use healthcare services twice as often as Black and Hispanic adults and three times as much as Asian adults [3].

Behavioral health illnesses include serious psychological distress, suicide, and mental disorders. Because of their conditions, behavioral health (BH) consumers – people with BHDs who are recipient of stigma, often tend to be in a state of personal distress.

Suicide costs an estimated $51B to the healthcare system [4]. One suicide occurs every thirteen minutes in the U.S. and costs an average of $1,795,379 in combined lost productivity and associated medical treatment. In 2015, the total cost of suicides and suicide attempts was $93.5B [5]. More than 90 percent of individuals who have committed suicide suffer from one or more treatable or temporary BHD(s) [6]. Adults aged between 18 to 25 years constitute the highest percentage of people with serious thoughts about committing suicide (7.4%), followed by adults aged 26 to 49 years (4.0%), and adults aged 50 years or older (2.7%) [4].

1.1 Problem statement

Currently, the U.S. spends an estimated $201B on BHDs, compared to $79B a decade ago, making it the number one most expensive medical condition [9]. In any given year, 43.8M Americans experience a BHD. More than half of them receive no treatment mainly because of their fear of being socially disgraced or stigmatized against [3].

Several initiatives have been developed worldwide to help recognize BH as an important component of the overall well-being, emphasize on the need to reduce stigma and help increase access to behavioral healthcare. One of such efforts is the "Mental Health Global Action Programme (mhGAP)" created by the World Health Organization (WHO) in 2001 to enhance the BH of populations based on four main strategies as shown in Figure 1 [10]. Designing a stigma index that measures the stigma prevalence over time and across regions is key to understand the extent to which stigma impacts the health of populations. Such an index would bring an essential quantitative understanding of stigma to implement region centered approaches and drive policy decision making strategies that many initiatives, such as the mhGAP program, strive to achieve. The stigma index will help behavioral health consumers overcome their fear of seeking treatment. In addition, it will allow BH organizations to monitor stigma over time to (a) locate gaps within the system responsible for the increasing cost of care, (b) advance policies that improve patients' experience of care, and (c) gain data-driven insights on how to reduce stigma towards people with BHDs.
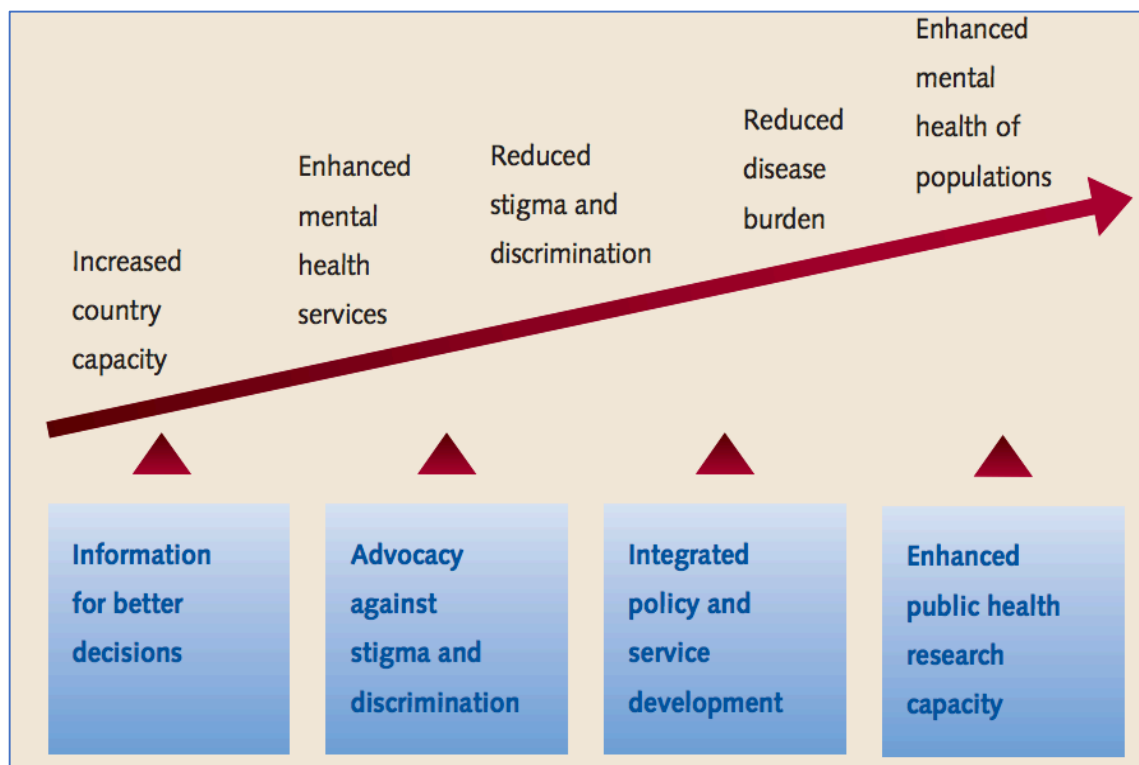
Figure 1: Mental Health Global Action Programme (mhGAP):

1.2 Research statement

Given the absence of a standardized scalable analytics approach to monitor and measure stigma over time at the local level and the importance of such a measurement system at providing data driven insights on stigma, the purpose of this research is to develop the stigma index, a new and easy-to-administer measurement system consisting of a minimal number of questions to examine the prevalence of stigma. The motivation behind such work is to build a computational model that provides the behavioral healthcare field with a stigma indicator capable of assessing the change of stigma over time and enhancing the adaptive management cycle of reducing stigma to improve the health of populations and patients' experience of care.

This research investigates the following research question: Is there a simple standardized metric system that allows for effective measurement of behavioral health (BH) stigma based on few questions?

1.3   Research contribution

The current Ph.D. thesis aims at computing a novel composite measure, the Stigma Index offers (1) a novel approach to produce the least number of attribute (8 questions) needed to measure BH stigma, (2) establishes a simple analytical tool to standardize and effective measurement of stigma towards BHDs in different populations, and (3) offers a generalizable research design towards using analytics to measure intangible social behavioral information. The current state of knowledge in the field consists of a large number of measuring scales to assess stigma-related to BHDs in a variety of settings, including BH consumers, the general public and healthcare providers with most of the studies stemming from the social psychology discipline. The large number and variety of questions and scales in the measurement of BH stigma makes it difficult to compare finding across contexts.

In order to improve the measurement of BH stigma, there is a need to establish the magnitude of the problem, define optimal solutions and determine the impact of stigma-reduction initiatives. It is therefore important to measure BH stigma uniformly and systematically over time.

The Stigma Index is an innovative analytical tool that allows comparing the prevalence of stigma in different populations. Such a measure can be especially useful for guiding financial and resource allocation towards community-based services that are likely to lead to the most reduction in BH stigma.

CHAPTER 2**:** LITTERATURE REVIEW

2.1   Behavioral health stigma

Corrigan explains stigma as a three-step structural process: (1) Initiating of stereotypic views about a behavioral health consumer, (2) acquiring prejudicial attitudes and (3) discriminating against that person [17].

Stereotypes. Stereotypes are defined as fixed and generalized beliefs about a group or class of people [17,18]. They are structures learned by members of a social group [18-20]. Individuals who have stereotypes applied to them are labeled as different because they have a physical, observable and/or behavioral characteristic(s) that cue(s) them as deviant from the mainstream "norm". An example of a stereotypic statement associated towards consumers is: "All people with a BHD are dangerous". Such a statement indicates that a label of being a dangerous person is attached to all people who have BHDs.

Prejudice. Prejudice occurs when individuals endorse and agree with stereotypic statements. It is when someone endorses the general stereotypic beliefs that he/she is said to have prejudice. An example of a prejudicial statement is: "I agree, people with BHDs are dangerous and I am afraid of them". Such a statement indicates the endorsement with stereotypic beliefs and represents the personal attitude that someone might have towards this group of people. Prejudice is often accompanied by common responses such as a

reflexive disgust to avoid the contact with a person who is judged as undesirable or offensive by others [20-22]. The degree to which people make such prejudicial statements depends on their cognitive rule-based processes and what they would expect from a social interaction [23]. If one's cognitive process allows for making prejudicial statements, more emotions are then created towards a targeted group of people.

Discrimination. Prejudice creates emotions and shapes discriminatory behavioral responses. Discrimination can take multiple forms such as social distancing and avoidance [21]. It is the result of prejudice and occurs when people have negative social interactions with consumers and support policies that treat the latter group unfairly [24]. People are likely to have discriminatory behaviors towards consumers either because they perceive them as part of a lower social status than theirs or because they believe that being in contact with them might lower their social levels and make their identities less ideal [23].

Public stigma is defined as the result of a person's endorsement of existing stereotypes and discriminatory behaviors assigned to labeled behavioral health consumers [19]. Personal stigma is the collection of individuals' attitudes that people in a community have towards a behavioral health consumer. This type of stigma arises once an individual has perceived public stigma to be present in their community [25,26]. Perceived stigma is the individual's perception of the stigmatizing discrimination that exists in the community. It can be assessed from the perspectives of both, BHconsumers and non-consumers. In the case of consumers, perceived stigma can reflect their fear of the stigma present in the community which has a great effect on consumers' willingness

to seek treatments [27-31]. For instance, a higher level of perceived public stigma was shown to be linked to a lower treatment adherence [27].

Self-stigma is defined as "the product of internalization of shame, blame, hopefulness, guilt and fear of discrimination associated with a behavioral health disorder" [32]. It is a process by which BH consumers have fewer self- expectations [33]. In other words, consumers with self-stigma endorse public prejudicial attitudes and discriminatory behavior assigned to them and perceive themselves as less adequate and more inferior than others in the society [19, 34-36].

The awareness of public stigma (perceived public stigma) initiates the formation of a person's own discriminatory attitudes (i.e., personal stigma) and endorsement of prejudicial stereotypes (i.e., endorsed stigma). In the case of a behavioral health consumer, he or she might choose to internalize the stigmatizing attitudes (self-stigma) [37].

2.2   Current methods used to measure behavioral health stigma

Table1 summarizes common survey response measuring scales that are not based on vignette studies or experimental scenarios and are currently being used to measure (1) *general public stigma* and (2) *consumer stigma*. The general public stigma is the stigma from the perspective of the general public and consumer stigma is the stigma from the perspective of consumers or individuals with BHDs. The subscales are categorized based on their measurement of personal, perceived and endorsed stigma for *general public stigma* scales and their measurement of perceived, endorsed and self-stigma for *consumer stigma* scales.

Table 1. Summary of currently used stigma measuring scales scales

	#	Scale Abbreviation	Scale Name	Scale Type	Number of items	Personal Stigma	Perceived Stigma	Endorsed Stigma	Self-Stigma	Perceived Stigma	Endorsed Stigma	Internal consistency (α value/range)
General Public Stigma	1	CAMI [41]	Community Attitudes Toward the Mentally Ill	5-point Likert scale	40	✓	✓	✓				0.66-0.88
	2	BMI [42]	Belief Towards Mental Illness Scale	6-point Likert scale	21	✓	✓	✓				0.91
	3	OMS-HC [43]	Opinion Minds Scale for Healthcare Providers	5-point Likert scale	20	✓	✗	✗				0.79
	4	RIBS [44]	Reported and Intended Behavior Scale	6-point Likert scale & Multiple choice	8	✓	✗	✗				0.72-0.81
	5	SDS [45]	Social Distance Scale	4-point Likert scale	7	✓	✗	✗				0.75 - 0.76
	6	DMISS [46]	Mental Illness Stigma Scale	7-point Likert scale	27	✓	✗	✓				0.87
	7	MICA [47]	Mental Illness Clinicians' Attitudes	6-point Likert scale	16	✓	✓	✓				0.72
	8	DD [48]	Devaluation-Discrimination	5-point Likert scale	12	✗	✗	✗				0.76
	9	OMI [49]	Opinions about Mental Illness Scale	6-point Likert scale	51	✗	✓	✓				-
	10	MAKS [50]	Mental Health knowledge Schedule	5-point Likert scale	12	✗	✗	✓				0.65
Consumer Stigma	1	SSMIS-SF [51]	Self-stigma of Mental Illness Scale-Short Form	9-point Likert scale	20				✓	✓	✓	0.65-0.87
	2	ISE [52]	The Inventory of Stigmatizing Experiences	5-point Likert scale & Multiple choice	17				✓	✓	✗	-
	3	RES [64]	Rejection Experiences Scale	5-point Likert scale	11				✓	✓	✗	0.85
	4	SS [54]	Stigma Scale	5-point Likert scale	28				✓	✗	✗	0.87
	5	ISMI [53]	Internalized Stigma of Mental Illness	4-point Likert scale	29				✓	✗	✓	0.90
	6	HSS [55,56]	Stigmatization Scale	5-point Likert scale	15				✗	✓	✗	≥ 0.80
	7	SESQ [57]	Self-esteem and Stigma Questionnaire	6-point Likert scale	14				✓	✓	✗	0.80
	8	PDD [58]	Perceived Devaluation and Discrimination Scale	6-point Likert scale	12				✗	✓	✗	0.86-0.88
	9	CESQ [59]	Consumer Experiences of Stigma Questionnaire	5-point Likert scale	21				✗	✗	✗	-
	10	MIDUS [60]	MacArthur Foundation Midlife Development in the United States	5-point Likert scale	22				✗	✗	✗	0.87
	11	SSOSH [61]	Self-Stigma of Seeking Help	5-point Likert scale	10				✗	✗	✗	0.86-0.90
	12	DISC-12 [62]	Discrimination and Stigma Scale	4-point Likert scale	36				✗	✗	✗	-
	13	SRER [63]	Self-reported Experiences of Rejection	Yes/No response	12				✗	✗	✗	0.80

Four criteria were used to evaluate current behavioral health stigma measures:

1. *Type of stigma measured* – this criterion is used to evaluate each scale based on its measurement of the three types of stigma. An optimal and comprehensive scale is one that covers all three types of stigma.

2. *Number of scale points* – this criterion is used to evaluate each measure based on the response scale format used. Measurement scales that are based on Likert scales with points below five or above seven are shown to generate significantly less accurate data than other measures [38]. While there is no hypothetical reason to dismiss different types of response scale, five-point Likert response scales have been the norm for measuring attitudes because of their ability to provide enough choices to choose from that reflects both the strength and the direction of the responses.

3. *Total number of items per scale* – this criterion is used to evaluate the total number of items in each scale. To avoid respondent fatigue, five to ten items per scale was chosen to be the optimal total number of items needed to measure stigma efficiently and concisely.

4. *Scale internal consistency reliability*– this criterion is used to evaluate the internal consistency reliability of each measure based on the Cronbach's alpha value/range. Table 2 shows the process adopted to evaluate the Cronbach's alpha value/range of each scale [39].

Table 2. Internal consistency value/range [39]

Cronbach's alpha	Internal consistency
$\alpha \geq 0.9$	Excellent
$0.9 > \alpha \geq 0.8$	Good
$0.8 > \alpha \geq 0.7$	Acceptable
$0.7 > \alpha \geq 0.6$	Questionable
$0.6 > \alpha \geq 0.5$	Poor
$0.5 > \alpha$	Unacceptable
-	Not Reported

1) Measures of general public stigma

The ten most commonly used scales to measure public stigma are illustrated in Table 2. The Community Attitudes toward the Mentally Ill scale [41] and the Belief towards Mental Illness scale (BMI) [42] are the only two that measure all three types of stigma: personal, perceived and endorsed stigma.

CAMI is a five-point Likert scale that includes statement opinions to measure four main constructs: authoritarianism (e.g., "There is something about the mentally ill that makes it easy to tell them from normal people"), benevolence (e.g., "The mentally ill don't deserve our sympathy"), social restiveness (e.g., "The mentally ill are a danger to themselves and those around them" or "A woman would be foolish to marry a man who has suffered from mental illness, even though he seems fully recovered), and community mental health ideology (e.g., "Local residents have good reason to resist the location of mental health services in their neighborhood"). While the CAMI scale covers the three types of stigma, it has a high total number of items of 40 which isn't a reasonable number to avoid respondent fatigue.

The Belief towards Mental Illness scale (BMI) was developed to measure cross-cultural differences in beliefs towards BHDs. It assesses the following three dimensions: dangerousness, poor social and interpersonal skills, and incurability. The BMI scale is based on a six-point Likert response format, has an excellent internal consistency reliability ($\alpha = 0.91$) but includes 21 total number of items which could potential cause respondent fatigue.

The Opinion Minds scale for Healthcare Providers (OMS-HC) [43] measures stigma towards consumers from the perspective of healthcare professionals. It is a five-

point Likert scale that was validated based on data collected during 12 different anti-stigma interventions across Canada. The focus of the OMS-HC scale is to measure attitudes by looking at three main factors: social distance, disclosure/help seeking and attitudes that healthcare providers have towards BH and individuals who have BHDs. While those three factors are essential to understand the personal stigma of healthcare professionals, it does not measure neither perceived nor endorsed stigma. The OMS-HC scale reported an acceptable internal-consistency reliability of 0.79. Nevertheless, it was validated based on a data collected with most respondents being women (77.4 percent), which potentially makes the scale vulnerable to be gender biased.

The Reported and Intended and Behavior Scale (RIBS) [44] has a reasonable number of eight items. However, it only measures personal stigma and does not assess neither perceived nor endorsed stigma. Nevertheless, this scale is unique as it identifies stigma by measuring the reported and intended behavioral discrimination at the population level. It is based on a combination of multiple choices and six-point Likert scale items and has proven to have an acceptable internal consistency reliability.

The Social Distance Scale (SDS) [45] is a four-point Likert scale, consists of a reasonable number of only seven items and has an acceptable internal consistency reliability that ranges between 0.75 and 0.76. It measures what people say they would do if interacting with persons with mental illness but does not measure actual behavior and therefore is a proxy measure of behavior. However, it only measures personal stigma and does not include any item that measures perceived or endorsed stigma.

The Day's Mental Illness Stigma Scale (DMISS) [46] is a seven-point Likert scale, consisting of 28 items that measures the attitudes of the public towards consumers

based on the seven factors: interpersonal anxiety, relationship disruption, poor hygiene, visibility, treatability, professional efficacy, and recovery. While the DMISS shows to have a good internal consistency reliability ($\alpha = 0.87$), it only measures personal stigma. The Mental Illness Clinician's Attitudes scale (MICA) [47] is a six-point Likert scale that consists of a total of 16 items, which is not a reasonable number. It was originally developed to measure the attitudes of healthcare professionals towards consumers. Results show the scale to have an acceptable internal consistency reliability ($\alpha = 0.72$), but only measures personal stigma.

The Opinions about Mental Illness (OMI) scale [49] was developed to measure the attitudes of hospital personnel towards BHDs. It includes five scales (each being a six-point Likert scale) labeled as follows: (1) authoritarianism (describing someone with a BHD as an inferior class), (2) benevolence (reflecting a sympathetic view of patients), (3) mental hygiene ideology (describe a BHD to be a disorder like any other), (4) social restrictiveness (viewing someone who has a BHD as a danger to society), and (5) interpersonal etiology (believing that someone who has a BHD is a result of interpersonal experience, especially deprivation of parental love during childhood). The OMI scale has the highest number of items among the other general public scales with a total of 51 items, which is a large and unreasonable number of items. In addition, no information regarding its internal consistency is reported.

The Mental Health Knowledge Schedule scale (MAKS) [50] is a five-point Likert scale that assess stigma-related behavioral health knowledge areas (help-seeking, recognition, support, employment, treatment and recovery) and the identification of various types of BHDs by the public. It consists of 12 items in total, which is not too far

from being considered a reasonable number of items, but has a questionable internal consistency reliability (α= 0.65). In addition, it only measures endorsed stigma and includes no item that reflects personal or endorsed stigma.

While each of the CAMI and BMI scales measures personal, perceived and endorsed stigma, the overall analysis of the public stigma scales indicates the absence of a scale that has an acceptable internal-consistent reliability and consists of a reasonable five to ten total number of items.

2) *Measures of consumer stigma*

Thirteen measuring scales are most commonly used to measure consumer stigma. They are illustrated in Table 1. The Self-stigma of Mental Illness Scale-Short Form (SSMIS-SF) [51] is the only scale that measures all three types of stigma: perceived, endorsed and self-stigma. It is a nine-point Likert scale that consists of total of 20 items. With an alpha range of 0.65-0.87, the SSMIS has an acceptable internal consistency. Nevertheless, its 20 items make it difficult to administer. In addition, a nine-point Likert scale response format is more likely to generate significantly less accurate data.

The Inventory of Stigmatizing Experiences scale (ISE) [52] consists of a combination of five-point Likert scale and multiple choices questions. It has a total of 17 items. The internal consistency of the ISE scale is not reported and only measures perceived and self-stigma.

The Internalized Stigma of Mental Illness sale (ISMI) [53] is a four-point Likert scale with an excellent internal consistency (α= 0.9) and has is 29 total items. It was developed to measure the experience of stigma, with subscales measuring alienation,

stereotype endorsement, perceived discrimination, social withdrawal and stigma resistance. The Stigma Scale (SS) [54] is a 28 item, five point Likert scale with a good internal consistency (α= 0.87) that measures the following three factors: discrimination, disclosure and potential positive aspects of BHDs. The ISMI and SS scales measure only self-stigma and do not include items that evaluate perceived stigma. In addition, the ISMI scale is based on a four-point Likert format, which makes it likely to generate significantly less accurate data [38].

The following scales only measure perceived stigma: Stigmatization Scale (HSS) [55,56] and Self-esteem and Stigma Questionnaire (SESQ) [57] and Perceived Devaluation and Discrimination Scale (PDD) [35]. HSS is a five-point Likert scale that has a good internal consistency, but includes a total of 15 items, which is not an optimal number. Both SESQ and PDD scales are six-point Likert scales that have good internal consistencies, but consist of 14 and 12 items in total, respectively. The Perceived Devaluation-Discrimination (PDD) scale is a six point Likert scale. It consists of a total of twelve items and has an acceptable internal consistency reliability that ranges between 0.82 and 0.86. Because it measures the extent to which an individual perceives that other people will devalue or discriminate against behavioral health consumers, it only measures perceived stigma.

The following scales do not measure any of the three types of consumer stigma: Consumer Experiences of Stigma Questionnaire (CESQ) [59], MacArthur Foundation Midlife Development in the United States (MIDUS) [60], Self-Stigma of Seeking Help (SSOSH) [61], Discrimination and Stigma Scale (DISC-12) [62], Self-Reported Experiences of Rejection Scale (SRES) [63] and Rejection Experiences Scale (RES)[64].

While they all show good internal consistencies ($\alpha \geq 0.8$), except for CESQ and DISC-12, they do not measure any of the stigma types being evaluated. They measure rejection, stigmatizing and discrimination experiences from the perspective of consumers without measuring the perception, endorsement and self-internalization of stigma.

The SSMIS scale measures all three types of stigma. Nevertheless, the overall analysis of consumer stigma measuring scales indicates the absence of a scale that has an acceptable internal-consistent reliability and a reasonable five to ten total number of items.

2.3   The need for the stigma index at the social, clinical and policy levels

Stigma towards behavioral health consumers is fueled by the existence of negative attitudes within communities and sometimes aggravated by healthcare professionals. Stigma remains present today even with all the anti-stigma interventions, regulations and laws that are implemented around the world to reduce it. Stigmatizing attitudes vary among individuals, ethnicities, cultures, across countries and communities [65]. This can be attributed to the "cultural divide" phenomenon which refers to the barrier that exists between communities of different social economic structures and shapes the way individuals perceive others with behavioral health disorders. Cultural and religious affiliations often influence and craft people's beliefs towards the origins and meaning of being a consumer of a BHD [65].

Following is a discussion of the need to develop a stigma index to evaluate Stigma and Discrimination Reduction (SDR) initiatives implemented at the social, clinical, and policy levels.

1) *At the social level*

SDR initiatives have adopted three main approaches to counter stigma: education, contact and social activism [66]. Education efforts involve public service announcements, Web pages and other podcasts. They aim to educate the public about behavioral health conditions and challenge the false stereotypic beliefs that exist in societies [67,68]. Other initiatives focus on contact as a mean of including interpersonal connections between members of the public and members of the stigmatized group. Research shows that the presence of such interactions is likely to reduce the level of prejudice among the public [68]. Social activism aims at broadcasting the damage that stigma has on behavioral health consumers with the hope to raise stigma awareness. While some research suggests that social activism can minimize damaging media representations, others have shown that protest campaigns can cause a "rebound" effect that potentially either worsen or leave the prejudice towards consumers unchanged [69-72].

An overall analysis of the three SDR strategies show that a contact driven initiative hold the biggest promise for being able to reduce stigma [66]. An index measure of stigma at the local level that shows the change in the degree of stigma over time is key to evaluate the effectiveness of such an initiative.

The BlueFriends application is an example of an SDR initiative that applies an education strategy approach to raise the awareness of BHDs. Haimson et al [73] developed this application to reduce stigma by displaying shareable information visualization graphic to alert Facebook users on the prevalence of individuals who suffer from depression in their network. BlueFriends is the first application of this kind. It aims at leveraging social environments to develop a more effective anti-stigma intervention

through social media. The application employs a predictive model of depression detection that provides Facebook users with percentage number of individuals in their network who show signs of having depression and compares it to the national proportion of people with depression.

While BlueFriends is a creative approach to reduce stigma, there is a need for a quantifiable standard measuring index to identify its success rate at preforming its main goal at reducing stigma. An example of how the stigma index would quantitatively help validate such an initiative is by showing the change in the prevalence of stigma before and after the use of the BlueFriends application. Results of such comparison would help enable decision makers to make conclusions with certainty about the choice of appropriate intervention that causes the highest stigma reduction degree towards BH consumers at the local level.

2) *At the clinical level*

Almost 70 percent of all healthcare visits are based on psychosocial disorders such as behavioral health disorders and only 12 to 25 percent of healthcare use is due to disability or morbidity alone [67]. The strong inter-correlation that exists between physical and behavioral disorders has lead healthcare facilities to implement strategies that improve the access and the quality of behavioral healthcare.

One of the main strategies adopted by healthcare facilities is integrating BH into primary health care (PHC) settings to help encourage people who are undermined by stigma to seek help and get the access of care they need [74, 75]. This change in medical settings causes healthcare facilities and behavioral health national programs to shift their

focus towards training healthcare professionals to use non-discriminatory evidence-based practices when communicating and screening patients for behavioral health disorders.

Examining the stigma that exists among healthcare professionals is important to ensure that consumers obtain a compassionate and respectful care that encourages them to follow up with their treatments. There are psychiatric professionals who perceive people with certain behavioral health conditions as less deserving for care, annoying and manipulative with suicidal urges [76]. Such stigmatizing behaviors are felt and perceived by consumers who often state having to face negative attitudes from behavioral health professionals about their diagnoses [76]. Even health professionals with behavioral health conditions agree that negative discriminatory attitudes exist in the medical profession towards consumers [77]. Such stigmatizing views could potentially be one of the underlying causes for the existence of treatment disparities in access to behavioral healthcare.

The presence of stigma in healthcare facilities and the lack of effective education-based training that aims at eradicating stigma can potentially result in the misdiagnoses of patients with BHDs. This occur when consumers' physical illnesses are only associated to their behavioral health conditions while the true cause of their symptoms is due to another physical health disease they are suffering from. The National Comorbidity Survey Replication showed that comorbidity between mental and physical conditions is highly likely [67,79]. People who face serious behavioral health disorders die on average 25 years earlier than the general population, mostly due to associated diseases causes such as cardiovascular disease, respiratory disease, diabetes, obesity, and cancer. In fact, more than 68% of adults with a behavioral health disorder were found to have at least one

medical condition, and 29% of those who have a medical disorder had a comorbid behavioral health condition [78].

Monitoring the change of stigma in clinical settings with the use of a standard measurement system such as the stigma index is essential to measure the efficiency of intervention techniques applied by healthcare facilities that aim at improving the access to behavioral healthcare and ultimately reducing comorbid conditions related to BHDs.

3) *At the public policy level*

Some of the anti-discrimination laws that are the most comprehensive in the world to cover psychiatric disorders are implemented in the United States (e.g., the Americans with Disabilities and the federal law that prohibits housing discrimination based on disability) [80]. However, stigma and discrimination still prevents people with behavioral health disorders from living a normal civic life. The issue of community lodging, for example, is important to consider when examining the social acceptance of stigmatized individuals. In fact, this method of assessment was adopted during the early American civil rights movement, when it was clear that the same rooms that are said to be available to potential White tenants are said to be unavailable to potential Black tenants. Similarly, research shows that property-owners are significantly less likely to rent their houses/apartments to someone who has a BHD than to someone who does not [81].

Refusing to accommodate people with BHDs is one example of socially excluding them based on their behavioral health conditions, even with the presence of regulations that are meant to protect their rights to live a normal civic life. Such social

exclusion scenarios nurture the vital cycle of stigma. If consumers are instead accepted and treated fairly like any other member of the society, stigma could potentially decrease over time. The only way to capture such a finding is through a stigma index measurement system that would reflect the changes of stigma over time and possibly help uncover the extent to which the public is abiding by federal laws and regulations.

Internationally, there are several anti-stigma efforts implemented to make the appropriate policy changes to reduce stigma. An example of such efforts is the "Time to Change" anti-stigma initiative in England [82]. "Time to Change" campaign mapped the existence and the location of stigma on a worldwide map based on the presence of regulations restricting people with BHDs from accessing public and leisure facilities [83]. An example of such regulations highlighted is in Japan where a sign outside of a museum states: "Those people with mental disease are declined to enter the museum".

While it is essential to map and locate stigma, there is a need to quantitatively assess the presence of stigma around the world by means of a stigma index to make changes in policies that discriminate against people with BHDs.

2.4   Similar conceptual indices to the stigma index

One of the closes example to the SI would be along the lines of the Consumer Sentiment Index (CSI) [84]. The CSI is a statistical measure of consumer attitudes towards the economy's overall health that aim to aggregate attitudes regarding the current and expected conditions of the economy in the United States. The survey consists of only five main psychometric items that are conducted every month by the Survey Research Center at the University of Michigan and derived from five questions regarding (1) the financial situation of households compared to one year ago, (2) the expected financial

situation of households within one year, (3) the expected general economic/financial situation of the country over the next twelve months, (4) the economic expectations during the next five years, and (5) the appropriateness of buying major household durables at present. The CSI is computed into "one indicator" based on only the five questions as shown below.

$$ICS = \frac{X_1 + X_2 + X_3 + X_4 + X_5}{6.7558} + 2.0$$

To calculate the CSI, the relative scores (the percent giving favorable replies minus the percent giving unfavorable replies, plus 100) is computed for each of the five index questions (see X_1 ...X_5). Each of the relative scores is then rounded to the nearest whole number. Using the formula shown in Fig. 2, the five relative scores are summed and divided by the 1966 base period total of 6.7558. The constant number is added to correct for sample design changes from the 1950s.

A similar index to the CSI applied in the behavioral health field, such as the Stigma Index, would reflect the overall perception towards consumers by the general public in the U.S. It would play a key role in predicting the prevalence of stigma towards BHDs over time and assess the impact of anti-stigma interventions. Such a prediction can provide incentives for decision makers in the healthcare field to better plan programs that reduces stigma over time.

The America's Brain Health Index is another close example to the concept of the Stigma Index [85]. The former is a state-by-state measure of the United States nation's brain health. It is based on 21 factors that have being indicated to be essential for the human brain health. The objective for creating such an index was to monitor the brain

health of individuals across the nation and provide them with guidance and instructions on health measures and life changes they can take if they wish to ameliorate their brains health.

To formulate the America's Brain Health Index, researchers had to first define the most important health indicators at the center of brain health, which they weighed based on the effects they have on the brain health. Then, they compared the data for all the states to the national average, which was set to be 100. Data points exceeding the national average were indexed higher than 100 and those below the national average were indexed lower than 100. The last stage was to compute the overall Index by weighing each of the health indicators' index scores based on the weight of each health indicator.

The America's Brain Health Index have three many benefits. First, it brings the awareness of Americans about the health of their brains relative to others across the United States. Second, it provides them with feedback on how they can improve the health of their brains. Third and most importantly, America's Brain Health Index monitors people's brain health across the nation as a function of time, which gives an indication of the progress that has been made every year.

Creating the stigma index along the lines of the America's Brain Health Index will be essential to simplify the complexity of measuring stigma towards VH consumers. It would help identify the main stigma manifest indicators and the presence of any correlations among them. The stigma index could also be used as a tool to provide different stigma index values for each state across the United States. Such results can then be used to create a visual map about the prevalence of stigma and bring awareness across the nation on the importance of reducing BH stigma. In addition, the stigma index

will help in monitoring the change of the prevalence of stigma over time which can assist healthcare systems efforts to increase the access the behavioral healthcare.

In order to apply a similar framework to the Consumer Sentiment Index and the America's Brain Health Index for developing a behavioral health Stigma Index, it is important to begin with identifying the manifestations of stigma. The closest research work in the behavioral healthcare field that establishes a standardized measurement framework is STRIVE, a research consortium aiming to investigate the social norms and inequalities driving the HIV/AIDS epidemic [86]. The main goal of this research is to find the chief reasons why the AIDS epidemic continues to devastate societies and identify the best intervention strategies that would decrease the HIV/AIDS related stigma.

The STRIVE research perceives stigmatization and discrimination as a social process that involves not only individuals suffering HIV/AIDS and the general population but also the workers in healthcare facilities. This approach of looking at stigma is what the BH sector lacks. BH stigma is complex and requires researchers to investigate it following an upstream approach. By doing so, the key fundamental agents responsible for the evolving of stigma towards individuals who have BHDs can be measured and analyzed to further be used to finding the gaps which explain why stigma is still a growing public health epidemic.

The International Center for Research on Women (ICRW), one of STRIVE partners, has put together a measurement brief describing the key domains of HIV related stigma and discrimination that need to be measured along. They conceptually framed the process to measure and identify the drivers, manifestations, outcomes and impacts of stigma in societies. While the framework proposed by STRIVE mainly focuses on

studying stigma related to HIV/AIDS, it can be used as a template structure for application in the BH field to conceptualize the factors that are responsible for the emergence of the manifestations of stigma towards behavioral health in different contexts.

CHAPTER 3: METHODOLOGY

3.1   Operationalize the measurement of stigma

The aim of this phase is to operationalize the measurement of stigma. Table 3 illustrates the three types of stigma examined in this study: personal stigma, perceived stigma and endorsed stigma. It is worth noting that personal stigma is examined instead of self-stigma as it applies to everyone in public, whether they identify themselves as consumers or they don't.

Table 3. Stigma measures and definition

Stigma Measure	Definition
Personal Stigma	Individual's own stigmatizing attitudes
Perceived Stigma	Individual's perception of stigma
Endorsed Stigma	Individual's endorsement of stereotypes

In this research, financial resources to directly measure stigma were unavailable. Providing such a direct measure of stigma is complex and can be expansive. It would rely on training a large crew of evaluators to collect observational records and directly evaluate the presence or absence of a stigmatizing behavior on a case by case scenario. Instead, the presence or absence of stigma is operationalized based on participants' answers to the stigma index self-reported survey that consists of five-point Likert scale items and a binary proxy measure of a stigmatizing behavior.

a. Five-point Likert scale

The items in the scale cover stigma components that relates to relationships, respect and employment opportunities. They were an adaptation of the Explanatory Model Interview Catalogue (EMIC) and the Participation domain of the International Classification of Functioning (ICF). EMIC has been developed to elicit illness-related perceptions and beliefs. Part of it is the Stigma Scale which assesses community-perceived stigma and discrimination that relates to a condition [87]. The ICF provides a standard framework language for the description of health and health-related states. The participation domain that focuses on the involvement of individuals in a life situation at the community, social and civic aspects of the social life is used towards developing the scale items [88].

b. Binary proxy measure

The fear that consumers may be dangerous or violent is at the core of stigma. Consumers are often described as homicidal maniacs who need to be feared. Emory Bogardus, a prominent figure of the American sociology is the creator of "Bogardus social distance scale" [45], is the first at examining the affective social distance as a proxy measure of a stigmatizing behavior. This type of social distance focuses on individuals' affectivity or the experience of a negative emotion related to one's consciousness. It is at the center of the feeling reactions that persons have towards others and towards group of people. In this research, the following binary question is used as a proxy measure of a stigmatizing behavior: "When you find yourself near someone who has a BHD do you fear

for your safety?". This question is a proxy measure as it measures people's affective social distance reaction towards individuals with behavioral health disorder and does not measure their actual behavior.

3.2   Develop an easy-to-administer stigma index Likert scale

The aim of this phase is to establish an easy-to-administer stigma index Likert scale that has a good internal consistency reliability and consists of no more than 10 items as this would reduce the risk for respondent fatigue.

The Stigma Index survey was administered at a public research university located in North Carolina, U.S. It was electronically available to participants through the Department of Psychology Research Signup system. The latter is run by the SONA system, an experiment management system for online research study participation for recruiting students in universities.

Prior to completing the survey, all participants were presented with a consent that describes the aim of the study. It was not until after they have read and provided their informed consent that they could proceed with completing the survey. Participants were college students drawn from multiple sections of a required research course and received research credits applied towards their program of study upon completing the survey. Data collection was completely anonymous as there were no personal records about the participants.

Two pilot studies were performed. The initial pilot study (pilot study 1) aimed at exploring the underlying factors structure of the Likert scale. A total of 660 students completed the survey and took on average eight minutes to complete it (M=7.50, SD=4.65).

Based on the exploratory factor analysis, a shorter version of the stigma index scale was produced by reducing the total number of items yet ensuring an overall acceptable internal consistency reliability of the scale. A secondary pilot study (pilot study 2) was performed to confirm the internal reliability of the stigma index scale produced. A total of 1244 students completed the survey and took on average four minutes to complete it (M=4.08, SD=3.05).

3.3   Build a classification decision tree model

The aim of this phase is to establish and evaluate a decision tree model that classifies individuals based on whether they are likely or not to have a stigmatizing behavior.

The first step was to determine the basis for evaluating participants' responses to the items in the five-point Likert stigma index scale. This was done using the binary proxy measure question. The stigma index scale consists of three subscales, each measuring one type of stigma and serves as a psychometric measure to gage people's level of agreement or disagreement with stigmatizing statements towards consumers. Individuals' responses to each of the three subscales is key to obtain an insight on the direction of their level of stigmatizing attitudes without having to force them to take an explicit and binary stand on the stigma topic. The binary proxy question explained in Section 3.2 serves as an aid to evaluate the scores on the stigma index Likert scale. It is used to perform a binary classification to determine whether an individual is inclined to have a stigmatizing behavior based on their responses to the Likert scale items or not. In other words, it is used as a

reference tool to identify the threshold score for each of the three subscales above which a person would be likely to have a stigmatizing behavior.

The second step of this phase was to perform a feature selection to identify and remove irrelevant and redundant attributes (scale items) from the data that may decrease the accuracy of the model. The information gain attribute evaluator was used. Its aim is to rank all the features in the dataset to select the most influential attributes that have the highest information gain with respect to the class. In other terms, it measures how each attribute contributes to decreasing the overall entropy which is the overall goal.

The third step of this phase was to adopt a classification learning algorithm to build the classification model. J48 classifier was chosen. It is an open Java implementation that generates a decision tree using C4.5 as the classification algorithm. The model was built by classification trees because (1) it is relatively easier to interpret the results with the tree visualization, and (2) it generates a dynamic and automated classification based on individuals' responses to the stigma index scale. The classification accuracy was estimated using a 66-percentage split, meaning 66 percent of the instances is used for training the data and the rest 34 percent is used for the testing. This was done to avoid the use of the same data set to eventually test the performance of the final classifier.

3.4   Compute the Stigma Index

The motivation behind this work is to quantify behavioral health stigma efficiently based on the least number of psychometric items possible to aid in reducing respondents' fatigue while increasing their willingness to complete the survey with integrity and improving the accuracy of the data collected. Computing the stigma index that identifies the overall level of stigma in communities would make it possible to monitor stigma levels over time. Such an indicator could ultimately be used to inform and guide health policy and health program decision-making on investments in stigma-reducing interventions.

The stigma index was computed using the data collected from year 2015 to 2017. The first step in computing the index is to calculate the relative scores for each of the retained psychometric items. The relative score is defined by the percentage giving unfavorable responses minus the percentage giving favorable responses. Next, the relative scores are rounded to the nearest whole number and summed. Finally, a constant factor was added to adjust for the sample design.

3.5   Validate the Stigma Index

In order to validate the ability of the stigma index to accurately measure BH stigma, a vignette experiment was designed that would elicit participants' perceptions and intended behaviors towards someone with a BHD. Participants were presented with a series of five hypothetical situations to which they were asked to respond on a five-point Likert scale (1 = Extremely unlikely, 2 = Unlikely, 3 = Neutral, 4 = Likely, 5 = Extremely likely). They were asked to read five emails that they hypothetically received from five different

individuals and indicate how likely they are to select each of them as a potential roommate. The wording of each vignette was experimentally controlled in such a way that three of them described individuals with signs of BHDs (one mentioning his/her depression episodes, one mentioning his/her visit to the counseling center and another one mentioning his/her visit to the psychiatrist). The other two vignettes described individuals who show no apparent signs for having a BHD. The complete wording of the validation study is shown in Appendix C.

Convergent and divergent or discriminant validity were evaluated to ensure that the stigma index score (a) correlates with participants' responses to the vignette describing individuals who have a BHD, and (b) does not correlate with participants' responses to the vignette describing the other two individuals. For the stigma index to be valid, participants who score high on the stigma index should have given a low rating to one or all three vignettes describing someone with apparent signs of a BHD. In other terms, participants who received a high score on the stigma index are more likely to give a rating of "Extremely unlikely" or "Unlikely" as to selecting someone with a BHD as a potential roommate.

CHAPTER 4: RESULTS & DISCUSSION

4.1   Sample Demographics

4.1.1   Pilot study 1

A total of seven hundred and eight participants were recruited to participate in the initial pilot study. Students who completed the survey in less than four minutes were removed from the study, leaving a total sample size of six hundred and sixty participants. On average, participants took approximately eight minutes to complete the survey (M = 7.77, SD = 4.60).

Table 1 presents the demographic characteristics of the total sample. The majority were unmarried (94.2%), White Americans (67.7%), aged between 18 and 22 years old (82.3%), completing their freshman year of education (45.5%). Out of the total sample size, 47.6% indicated they have a family member who is a consumer and 69.8% indicated they have a friend who is a consumer. While the majority of participants indicated they would not fear for their safety if they are near someone who has a BHD (89.1%), 10.9% indicated they would.

All participants were asked to indicate their level of agreement with each of the items. The order of the items in the survey was randomized. A five-point Likert scale was used ranging from 1 to 5 (1= Strongly agree, 2= Agree, 3= Neutral, 4= Disagree, 5= Strongly disagree). Personal stigma statements begin with "I" followed by an example of discriminatory behavior. Statements measuring perceived stigma begin with "Most

people" or "In my community/family". Statements measuring endorsed stigma consists of general stereotypic statements such as "Having a behavioral health disorder is a problem for a person to get married". The scale consists of 11 items addressing "personal stigma", 17 items addressing "perceived stigma" and 8 items addressing "endorsed stigma".

Table 4. Participant demographic information for pilot study 1

Participant demographic information.	
	N = 660
Gender (%)	
Female	54.8
Male	44.8
Age (%)	
18-22	82.3
23-27	12.9
28-32	2.3
>32	1.5
Race (%)	
White	
African American	67.7
Hispanic	19.1
Asian	4.4
Other	3.2
Education (%)	5.6
Undergraduate	
Freshman	45.5
Sophomore	24.4
Junior	17.1
Senior	12.1
Others	0.8
Marriage Status (%)	
Unmarried	94.4
Married	3.3
Other	3.3
Have a family member with a BHD (%)	
Yes	47.6
No	52.4
Have a friend with a BHD (%)	
Yes	69.8
No	30.2
Fear of someone with a BHD	
Yes	10.9
No	89.1

4.1.2   Pilot Study 2

A total of one thousand and forty-four participants were recruited to participate in the second pilot study. On average, participants took approximately four minutes to complete it (M=4.08, SD=3.05).

Table 5 presents the demographic characteristics of the total sample. The majority were unmarried (94.9%), White Americans (63.8%), female (63.6%), aged between 18 and 22 years old (89.6%), completing their sophomore year of education (33.2%). Compared to pilot study 1, less participants indicated they have a family member who is a consumer (35.1%) and have a friend who is a consumer (41.8%). However, more indicated to be fearful for their safety if they are near someone with a BHD (14.8%).

All participants were asked to indicate their level of agreement with each of the nine items of the stigma index scale. It consisted of three items for each of the stigma types being measured: personal, perceived and endorsed.

Table 5. Participant demographic information for pilot study 2

Table 1
Participant demographic information.

	N = 1244
Gender (%)	
Female	63.6
Male	36.4
Age (%)	
18-22	59.6
23-27	7.0
28-32	1.9
>32	1.5
Race (%)	
White	
African American	63.8
Hispanic	16.2
Asian	6.9
Other	6.2
Education (%)	6.8
Undergraduate	
Freshman	24.6
Sophomore	33.2
Junior	22.7
Senior	18.4
Others	1.1
Marriage Status (%)	
Unmarried	94.9
Married	3.0
Other	3.1
Have a BHD (%)	
Yes	35.1
No	52.4
Have a family member with a BHD (%)	
Yes	35.1
No	52.4
Have a friend with a BHD (%)	
Yes	41.8
No	58.2
Fear of someone with a BHD (%)	
Yes	14.8
No	85.2

4.2   Exploratory factor analysis

4.2.1 Pilot Study 1

All item statistics are shown in Table 3. Prior to entering items into the factor analysis, all items were screened for appropriate item endorsement rates (items means) and variability (standard deviation). Six items were removed from the item pool because their means were lower than 2.2, but the rest of the items had moderate means (between 2.2 and 4 on the 5-point Likert response scale). Corrected item-correlations (r_{IT}) were then computed to assess item discrimination for the retained items. A total of five items showed to have a weak correlation with r_{IT} values below 0.2 and therefore were eliminated. One of the items that aimed at measuring stigma present at employment places was removed as 21.3% of participants indicated they were not employed at the time of completing the survey.

An exploratory factor analysis was conducted to evaluate the factor structure underlying the retained set of items, and aid in the selection of items to be included in the final scale. Stopping rules were followed in conducting the analysis and interpreting the results. maximum likelihood extraction with an oblique rotation was used to allow for the factors to correlate.

Table 6. Exploratory factor analysis and item-total correlations (pilot study 1, Cronbach's alpha = 0.73)

	Factors					
Items	Personal Stigma	Perceived Stigma	Endorsed Stigma	M	SD	r_{IT}
10	0.56			2.21	0.77	0.48
3	0.54			2.58	0.81	0.39
5	0.53			3.02	0.91	0.36
28		0.70		2.68	0.80	0.53
18		0.68		2.35	0.78	0.51
16		0.66		2.43	0.81	0.43
27			0.62	3.58	0.85	0.33
23			0.59	3.00	0.91	0.45
22			0.52	3.29	0.86	0.40

The initial extraction revealed four factors with an eigenvalue above 1.0, which indicates the presence of fewer than four factors. Given that four factors were required to account for at least 54 % of the total item variance and the list of eigenvalues showed a clear "elbow" suggesting the possibility of the existence of three factors in this model, the degree of simple structure of three separate exploratory factor analyses specifying two, three and four factors were evaluated.

Based on this analysis, the three-factor model was selected as the best fitting model. The four-factor model was rejected because multiple items had significant non-conceptual cross loadings. Within the three-factor model, one item was removed as it had a lower factor loading and another one was removed as it conceptually loaded on the wrong factor. This resulted in a model that had a minimum of four items loading on each of the three factors. Definitions of the stigma measures are summarized in Table 2. A total of seventeen items were retained: five items loaded on "personal stigma", eight items loaded on "perceived stigma" and four items loaded on "endorsed stigma".

Following the initial factor analysis and to create a final stigma index scale that was relatively short but retained sufficient content validity, three items within each factor were selected. The aim was to create a scale that consists of a minimal set yet sufficient total number of items required to reduce respondent fatigue. A total of nine items were retained with each factor having three items.

The nine items demonstrated acceptable discrimination with r_{IT} values of more than 0.3 [89]. The internal consistency for the overall scale composed of the nine items was acceptable [90] with a Cronbach's alpha of 0.73. All exploratory factor analysis

statistics of the retained items are shown in Table 3. The complete wording of the nine

items scale is shown in Appendix B.
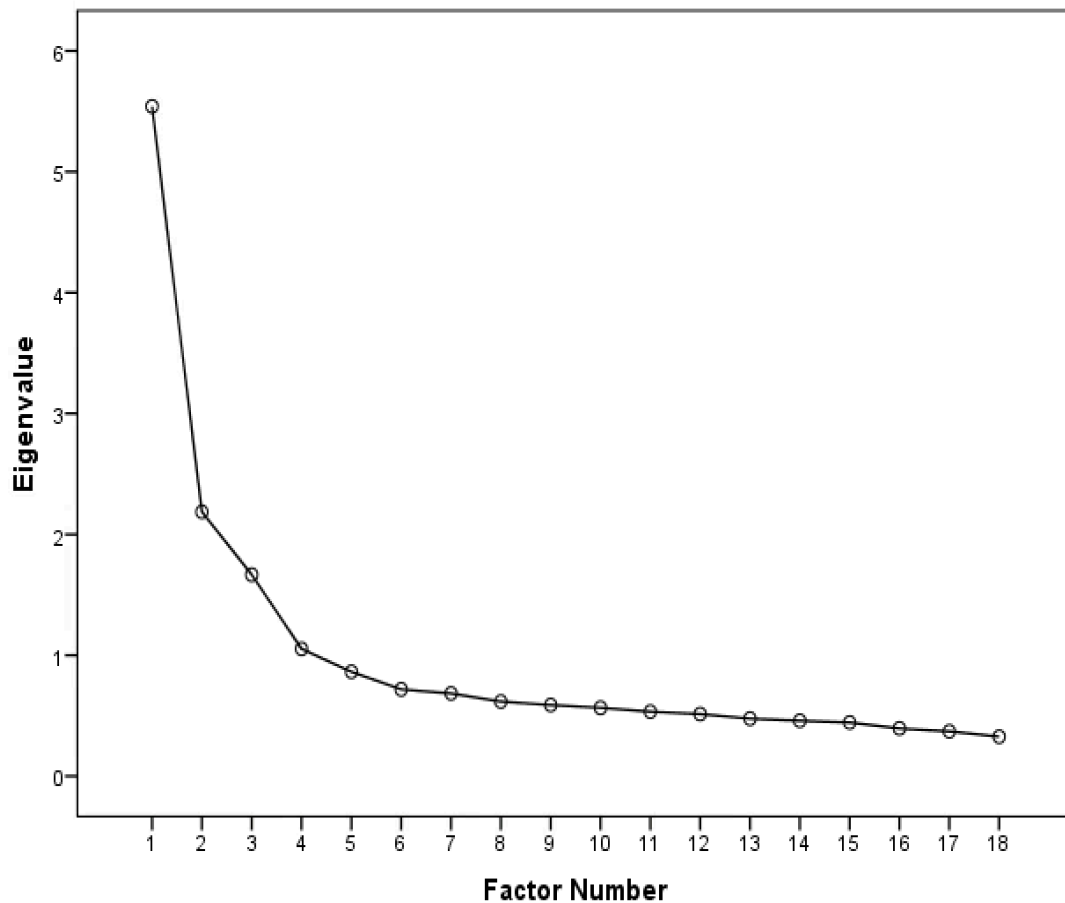
Figure 2. Scree plot of scale items

4.2.1.2 Pilot Study 2

Table 4 illustrates the factor loadings of the nine stigma index scale items after

collecting pilot study 2 data. The nine items demonstrated acceptable discrimination with

r_{IT} values of more than 0.3 [89]. The internal consistency for the overall scale composed of

the nine items remained acceptable [90] with a Cronbach's alpha of 0.70.

42

Table 7. Exploratory factor analysis and item-total correlations (pilot study2, Cronbach's alpha =0.70)

Items	Factors			M	SD	r_{IT}
	Personal Stigma	Perceived Stigma	Endorsed Stigma			
10	0.69			2.30	0.86	0.42
3	0.66			2.59	0.85	0.34
5	0.59			2.97	1.00	0.37
16		0.73		2.61	0.94	0.36
18		0.63		2.45	0.88	0.37
28		0.61		2.92	0.97	0.38
27			0.78	3.70	0.79	0.38
23			0.54	2.91	0.95	0.38
22			0.63	3.52	0.87	0.30

4.3   Decision tree classification algorithm

4.3.1   Determining the criteria for evaluating the stigma subscale scores

The sensitivity and specificity are computed across all the possible threshold values on each of the three subscales measuring the three domains of stigma (personal, perceived and endorsed stigma) within the psychometric stigma scale as shown in Tables 7.

The diagnostic accuracy of classification was based on the sensitivity and specificity of potential threshold scores on each of the three subscales to ultimately select the threshold score on each subscale that is optimal at classifying the participant as likely or not to have a stigmatizing behavior while holding the binary question as the reference variable.

The detailed report of the specificity and sensitivity for potential threshold scores for each of the subscales are illustrated in Tables 7,8,9. The best threshold selected for each subscale is highlighted in green and bolded. The maximum score that a participant can obtain on each subscale is 15 (three items in each subscale, each ranging from 1 to 5 points) with a higher score indicating a more stigmatizing attitude compared to a lower one.

A score of 9 was selected to be the best threshold score for each of the personal stigma subscale (a sensitivity of 61.41% and a specificity of 63.58%) and the perceived stigma subscale (a sensitivity of 52.17% and a specificity of 63.58%). A score of 11 was selected to be the best threshold score for the endorsed stigma subscale (a sensitivity of 66.30% and a specificity of 59.81%).

Table 8. Statistical evaluation measures of the personal, perceived and endorsed subscales

Subscale	Potential Threshold Score	TPR	FPR	Sensitivity %	Specificity %	Classification Accuracy (%)
Personal Stigma	6.00	0.94	0.88	94.02	11.51	24.12
	7.00	0.88	0.69	88.04	31.13	39.63
	8.00	0.75	0.52	75.00	47.55	51.29
	9.00	**0.61**	**0.36**	**61.41**	**63.58**	**61.90**
	10.00	0.41	0.23	41.30	77.26	70.90
	11.00	0.26	0.14	25.54	86.04	76.05
	12.00	0.14	0.07	13.59	93.30	81.03
Perceived Stigma	6.00	0.97	0.88	96.74	11.51	24.12
	7.00	0.89	0.69	88.59	31.13	39.63
	8.00	0.73	0.52	72.83	47.55	51.29
	9.00	**0.52**	**0.36**	**52.17**	**63.58**	**61.90**
	10.00	0.34	0.23	34.24	77.26	70.90
	11.00	0.18	0.14	18.48	86.04	76.05
	12.00	0.10	0.07	10.33	93.30	81.03
Endorsed Stigma	6.00	0.98	0.98	98.37	1.60	15.92
	7.00	0.98	0.95	97.83	5.00	18.73
	8.00	0.96	0.89	95.65	10.57	23.15
	9.00	0.92	0.78	91.85	21.70	32.07
	10.00	0.75	0.61	75.26	38.96	44.77
	11.00	**0.66**	**0.40**	**66.30**	**59.81**	**60.77**
	12.00	0.46	0.23	45.67	76.51	71.95

The Receiving Operating Characteristic (ROC) curve is a diagnostic effective performance metric measure of accuracy that plots the Sensitivity (True Positive Rate or TPR) vs. 1-Specificity (False Positive Rate or FPR) and is mainly applied in healthcare settings. [28] ROC curves are used to select an optimal threshold for a classifier in such a way that maximizes the true positives while minimizing the false positives. In this study, they were used to evaluate the ability to discriminate the true state of subjects, as likely or not to be have a stigmatizing behavior based on their survey responses, and find the optimal classifier threshold values on each of the three subscales. The binary question, asking participants whether or not they would fear for their safety if they happen to be near someone who has a BHD, was used as the reference variable being the proxy measure. ROC curves were generated for each of the three subscales to assess the discrimination power of the Likert scale items while holding the binary question as the reference variable (see Figures 3, 4, 5).

As a result of this analysis, participants who obtained a score greater than or equal to 9 on either the personal or perceived stigma subscales, are classified as more likely to be stigmatizing towards behavioral health consumers than others who scored lower. Similarly, participants who scored greater than or equal to 11 are classified as more likely to have stigmatizing behaviors than others who scores lower.

The results of this binary classification are used for the purpose of building a decision tree classification algorithm model that classifies individuals not only based on their scores on each subscale but on their overall score. The majority (92%) of respondents who provided a "yes" answer to the binary proxy measure scored higher than the

threshold score on at least one of the three subscales. This rule was therefore applied to all the participants in this study whereby for someone to be classified as likely to be stigmatizing, he/she had to score high on at least one of the three subscales.
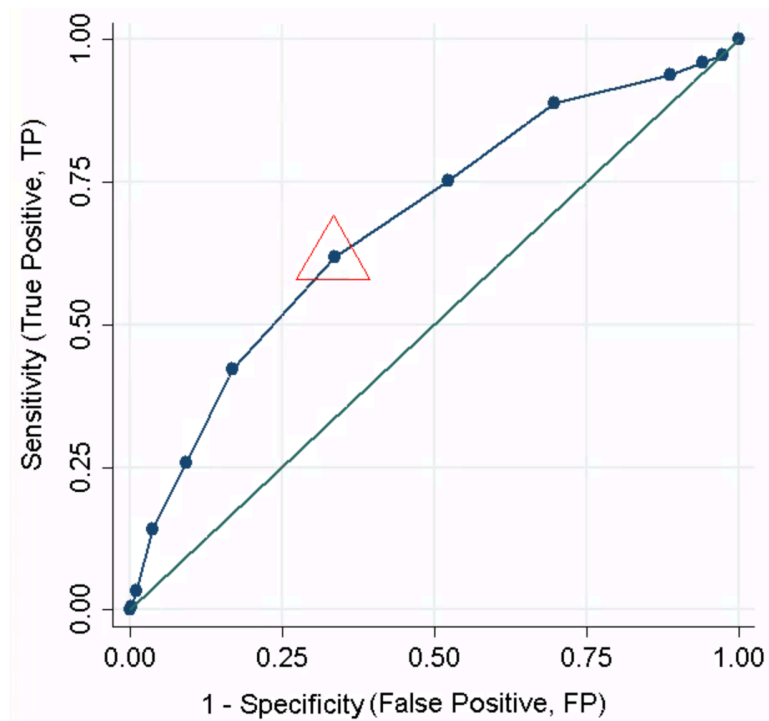
Figure 3. ROC curve for personal stigma subscale
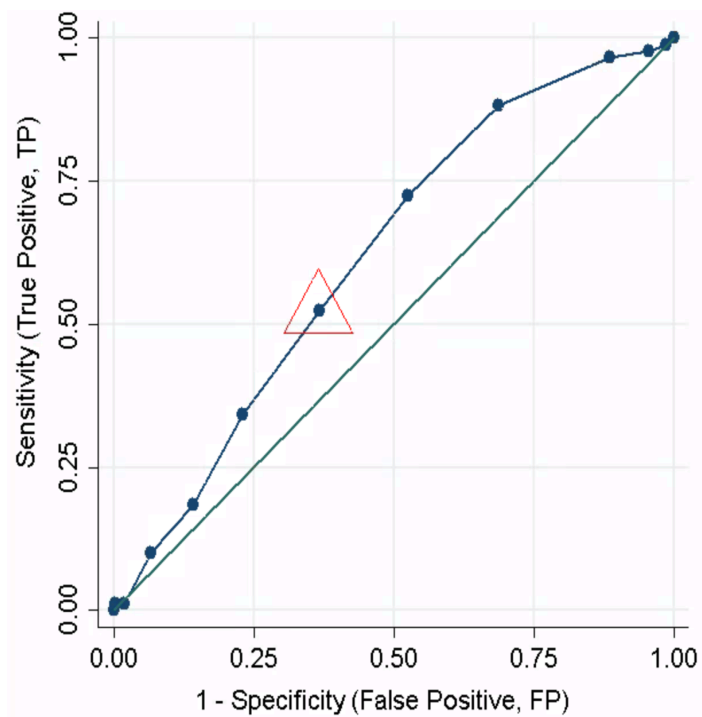
Figure 4. ROC curve for perceived stigma subscale-
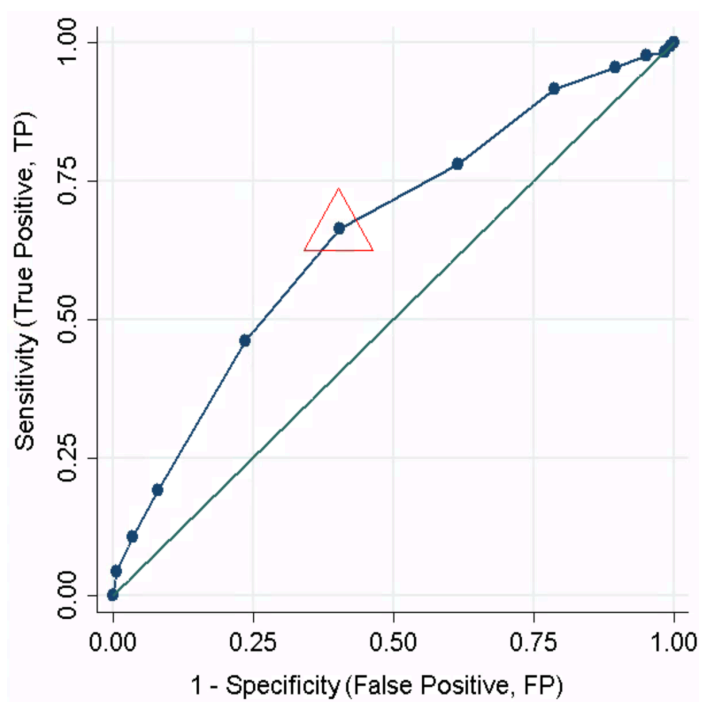
Figure 5. ROC curve for endorsed stigma subscale

4.3.2   Constructing a classification decision tree

Feature selection was performed using the information gain attribute evaluator. It resulted in four features (scale items) being the least ranked as contributing to the predictive model. Each of the four features were omitted one at a time to select which item(s) to remove based on the predicitive accuracy of the classification algorithm. One item (Item 3) was selected to be removed as it reduced the total accuracy of the model. Figure 4 illustrates the classifier output obtained.

Based on the results obtained, the predictive accuracy is 92.4% with 7.6% of the instances incorrectly classified. The kappa statistic of 0.81 indicates an excellent inter-rater reliability [79]. This measure compares the observed accuracy with the expeced accuracy and the closer it is to a value of "+1", the more likely it is to indicate a higher agreement. The detailed report of the accuracy by class indicates a high true positive rate of 0.92 and a low false positive rate of 0.11.

Table 9. Report of the J48 classifier

Correctly Classified Instances	391	92.44%
Incorrectly Classified Instances	32	7.57%
Kappa Statistic	0.813	

	TPR	FPR	Precision	Recall	F-Measure	Class
	0.94	0.13	0.95	0.94	0.05	S
	0.87	0.06	0.86	0.87	0.87	N.S
Weighted Average	0.92	0.11	0.93	0.92	0.93	

Confusion Matrix ← classified as

a	b	
288	17	| a = S (likely to Stigmatize)
15	103	| b = N.S (Not likely to Stigmatize)

Figure 6 is a visualization of the J48 decision tree classification. For each of the attributes, the algorithm finds the normalized information gain ratio from splitting on it. It creates a decision node that splits on the attribute that generates the highest normalized information gain (Item 23 in this model). Then, the algorithm recurs the sublists obtained by splitting on this attribute and adds these nodes as its children. Next, the algorithm looks again for the next attribute that generates the highest normalized gain among the children nodes and iteratively repeats the process until no attribute is left.

To illustrate an example of how the algorithm functions at classifying participants, let's assume a person's response to Item 27 of the stigma scale is less than or equal to 3 ("Neutral"), then the algorithm would assess the response on Item 10. If its value is less than or equal to 2 ("Agree"), then the algorithm would evaluate the response on Item 28. If this value is greater than 3 ("Neutral"), then it would assess the response on Item 16 which would classify someone as more likeley to stigmatize if the reponse value was greater than 2 ("Agree"). As illustrated in this example, the algorithm was able to classify a person's likeliness to have a stigmatizing behavior based on their answers provided to only four out of the eight total number of items.
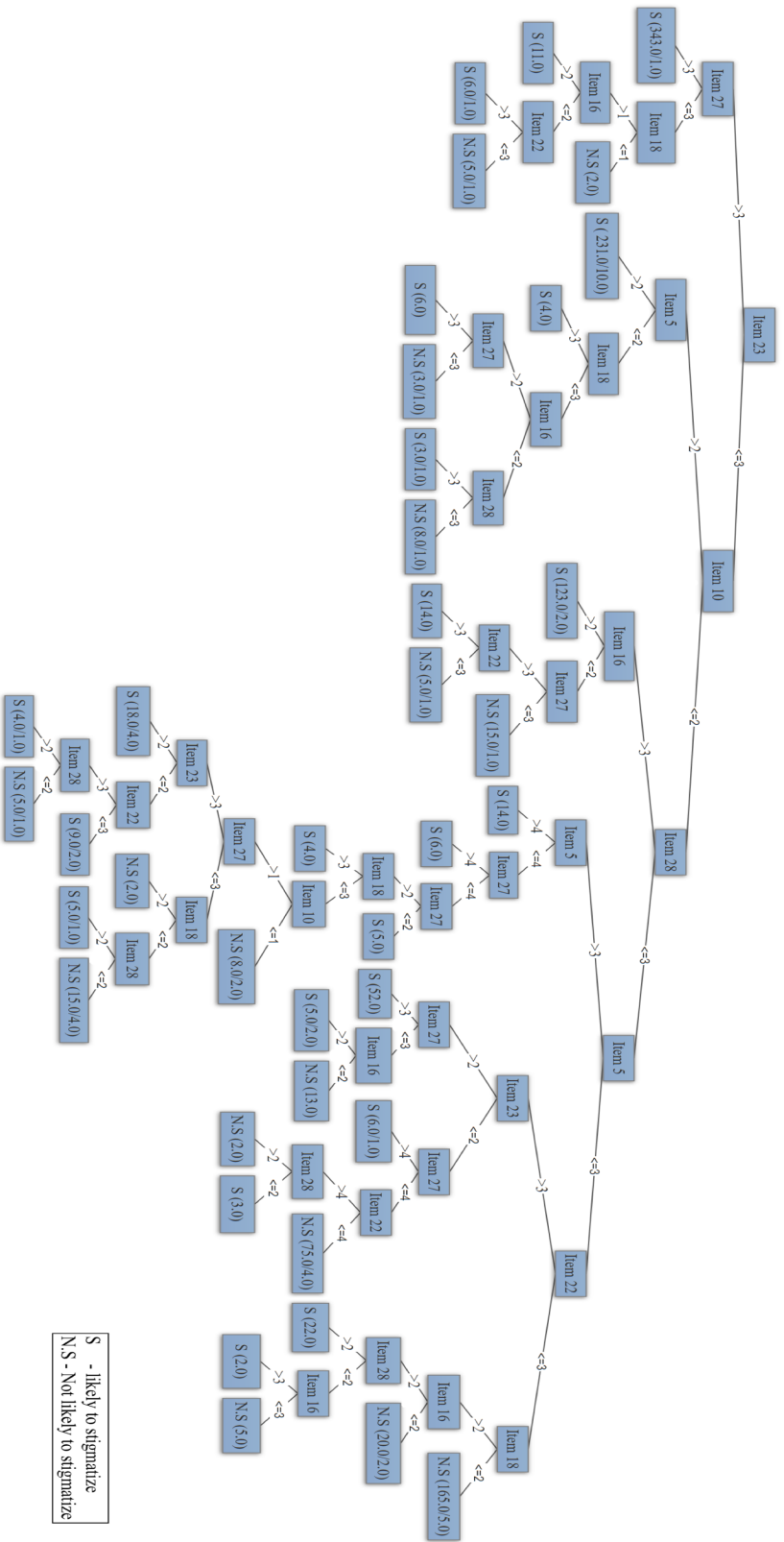
Figure 6. Visualization of the J48 decision tree classification

S - likely to stigmatize
N.S - Not likely to stigmatize

4.4   Stigma Index computation

4.4.1   Stigma Index data from 2015 - 2018

The Stigma Index (SI) is computed based on the eight Likert-scale items as shown

in Figure 7.

$$SI = \sum_{i=1}^{8} Xi + 8.0$$

Following is a detailed explanation of the steps needed to compute the index:

1. Compute the relative scores for each of the eight index items (see x_1......x_8), by
    subtracting the number of positive responses from the negative responses, and
    dividing the result by the total number of responses. In other terms, compute
    the difference between the number of participants who indicated a more
    favorable response and those who indicated a less favorable response on each
    of the items and divide this difference by the total number of participants.

2. Round each of the relative score to the nearest whole number

3. Using the formula shown above, sum the eight relative scores, and add 8.0 (a
    constant to shift the spread of the data to the positive quadrant).

The relative scores for each of the eight index items can range from "-1" to "+1"
making the stigma index value range between 0 and 16. A higher index value indicates a
more stigmatizing view towards individuals with BHDs than a lower value.

The SI was computed on a monthly basis in the Fall and Spring semesters between 2015 and 2018. Throughout the period of six academic semesters, a total of 3852 completed the survey with an average of 193 participants in each month. Table 10 shows the index value for each month (Max = 8.7 in October 2017 and Min = 6.3 in February 2016).

The stigma index maintained a relatively stable trend from Fall 2015 until Spring 2018 with an overall average value of 7.3 across the six academic semesters. Figure10 illustrates the monthly change in the SI from 2015 – 2018. The solid line represents raw values of the SI. The dotted line gives a visual representation of the SI 3-months moving average which indicates the overall trend of the SI over the period of six semesters. As more data is collected, the moving average will continue to become more useful for forecasting long-term trends to evaluate the changes in the SI. Over the period of data collection, the SI seems to have remained nearly constant with the exception of a slightly increase during Fall 2016 and a dramatic increase during Fall 2017. On average, the SI value was lower during Fall 2015 (6.9), Spring 2016 (6.9), Spring 2017 (7.3) and Spring 2018 (6.8). However, the upward change in the SI during Fall 2016 and Fall 2017 is important to elaborate on.

Date of Survey		Stigma Index	N
November	2015	6.9	334
December	2015	6.5	100
February	2016	6.3	90
March	2016	6.9	213
April	2016	6.9	355
September	2016	7.6	145
October	2016	7.7	170
November	2016	7.8	492
December	2016	7.7	52
January	2017	7.1	153
February	2017	7.3	115
March	2017	6.8	82
April	2017	7.4	387
October	2017	8.7	171
November	2017	8.3	339
December	2017	7.6	51
January	2018	6.5	62
February	2018	6.9	174
March	2018	6.4	198
April	2018	7.0	145

Table 10. Descriptive statistics of monthly stigma index data

The main reason behind the peak in the SI values during Fall 2016 is not clear based on this research alone. Nevertheless, it is worth noting that this period of time coincides with the presidential elections of 2016 in the U.S which might have been a critical time for an increase in the negative polarity of attitude. According to a recent study, events linked to this presidential campaign and election have caused an increase in fear and anxiety among many Americans [91]. Such events can have negative discriminatory consequences on people, especially those who belong to a stigmatized group. Hence, one hypothesis that potentially explains the increase in the negative attitudes observed during Fall 2016 is the impact of the presidential election on Americans' attitudes towards other people who are characterized as different from the mainstream population such as those who are consumers of BHDs.

Two of the deadliest mass shootings in modern U.S. history happened in October and November of 2017. On Oct.1, the Las Vegas shooting during a music festival left 58 people dead and 850 people wounded. The shooter's primary care doctor stated that the shooter had bipolar disorder who never wanted to discuss the topic. This is confirmed by the investigators who believe the gunmen had sever undiagnosed mental illness. Then five weeks later, on Nov. 5, 27 people were killed and 20 people were wounded after a gunman opened fire at a church in Sutherland Springs, Texas. Investigation in the case revealed that the gunman escaped a mental health facility in 2012 and was diagnosed with a mental health disorder prior to the shooting. While mental health illness is not to blame for both of the above-mentioned shootings, the sudden increase in the SI can perhaps indicate a sense of fear felt by participants who took the survey towards people

with BHDs. Given that the SI is not evaluated for a long period of time in this study, it is difficult to confirm such a finding but it is important to take this observation into account as to explaining the steep increase in the SI value during Fall 2017.

STIGMA INDEX
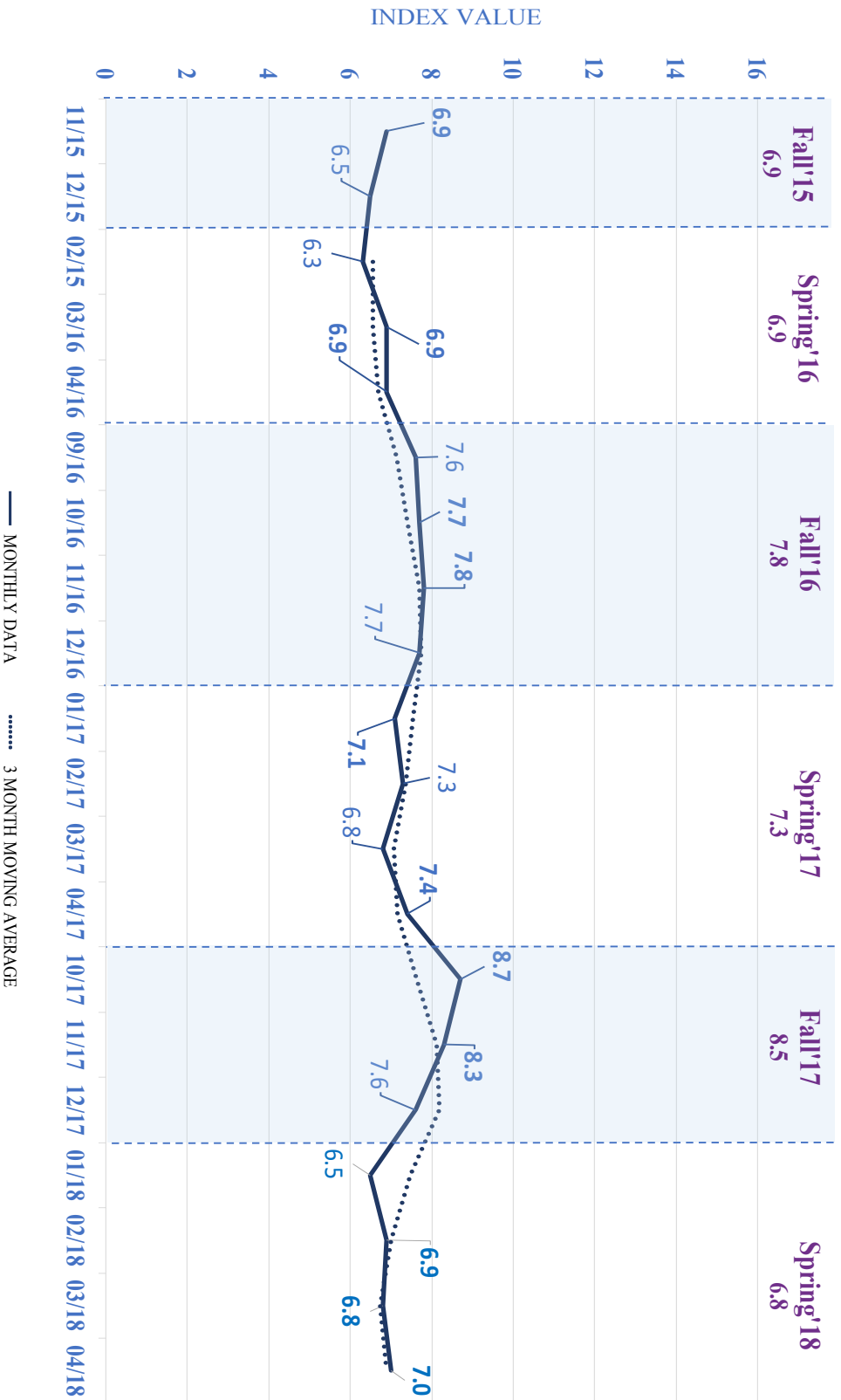
Figure 7. Stigma Index (Monthly Index Level 2015 – 2018)

4.4.2   Evaluating the levels of stigma in different populations

In order to evaluate any existent differences in participants' attitudes towards people with BHDs, a comparative analysis of the Stigma Index was conducted by: gender, experience with a BHD, contact with a BH consumer, race/ethnicity and university class standing. Table 11 summarizes the results obtained. The overall numbers among the different population groups are not equal because of missing information. Asteriks refer to statistically significant differences from the reference group (the most numerous group) with a $p < 0.01$.

4.4.2.1.   By gender and exposure to a BHD on stigma level

As shown in Table 11, relative to men, women had a lower SI (-0.7, $p < 0.01$). Consumers of BHDs (11%) had a lower SI (-0.5, $p < .01$) than those who are not (89%). In addition, participants in contact with a BH consumer tend to have a lower level than others. Those who have a consumer family member (65%) had a slightly lower SI than those who don't (35%) (-0.3, $p < 0.1$). Relative to those who don't have a consumer friend (51%), those who do (49%) had a lower mean SI (-0.7, $p < .01$). Participants who are employed but don't have a consumer colleague (69%) have the highest SI ($+0.1$, $+0.3$, $p<0.01$) when compared to those who do (17%), and those who are unemployed (14%), respectively.

Table 11. Levels of stigma in different population groups

%	Attribute	n	Stigma Index	SD	Significance
	Gender				
	Overall	3,409			
50.3%	Female	1,712	6.1	0.23	(Reference)
48.7%	Male	1,659	6.8	0.27	***
	Race				
	Overall	3,215			
7.0%	Asian	223	6.8	0.23	***
19.0%	Black	623	6.3	0.21	***
7.0%	Hispanic	214	6.2	0.23	***
67.0%	White	2,155	6.3	0.26	(Reference)
	Class standing				
	Overall	3,314			
46.0%	Freshman	1,531	6.4	0.3	(Reference)
14.0%	Junior	472	6.3	0.2	***
9.0%	Senior	307	6.6	0.3	***
30.0%	Sophomore	1,004	6.3	0.2	***
	Consumer vs. Non-consumers				
	Overall	3,409			
11.00%	Consumers	379	5.9	0.32	***
89.00%	Non-Consumers	3,030	6.4	0.25	(Reference)
	Consumer family member				
	Overall	3,843			
35.0%	Yes	1,356	6.1	0.27	***
65.0%	No	2,487	6.4	0.25	(Reference)
	Consumer friend				
	Overall	3,409			
49.0%	Yes	1,655	6	0.26	***
51.0%	No	1,754	6.7	0.24	(Reference)
	Consumer colleague				
	Overall	3,409			
17.0%	Yes	574	6.3	0.29	***
69.0%	No	2,353	6.4	0.25	(Reference)
14.0%	Unemployed	482	6.1	0.25	***

The difference in the level of stigma obtained between men and women are generally consistent with the literature. Several studies addressing sex differences and BH

indicated that men are more likely to attribute a "weakness of character" as a trigger for depression and have more negative attitudes towards BHDs, such as depression [92, 93, 94]. Additionally, men tend to have a more negative view about BH treatment and a lower likelihood of utilizing services than women [95,96].

As for being in contact with someone who has a BHD, evidence shows that such a contact tends to be associated with a lower level of stigma, which aligns with the findings of the current research [97]. A previous study comparing public stigma and that of patients with schizophrenia relatives showed that the latter group have more favorable perceptions towards people with schizophrenia than the general public [98]. Additionally, one of the effective strategies used to reduce BH stigma is to incorporate contact-based interventions components such as [99]

4.4.2.2   By race/ethnicity

As shown in Table 11, Asians, Blacks/African-Americans had a lower SI (-0.5, p < 0.01), Hispanics had a lower SI (-0.6, p < 0.01), and Whites had a lower SI (-0.5, p < 0.01). Figure 9 illustrates the 3-months moving average change in the index value among all four race/ethnicity groups: Asian, Black/African-American, Hispanic and White. Looking at the chart, it appears that Asian participants have the highest overall SI value across all academic semesters. However, a conclusive assessment of the variation in the stigma values among Whites, Blacks/African-Americans and Hispanics is difficult to make. Figure 10 is another view of the difference in the index value between Asians and

the other populations in which the 3-months moving SI average for all other three race/ethnic groups are combined and represented by the orange line.

The consistent higher level of stigma in the Asian population as shown by the results in this study aligns with literature evidence. According to the U.S. Census Bureau in 2014, 5.4% of the U.S. population identifies as Asian American. Among them, 54% are of Chinese decent, 21% are of Indian descent, 10% are of Vietnamese descent, 9% are of Korean descent, and 6% are of Japanese descent [100]. Asian Americans tend to generally have more negative attitudes towards seeking BH services than other groups [101,102,103]. While they have a 17.3% overall lifetime rate of any BHD, Asian Americans are three times less likely to seek BH services than Whites. As one previous study noted, one of the main reasons why most young Asian Americans tend to avoid seeking professional help is because of the stigma they perceive to surround BH issues.
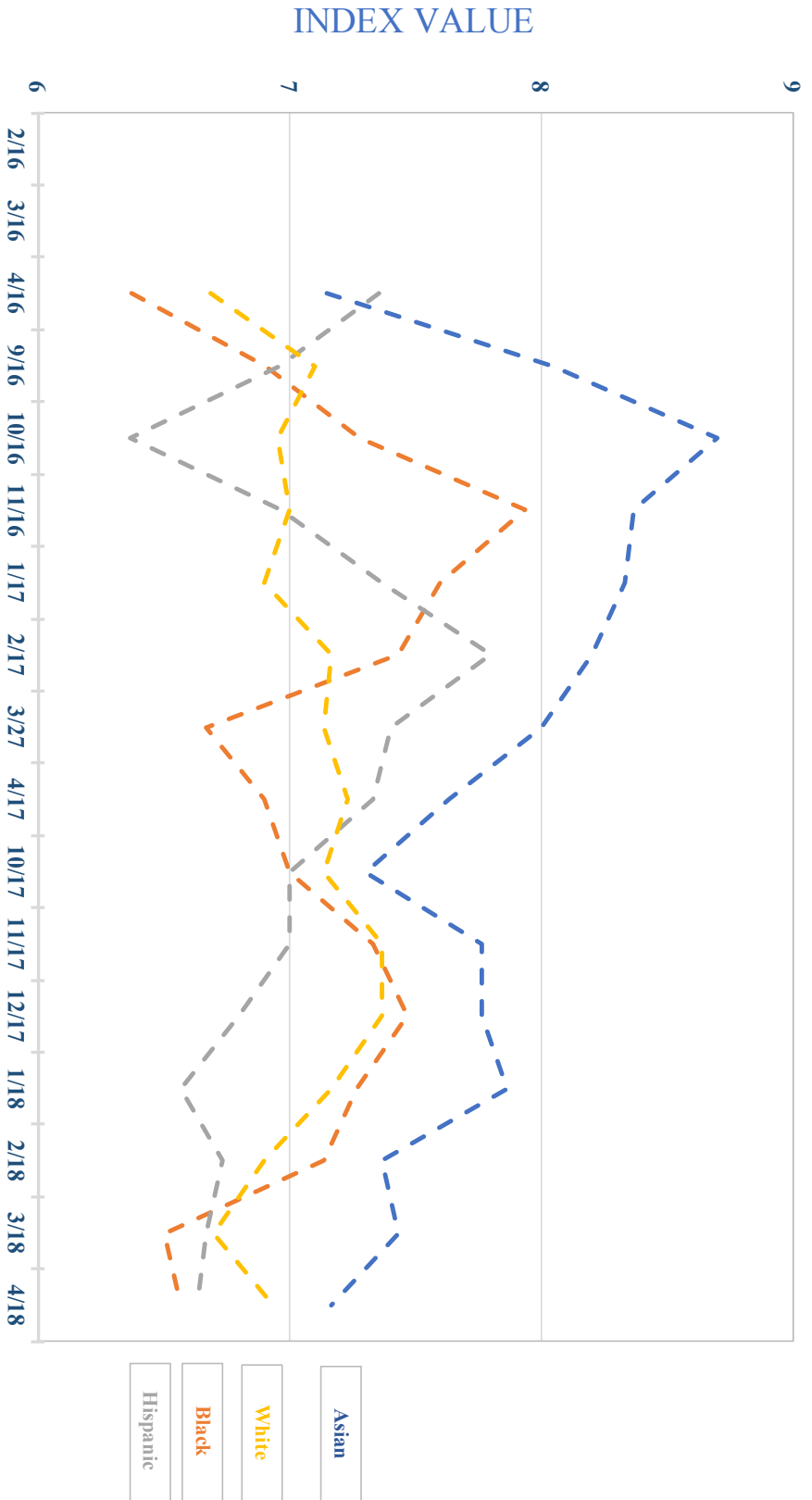
INDEX VALUE

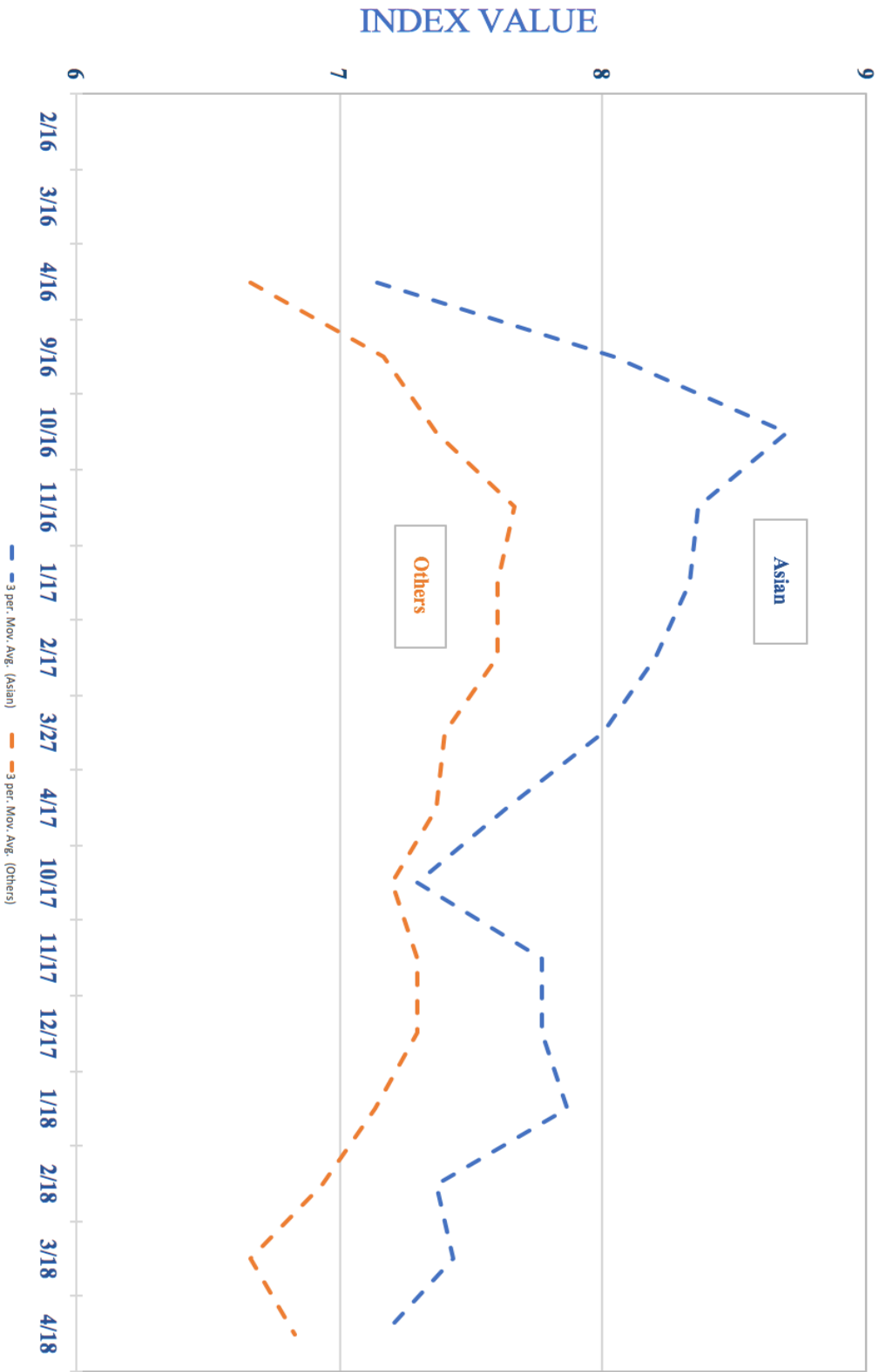Figure 8. Stigma Index by race/ethnicity (Monthly Index Level 2016)

Figure 9. Stigma Index by race/ethnicity (Asians vs. Others)

63

4.4.2.3 By academic class standing

As shown in Table 11, Seniors, Juniors had a lower SI (-0.3, p < 0.01),

Sophomores had a lower SI (-0.3, p < 0.01), and Freshman had a lower SI (-0.2, p <

0.01). In order to have a further detailed look at the difference in the level of stigma

among participants based on their class standing, the 3-months moving changes in the

index values were evaluated. Figure 11 shows the results of this change among all four

class standing groups: Freshman, Sophomore, Junior and Senior. As illustrated in Figure

11, Seniors tend to have a higher level of stigma than other students. While Juniors show

to have a higher stigma level than Sophomores, followed by Freshman, the fluctuation in

the stigma values across those three groups make it difficult to compare them among each

other. Figure 12 helps with visualizing the difference in the stigma level between Seniors

and others in which the 3-months moving SI average for all the other three class

standings are combined and represented by the orange line. Based on this chart, it is

evident that Seniors maintained a consistent higher level of stigma compared to others.

Based on the current state of knowledge, there is an absence of any study that

compares the level of stigma among college undergraduate students based on class

standing. The majority of previous cohorts investigate the impact of age on attitudes

towards individuals with BHDs. One study indicated that younger adults tend to hold

more positive attitudes towards BH treatment which follows a similar pattern to the

findings in this research [104]. Nevertheless, there is still a need to further understand

how undergraduate class standing impacts attitudes towards BHDs.
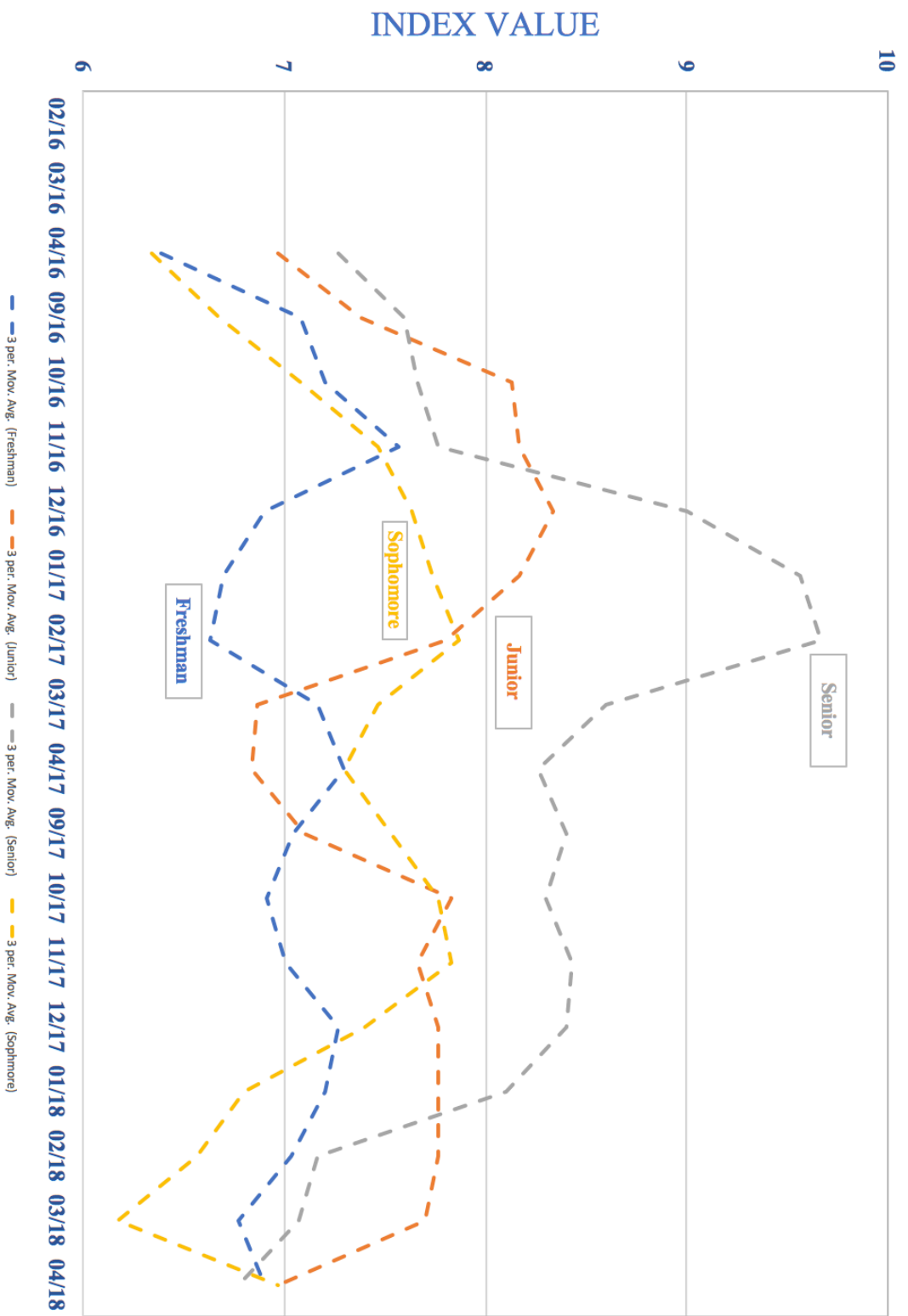
Figure 10. Stigma Index by class standing (Monthly Index Level 2016 – 2018)

INDEX VALUE

10

9

8

7

6

2/16 3/16 4/16 9/16 10/16 11/16 12/16 1/17 2/17 3/17 4/17 9/17 10/17 11/17 12/17 1/18 2/18 3/18 4/18

3 per. Mov. Avg. (Senior)

3 per. Mov. Avg. (others)
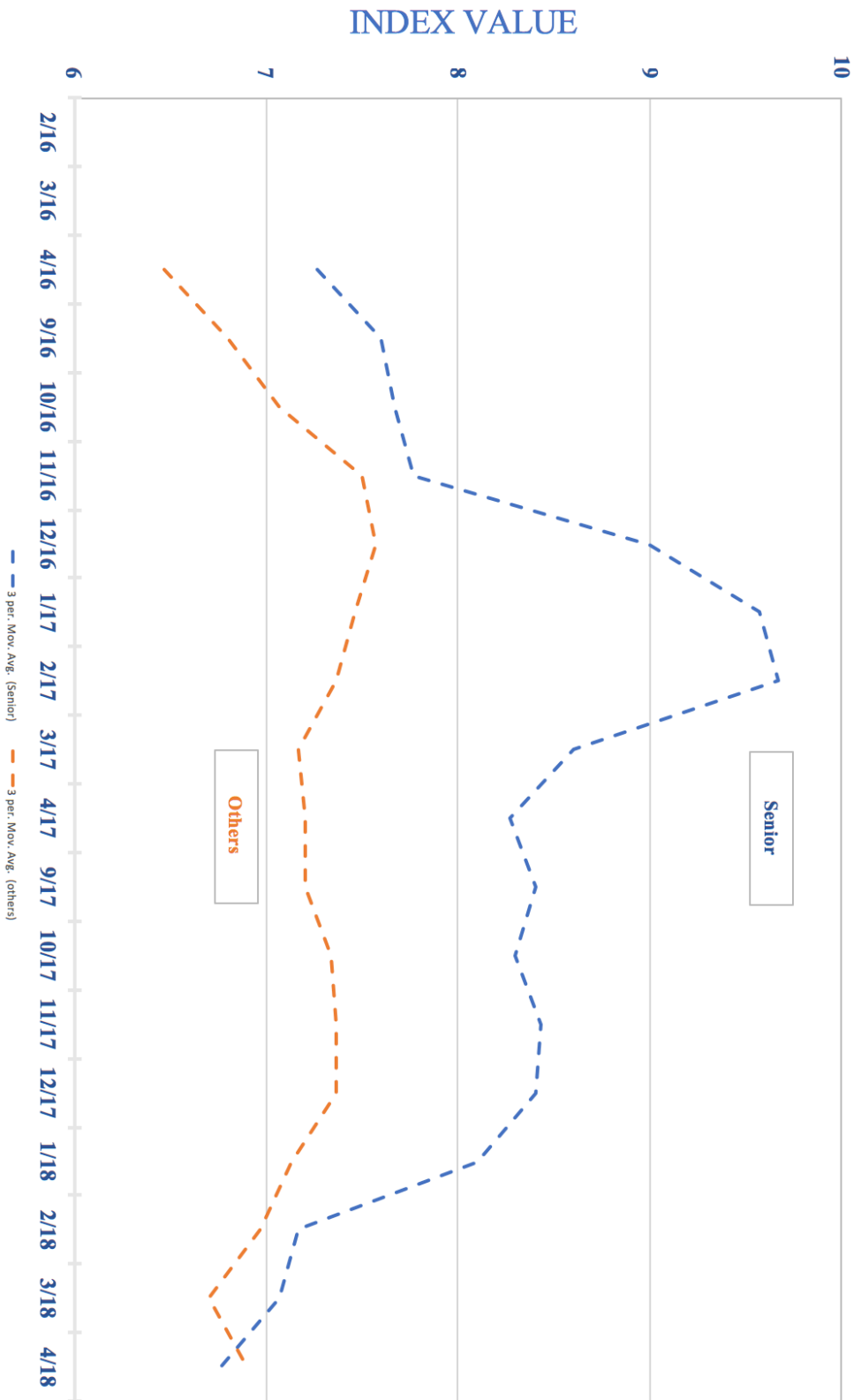
Others

Senior

Figure 11. Stigma Index by class standing (Seniors vs. Others)

4.4.2.4   By healthcare specialty

The importance of a standardized composite measure such as the SI is in its

ability to reveal differences in the stigma levels across different populations. With an

effort to measure the difference in the stigma level between providers within BH and

PHC settings, a total of 230 healthcare providers completed the eight-item stigma index

scale during the Mental Health First Aid (MHFA) training program. MHFA is a

standardized program that educate the public about BHDs and guide the general

population with recognizing others who show signs of behavioral health problems in

order to assist them with receiving professional services they are in utmost need of.

Providers' demographic information is shown in Table 12. The majority were females

(91.0%), married (49.0%), White Americans (63.0%), and aged between 26 and 35 years

old (23.8%). Out of the total sample, 67.4% were BH providers and 32.6% were PHC

providers. Out of the total sample size, 47.6% indicated they have a family member who

is a consumer and 69.8% indicated they have a friend who is a consumer.

	N = 230
Gender (%)	
Female	91.0
Male	9.0
Race (%)	
Asian	4.0
Black	23.0
Hispanic	5.0
White	63.0
Marital status (%)	
Never Married	35.0
Married	49.0
Divorced	13.0
Widowed	1.0
Other	2.0
Age (%)	
18-25	16.5
26-35	23.8
36-45	18.9
46-55	20.4
56-65	9.7
A BH consumer (%)	
Yes	11.0
No	89.0
Have a family member with a BHD (%)	
Yes	28.0
No	72.0
Have a friend with a BHD (%)	
Yes	64.0
No	36.0
Have a colleague with a BHD (%)	
Yes	64.0
No	36.0
Providers' specialty	
Behavioral Health	32.6
Primary Care	67.4

Table 12. Healthcare providers' demographic information

Table 13 compares the stigma level of BH and PHC providers. Results show that BH providers had a lower SI value than PHC providers (- 0.6. $p < 0.01$).

Table 13. Levels of stigma by healthcare settings

Providers' specialty	Stigma Index	SD	Significance
Behavioral Health	6.8	0.4	(Reference)
Primary Care	7.4	0.5	***

In 2008, the World Health Organization (WHO) and the World Organization of Family Doctors produced a report to present practical recommendations for integrating behavioral health into primary care [105]. According to the report, such an integration is the most viable way of closing the treatment gap ensuring that BH consumers obtain a "holistic patient-centered care". As BHDs continue to be responsible for 14% of global burden of disease, the one tool thought to help make behavioral health accessible to all populations is primary care. Nevertheless, for BH consumers, stigma remains a key barrier to accessing behavioral health care. In fact, when compared to the general population, stigma may be one of the contributor to the increased in the morbidity and mortality of consumers.

While integrating behavioral health into primary care can help BH consumers get better access to care, it is important to ensure they receive a compassionate care. Evidence shows that physicians in PHC settings might be inclined to have high levels of stigma towards patients with BHDs which aligns with the current research findings. It is therefore important to monitor the change in stigma index for BH and PHC providers to improve the strategies implemented and achieve successful and functional integrated primary care services [106].

4.5   Stigma Index Validation

4.5.1   Post-hoc and ANOVA analysis

Data collected during Spring 2018 was used to validate the stigma index scale to measure stigmatizing attitudes and its ability to capture group differences, namely between genders, exposure to a BHD, race/ethnicity and class standing. A total of 446 individuals participated in this validation study. Prior to answering the stigma index scale, participants were asked to complete the vignette experiment and rate how likely they are to select each of the five individuals who hypothetical sent them an email as a potential roommate.

A post-hoc Tukey test showed that participants rated someone with a BHD significantly different than someone who doesn't show to disclose any sign of having a BH problem at $p < .05$. An analysis of variance (ANOVA) was conducted to compare effect of a participants' score on rating each of the five potential roommates (see Tables 14, 15, 16). The effect of scores is significant for rating someone with depression, $F_{(23, 423)} = 3.57$, $p < 0.01$, someone who is seeing a psychiatrist, $F_{(21, 217)} = 2.21$, $p < 0.05$, and someone who just visited the counseling center, $F_{(23, 423)} = 2.45$, $p < 0.01$.

No significance was shown on the effect of scores for rating someone who has a concussion with an $F_{(23, 423)} = 0.78$, $p = 0.76$ and someone who just visited the career center with an $F_{(23, 423)} = 1.14$, $p = 0.30$. Tables 11,12,13,14 show the ANOVA results for each of the five scenarios.

Table 14. Test of between subject effects (dependent variable: depression)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	70.345[a]	23	3.058	3.569	.000	.163
Intercept	997.707	1	997.707	1164.161	.000	.733
Score	70.345	23	3.058	3.569	.000	.163
Error	362.519	423	.857			
Total	4202.000	447				
Corrected Total	432.864	446				

Table 15. Test of between subject effects (dependent variable: concussion)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	13.914[a]	23	.605	.775	.764	.040
Intercept	1401.758	1	1401.758	1794.991	.000	.809
Score	13.914	23	.605	.775	.764	.040
Error	330.332	423	.781			
Total	5126.000	447				
Corrected Total	344.246	446				

Table 16. Test of between subject effects (dependent variable; counseling center)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	35.135[a]	23	1.528	2.447	.000	.117
Intercept	1838.694	1	1838.694	2945.229	.000	.874
Score	35.135	23	1.528	2.447	.000	.117
Error	264.077	423	.624			
Total	6987.000	447				
Corrected Total	299.213	446				

Table 17. Test of between subject effects (dependent variable: career center)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	17.718[a]	23	.770	1.136	.302	.058
Intercept	1984.864	1	1984.864	2926.403	.000	.874
Score	17.718	23	.770	1.136	.302	.058
Error	286.904	423	.678			
Total	7353.000	447				
Corrected Total	304.622	446				

Table 18. Test of between subject effects (dependent variable: psychiatrist)

Source	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared
Corrected Model	40.319[a]	21	1.920	2.211	.002	.176
Intercept	683.571	1	683.571	787.025	.000	.784
Score	40.319	21	1.920	2.211	.002	.176
Error	188.476	217	.869			
Total	2422.000	239				
Corrected Total	228.795	238				

Results of the post-hoc Tukey and ANOVA tests demonstrates that participants had a significantly less favorable attitude towards someone who disclosed having a BHD compared to someone who did not.

4.5.2   Mean rating for vignette experiment by stigma index score

In order to assess the construct validity of the stigma index measurement, convergent and divergent validity were established by evaluating the relation between participants' ratings to the vignette experiment and their overall score on the eight-item stigma index scale. For the purpose of obtaining score cut points that divide the range of the scores distribution into contiguous intervals with equal probabilities, a quantiles breakdown was conducted. Participants' scores on the stigma index scale were therefore classified into five different groups: Group 1 (0 - 3), Group 2 (4 - 6), Group 3 (7 - 9), Group 4 (10 - 12) and Group 5 (13 - 16).

Figure 12. shows the mean rating of the five hypothetical scenarios (the five different colored lines) by participants within each of the five classification groups. Since the response to the vignette experiment is on a five-point Likert scale with a rating of 1 for "Extremely unlikely" and a rating of 5 for "Extremely likely", the lower the rating, the less in favor participants are to the particular vignette situation, and the higher the rating, the more in favor participants are to the particular vignette situation.
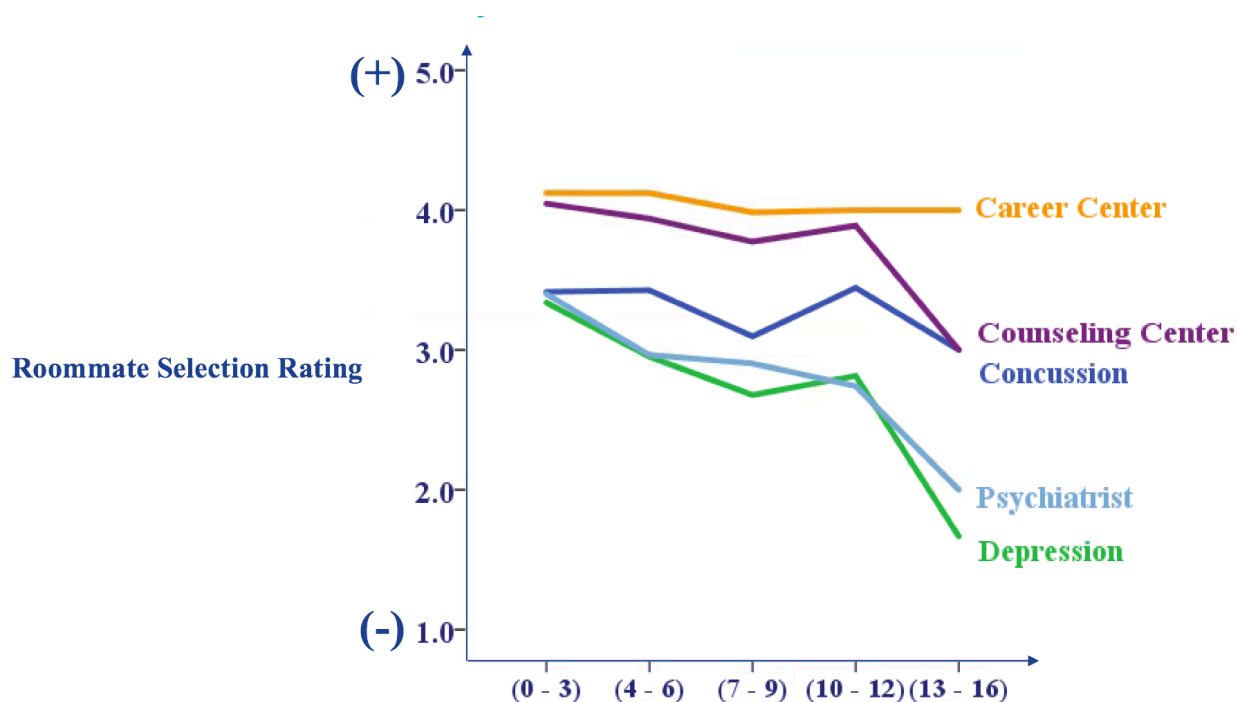
Figure 12. Mean rating for vignette scenarios by stigma index score

As shown in Figure 12, Group1 participants who scored low on the stigma index (0 - 3), gave an overall positive mean rating to all five individuals within the vignette experiment. As for Group 2 participants who score slightly higher on the stigma index (4 - 6), a drop in the mean rating of the three individuals who apparently have a BHD began to emerge. This drop is more obvious for Group 3 participants who scored higher on the stigma index scale (7 - 9), especially for rating someone who has visited the psychiatrist as the mean dropped below a rating of 3. However, the distinction between the mean rating of someone with signs of apparent BHDs and someone who is not became clearer with the drop observed for Group 4 (with scores of 10-12) and Group 5 (with scores 13 - 16). This is especially evident for the cases of individuals who have depression and seeking treatment from a psychiatrist.

Based on the results, the mean rating of the two individuals who don't show any sign of a BHD are not correlated with participants' scores on the stigma index. This illustrates the inability of the stigma index to capture people's attitudes towards others who don't have a BHD. Nevertheless, the correlation between the mean rating of the other three individuals with the participants' scores on the stigma index is a validation of the scale's ability to capture peoples' attitudes and intended behaviors towards BH consumers which was the main purpose of the stigma index.

CHAPTER 5: RECOMMENDATIONS

This dissertation offers the Stigma Index, an innovative analytical and methodological tool, to uniformly and systematically measure BH stigma in different populations. The motivation for carrying such a research stems from the need to standardize the measurement of stigma and use a data driven approach to prioritize policy objectives based on the pressing need in different populations.

5.1   Application of the Stigma Index

Measuring the impact of behavioral health stigma on mortality rate by suicide, number of Emergency Room visits, hospital readmissions due to a behavioral health disorders, and consumers' uptake of behavioral health treatment is essential for planning effective ways to set priorities when planning BH stigma reduction initiatives.

The SI allows for evaluating the effectiveness of anti-stigma interventions within the ecological system – intrapersonal, interpersonal, and structural [107]. At the interpersonal level, monitoring the change in the SI among members of the stigmatized group over time can help direct educational and counseling intervention program needs which can be different in populations. At the interpersonal level, there exists a number of interventions that target members of the stigmatized and non-stigmatized groups with an effort to reduce stigma. The SI change over time can be used to evaluate the progress of such processes and develop strategies that are most effective at reducing stigma. At the structural level, the SI can highlight on the dimension of the stigma problem to support policy and legal practices changes to enhance the reduction in stigma. Bidirectional

influences occur among all levels of an ecological system and can drive interventions to self-reinforce the outcome of stigma reduction. By monitoring the levels of stigma in each of the three levels, researchers will be able to assess gaps within the system and intervene accordingly.

This research demonstrates the ability of the SI to capture differences in stigma levels among different populations over time, namely between genders, exposure to a BHD, race/ethnicity and age. The sensitivity of the SI to depict a consistent higher stigma level among Asians compared to other races welcome the opportunity to use a data-driven approach to improve stigma-reduction initiatives.

One study measured the effectiveness of the MHFA program on first aiders serving in Latino and Asian American immigrant communities [108]. Results revealed a significant improvement in participant's BH literacy levels and attitudes towards BH consumers at the short-term. However, using the SI to gain an in depth understanding about the effectiveness of such interventions in communities in the long-term is essential and can be beneficial for shaping culture specific psychoeducational initiatives.

Tailoring intervention approaches to populations that are at more risk for developing stigmatizing attitudes towards treatment seeking and BH consumers can help break the vital stigma cycle and attenuate influences that cultures might have on viewing BHDs. Capturing stigma level changes by using the SI has the potential to drive such localized interventions to cause a positive overall impact at the global level over time.

5.2   Vision of the Stigma Index

Quantifying stigma is complex because it is engraved within a constantly changing social structure where no local centralized force is responsible for its emergence. Stigma is an example of a dynamic process and global behavior pattern that emerges from the collective interactions of individual components that interact and create local relationships at the simple level and have the ability to adapt to the environment where they belong.

The vision of the SI is to establish a unified and standardized measurement system to quantitatively evaluate stigma in different cultural and social contexts across different geographical areas over time. Figure 13 serves as an example to illustrate the long-term vision of the SI and doesn't contain any actual data related to BH stigma. The six color labels attribute the different levels of the SI and are randomly used to hypothetically code different geographical locations on the U.S. map. The city of Dallas in Texas is used as an example to show the benefit of using the SI to derive the overall trend in the stigmatizing attitudes over time. The same could be applied to any other city or region in real-life scenarios.

Untreated BHDs costs the U.S as much as $300B each year [109]. According to NAMI, the 2018 budget reduction proposal to BH programs of $400M would only aggravate the social and economic costs associated with BHDs [109]. Using the SI to measure stigma across the U.S over time can help identify the states that are in most need for the dollars to improve BH services and increase access to care.
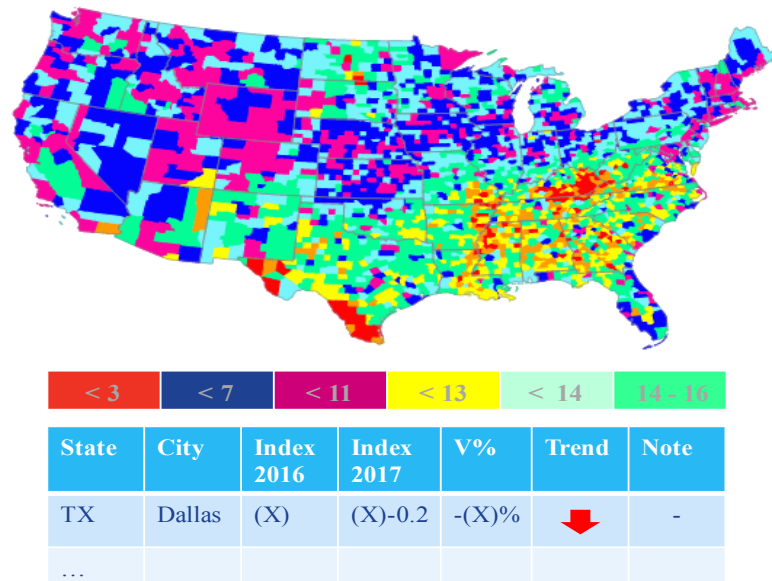
State	City	Index 2016	Index 2017	V%	Trend	Note
TX	Dallas	(X)	(X)-0.2	-(X)%		-
…						

Figure 13. Visualization of the Sigma Index vision

5.3 Generalizable research design

This research offers a generalizable research design towards using analytics to measure intangible social behavioral information. The following framework summarizes the seven key steps to translate social behavior into actionable information.

1. Define the construct of interest

2. Generate initial pool of items (questions)

3. Conduct an initial pilot study to ensure the internal consistency of the model

4. Collect data using methods such as an app, survey, website, etc.

5. Apply analytics, such as machine learning algorithms, to improve the model's accuracy and fitness

6. Design and evaluate the index over time

7. Validate the index

CHAPTER 6: CONCLUSION

This research establishes the foundation for the SI, an evidence-based formula for monitoring the change in stigma over time in different populations. This first of its kind computational approach offers promising population level applications that could assist healthcare and public health organizations to look at specific populations and provide each of them the care and interventions needed to reduce BH stigma. Following a population health approach, the SI has the potential to locate gaps within systems and communities. This can further influence decision makers to improve policy decisions that ensure social inclusion of BH consumers and drive upstream population - centered interventions.

REFERENCES

1. Behavioral Health in Primary Care / SAMHSA-HRSA. (2016), *Integration.samhsa.gov*.
2. R. Kessler, K. Mickelson and D. Williams, "The Prevalence, Distribution, and Mental Health Correlates of Perceived Discrimination in the United States", *Journal of Health and Social Behavior*, vol. 40, no. 3, p. 208, 1999.
3. NAMI: National Alliance on Mental Illness. (2016). NAMI: National Alliance on Mental Illness.
4. Web-based Injury Statistics Query and Reporting System (WISQARS), *Center for Disease Control and Prevention (CDC)*.
5. "Suicide Prevention Resource Center". *Sprc.org*. N.p., 2017
6. American Association of Suicidology. (2016). *Suicidology.org*.
7. B. Palmer, V. Pankratz and J. Bostwick, "The Lifetime Risk of Suicide in Schizophrenia", *Arch Gen Psychiatry*, vol. 62, no. 3, p. 247, 2005.
8. V. Raymont, "Suicide in schizophrenia -- how can research influence training and clinical practice?", *Psychiatric Bulletin*, vol. 25, no. 2, pp. 46-50, 2001.
9. Charles Roehrig. Mental Disorders Top The List Of The Most Costly Conditions in the United States: $201 Billion. *Health Affairs*, 2016.
10. *World Health Organization*, 2003.
11. C. Funk, *Thereby hangs a tale*. New York: Harper, 1950.
12. E. Jones, *Social stigma*. New York: W.H. Freeman, 1984.
13. E. Goffman, *Stigma*. Englewood Cliffs, N.J.: Prentice-Hall, 1963
14. P. Corrigan, L. River, R. Lundin, D. Penn, K. Uphoff-Wasowski, J. Campion, J. Mathisen, C. Gagnon, M. Bergman, H. Goldstein and M. Kubiak, "Three Strategies for Changing Attributions about Severe Mental Illness", *Schizophrenia Bulletin*, vol. 27, no. 2, pp. 187-195, 2001.
15. Griffin, E. (2006). *A first look at communication theory*. Boston: McGraw-Hill.
16. Sherif, C. (1963). Social categorization as a function of latitude of acceptance and series range. *The Journal Of Abnormal And Social Psychology*, 67(2), 148-156.
17. P. Corrigan, *On the stigma of mental illness*. Washington, DC: American Psychological Association, 2005.
18. I. Brockington, P. Hall, J. Levings and C. Murphy, "The community's tolerance of the mentally ill", *The British Journal of Psychiatry*, vol. 162, pp. 93–99, 1993.
19. P. Corrigan, "How Stigma Interferes With Mental Health Care.", *American Psychologist*, vol. 59, no. 7, pp. 614-625, 2004.
20. J. Pryor, G. Reeder, C. Yeadon and M. Hesson-McInnis, "A Dual-Process Model of Reactions to Perceived Stigma.", *Journal of Personality and Social Psychology*, vol. 87, no. 4, pp. 436-452, 2004.
21. P. Corrigan, L. River, R. Lundin, D. Penn, K. Uphoff-Wasowski, J. Campion, J. Mathisen, C. Gagnon, M. Bergman, H. Goldstein and M. Kubiak, "Three Strategies for Changing Attributions about Severe Mental Illness", *Schizophrenia Bulletin*, vol. 27, no. 2, pp. 187-195, 2001.
22. E. Holmes and L. River, "Individual strategies for coping with the stigma of severe mental illness", *Cognitive and Behavioral Practice*, vol. 5, no. 2, pp. 231-239, 1998.
23. D. Sadow, M. Ryder and D. Webster, "Is education of health professionals encouraging stigma towards the mentally ill?", *Journal of Mental Health*, vol. 11, no. 6, pp. 657-665, 2002.
24. Hemmens, C., Miller, M., Burton, V. S., Jr., and Milner, S., "The Consequences of Official Labels: An Examination of the Rights Lost by the Mentally Ill and Mentally Incompetent Ten Years Later," *Community Mental Health Journal*, Vol. 38, No. 2, 2002, pp. 129–140.
25. Griffiths K et al 2008. Predictors of depression stigma. BMCPsychiatry, 8, 25
26. A. Cooper, P. Corrigan and A. Watson, "Mental Illness stigma and Care Seeking", *The Journal of Nervous and Mental Disease*, vol. 191, no. 5, pp. 339-341, 2003.
27. Cooper, A., Corrigan, P., & Watson, A. (2003). Mental illness and care seeking. *The Journal Of Nervous And Mental Disease*, 191(5), 339-341.

28. Eisenberg, D., Downs, M., Golberstein, E., & Zivin, K. (2009). Stigma and Help Seeking for Mental Health Among College Students. *Medical Care Research And Review*, 66(5), 522-541.

29. J. Sirey, M. Bruce, G. Alexopoulos, D. Perlick, S. Friedman and B. Meyers, "Stigma as a Barrier to Recovery: Perceived Stigma and Patient-Rated Severity of Illness as Predictors of Antidepressant Drug Adherence", *PS*, vol. 52, no. 12, pp. 1615-1620, 2001.

30. Griffiths, K., Christensen, H., & Jorm, A. (2008). Predictors of depression stigma. *BMC Psychiatry*, 8(1).

31. R. Kessler, K. Mickelson and D. Williams, "The Prevalence, Distribution, and Mental Health Correlates of Perceived Discrimination in the United States", *Journal of Health and Social Behavior*, vol. 40, no. 3, p. 208, 1999.

32. P. Corrigan, A. Watson and L. Barr, "The Self–Stigma of Mental Illness: Implications for Self–Esteem and Self–Efficacy", *Journal of Social and Clinical Psychology*, vol. 25, no. 8, pp. 875-884, 2006.

33. D. Caltaux, "Internalized stigma: a barrier to employment for people with mental illness", *British Journal of Therapy and Rehabilitation*, vol. 10, no. 12, pp. 539-544, 2003.

34. P. Corrigan, "The impact of stigma on severe mental illness", *Cognitive and Behavioral Practice*, vol. 5, no. 2, pp. 201-222, 1998.

35. B. Link, "Understanding Labeling Effects in the Area of Mental Disorders: An Assessment of the Effects of Expectations of Rejection", *American Sociological Review*, vol. 52, no. 1, p. 96, 1987.

36. B. Link and J. Phelan, "Conceptualizing Stigma", *Annu. Rev. Sociol.*, vol. 27, no. 1, pp. 363-385, 2001.

37. P. Corrigan, A. Watson and L. Barr, "The Self–Stigma of Mental Illness: Implications for Self–Esteem and Self–Efficacy*", Journal of Social and Clinical Psychology*, vol. 25, no. 8, pp. 875-884, 2006.

38. Rob Johns, *Likert Items and Scales*, 1st ed., 2010.

39. George, D., & Mallery, P. (2003). *SPSS for Windows step by step: A simple guide and reference*. 11.0 update (4th ed.). Boston: Allyn & Bacon.

40. Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–334.

41. S. Taylor and M. Dear, "Scaling Community Attitudes Toward the Mentally Ill", *Schizophrenia Bulletin*, vol. 7, no. 2, pp. 225-240, 1981.

42. M. Hirai and G. Clum, "Hirai M, Clum GA. Development, reliability, and validity of the beliefs toward mental illness scale", *Psychopathology and Behavioral Assessment*, vol. 22, pp. 221-236, 2000.

43. G. Modgill, S. Patten, S. Knaak, A. Kassam and A. Szeto, "Opening Minds Stigma Scale for Health Care Providers (OMS- HC): Examination of psychometric properties and responsiveness", *BMC Psychiatry*, vol. 14, no. 1, p. 120, 2014.

44. S. Evans-Lacko, D. Rose, K. Little, C. Flach, D. Rhydderch, C. Henderson and G. Thornicroft, "Development and psychometric properties of the Reported and Intended Behaviour Scale (RIBS): a stigma-related behaviour measure", *Epidemiol Psychiatr Sci*, vol. 20, no. 03, pp. 263-271, 2011.

45. Bogardus, Emory S., Social Distance in the City. *Proceedings and Publications of the American Sociological Society*. 20, 1926, 40–46.

46. E. Day, Public attitudes toward mental illness. 2003.

47. J. Gabbidon, S. Clement, A. van Nieuwenhuizen, A. Kassam, E. Brohan, I. Norman and G. Thornicroft, "Mental Illness: Clinicians' Attitudes (MICA) Scale—Psychometric properties of a version for healthcare students and professionals", *Psychiatry Research*, vol. 206, no. 1, pp. 81-87, 2013.

48. Link BG. Mental patient status, work, and income: An examination of the effects of a psychiatric label. *American Sociological Review*, 1982

49. J. Cohen and E. Struening, "Opinions about mental illness in the personnel of two large mental hospitals.", *The Journal of Abnormal and Social Psychology*, vol. 64, no. 5, pp. 349-360, 1962.

50. L. Evans-Lacko S1, H. Meltzer, D. Rose, D. Rhydderch, C. Henderson and G. Thornicroft, "Development and psychometric properties of the Mental Health Knowledge Schedule", *Can J Psychiatry*, vol. 55, no. 7, pp. 440-448, 2010.

51. P. Corrigan, P. Michaels, E. Vega, M. Gause, A. Watson and N. Rüsch, "Self-stigma of mental illness scale—short form: Reliability and validity", *Psychiatry Research*, vol. 199, no. 1, pp. 65-69, 2012.

52. H. Stuart, R. Milev and M. Koller, "The Inventory of Stigmatizing Experiences: its development and reliability", *World Psychiatry*, no. 4, pp. 33-37, 2005.

53. J. Boyd Ritsher, P. Otilingam and M. Grajales, "Internalized stigma of mental illness: psychometric properties of a new measure", *Psychiatry Research*, vol. 121, no. 1, pp. 31-49, 2003.

54. M. King, S. Dinos, J. Shaw, R. Watson, S. Stevens, F. Passetti, S. Weich and M. Serfaty, "The Stigma Scale: development of a standardised measure of the stigma of mental illness", *The British Journal of Psychiatry*, vol. 190, no. 3, pp. 248-254, 2007.

55. C. Bagley and M. King, "Exploration of three stigma scales in 83 users of mental health services: Implications for campaigns to reduce stigma", *Journal of Mental Health*, vol. 14, no. 4, pp. 343-355, 2005.

56. R. Harvey, "Individual Differences in the Phenomenological Impact of Social Stigma", *The Journal of Social Psychology*, vol. 141, no. 2, pp. 174-189, 2001.

57. P. Hayward, G. Wong, J. Bright and D. Lam, "Stigma and self-esteem in manic depression: an exploratory study", *Journal of Affective Disorders*, vol. 69, no. 1-3, pp. 61-67, 2002.

58. B. Link, "Understanding Labeling Effects in the Area of Mental Disorders: An Assessment of the Effects of Expectations of Rejection", *American Sociological Review,* vol. 52, no. 1, p. 96, 1987.

59. O. Wahl, "Mental Health Consumers' Experience of Stigma", *Schizophrenia Bulletin*, vol. 25, no. 3, pp. 467-478, 1999.

60. R. Kessler, K. Mickelson and D. Williams, "The Prevalence, Distribution, and Mental Health Correlates of Perceived Discrimination in the United States", *Journal of Health and Social Behavior*, vol. 40, no. 3, p. 208, 1999.

61. Vogel, D.L., Wade, N.G., Haake, S. Measuring the Self-Stigma Associated with Seeking Psychological Help. (2006). *Journal of Counseling Psychology*, 53, 325-337

62. E. Brohan, M. Slade, S. Clement, D. Rose, N. Sartorius and G. Thornicroft, "Further development and psychometric validation of the discrimination and stigma scale (DISC-12)", *Psychiatrische Praxis*, vol. 38, no. 01, 2011.

63. B. Link, E. Struening, M. Rahav, J. Phelan and L. Nuttbrock, "On Stigma and Its Consequences: Evidence from a Longitudinal Study of Men with Dual Diagnoses of Mental Illness and Substance Abuse*", Journal of Health and Social Behavior*, vol. 38, no. 2, p. 177, 1997.

64. T. Björkman, B. Svensson and B. Lundberg, "Experiences of stigma among people with severe mental illness. Reliability, acceptability and construct validity of the Swedish versions of two stigma scales measuring devaluation/discrimination and rejection experiences", *Nordic Journal of Psychiatry*, vol. 61, no. 5, pp. 332-338, 2007.

65. T. Abdullah and T. Brown, "Mental illness stigma and ethnocultural beliefs, values, and norms: An integrative review*", Clinical Psychology Review*, vol. 31, no. 6, pp. 934-948, 2011.

66. P. Corrigan, S. Morris, P. Michaels, J. Rafacz and N. Rüsch, "Challenging the Public Stigma of Mental Illness: A Meta- Analysis of Outcome Studies", *PS*, vol. 63, no. 10, pp. 963-973, 2012.

67. J. Finkelstein, O. Lapshin and E. Wasserman, "Randomized study of different anti-stigma media", *Patient Education and Counseling*, vol. 71, no. 2, pp. 204-214, 2008.

68. "Mental illness: What a Difference a Friend Makes", *Substance Abuse and Mental Health Services Administration (SAMHSA)*. Available: http://whatadifference.samhsa.gov.

69. O. Wahl, *Media madness*. New Brunswick, NJ: Rutgers University Press, 1995.

70. C. Macrae, G. Bodenhausen, A. Milne and J. Jetten, "Out of mind but back in sight: Stereotypes on the rebound.", *Journal of Personality and Social Psychology*, vol. 67, no. 5, pp. 808-817, 1994.

71. D. Wegner, R. Erber and S. Zanakos, "Ironic processes in the mental control of mood and mood-related thought.", *Journal of Personality and Social Psychology*, vol. 65, no. 6, pp. 1093-1104, 1993.

72. J. Uleman and J. Bargh, *Unintended thought*. New York: Guilford Press, 1989.
73. O. Haimson, K. Ringland, S. Simpson and C. Wolf, "Using Depression Analytics to Reduce Stigma via Social Media: BlueFriends.", *Proc iConference*, 2014, pp. 1-5.
74. G. Ivbijaro and M. Funk, "No mental health without primary care", *Mental Health in Family Medicine*, vol. 5, no. 3, pp. 127-128, 2008.
75. "Behavioral Health in Primary Care / SAMHSA-HRSA", *Integration.samhsa.gov*, 2016.
76. G. Lewis and L. Appleby, "Personality disorder: the patients psychiatrists dislike", *The British Journal of Psychiatry*, vol. 153, no. 1, pp. 44-49, 1988.
77. H. Fabrega, "Cultural challenges to the psychiatric enterprise", *Comprehensive Psychiatry*, vol. 36, no. 5, pp. 377-383, 1995.
78. S. Goodall, B. Druss and E. Walker, "Mental disorders and medical comorbidity", *Research Synthesis Report*, 21, 1-26, 2011.
79. P. Corrigan and D. Penn, "Lessons from social psychology on discrediting psychiatric stigma.", *Stigma and Health,* vol. 1, no., pp. 2-17, 2015.
80. "Housing Discrimination/U.S. Department of Housing and Urban Development (HUD)", *Portal.hud.gov*, 2016.
81. S. Page, "Effects of the Mental Illness Label in 1993:", *Journal of Health & Social Policy*, vol. 7, no. 2, pp. 61-68, 1996.
82. Time to Change, *http://time-to-change-org.uk/what-were-doing/time-challenge*.
83. "Time to Change hosts Global meeting of Anti-stigma Programmes in London", Time To Change, 2016, *http://www.time-to-change.org.uk/news/global-meeting-anti-stigma-programme-london*.
84. Surveys of Consumers. (2016). *Data.sca.isr.umich.edu*.
85. "Beautiful Minds | Brain Health Resources, Research and Information", Beautiful-minds.com, 2015, *http://Beautiful-minds.com*.
86. A. Stangl, L. Brady, K. Fritz. "Measuring HIV stigma and discrimination", *STRIVE technical brief*, 2012.
87. Weiss, M., Doongaji, D., Siddhartha, S., Wypij, D., Pathare, S., & Bhatawdekar, M. et al. (1992). The Explanatory Model Interview Catalogue (EMIC). Contribution to cross- cultural research methods from a study of leprosy and mental health. *The British Journal Of Psychiatry*, 160(6), 819-830.
88. World Health Organization, "*The International Classification Of Functioning, Disability And Health*", 2003
89. Nunnally, J.C. & Bernstein, I.H. (1994). *Psychometric Theory*. New York: McGraw Hill, 3rd ed.
90. Streiner, David L. "Starting At The Beginning: An Introduction To Coefficient Alpha And Internal Consistency". Journal of Personality Assessment 80.1 (2003): 99-103. Web.
91. D. Williams and M. Medlock, "Health Effects of Dramatic Societal Events — Ramifications of the Recent Presidential Election", *New England Journal of Medicine*, vol. 376, no. 23, pp. 2295-2299, 2017
92. Wang, J., Adair, C., Fick, G., Lai, D., Evans, B., Perry, B. W. et al. (2007b). Depression literacy in Alberta: Findings from a general population sample. *Canadian Journal of Psychiatry*, *52*(7), 442–449.
93. Cook RM, Wang J. Descriptive epidemiology of stigma against depression in a general population sample in Alberta. *BMC Psychiatry*. 2010;10(1):29
94. J Wang., G, Fick C., D. Adair D., D. Lai D. Gender specific correlates of stigma toward depression in a Canadian general population sample. *Journal of Affective Disorders*. 2007;103(1–3):91–97
95. R. Mojtabai. (2007). Americans' attitudes toward mental health treatment seeking: 1990-2003. Psychiatric Services, 58, 642-651.
96. D. Rickwood, Deane, F. P., Wilson, C. J., & Ciarrochi, J. (2005). Young people's help-seeking for mental health problems. Australian e-Journal for the Advancement of Mental Health, 4, 1-34.
97. ME, Kolodziej. BT, Johnson. Interpersonal contact and acceptance of persons with psychiatric disorders: a research synthesis. *J Consult Clin Psychol*. 1996;64:387–396.)

98. S. Razali and Z. Ismail, "Public stigma towards patients with schizophrenia of ethnic Malay: a comparison between the general public and patients' relatives", *Journal of Mental Health*, vol. 23, no. 4, pp. 176-180, 2014.

99. S. Patten, A. Remillard, L. Phillips, G. Modgill, A. Szeto, A. Kassam and D. Gardner, "Effectiveness of contact-based education for reducing mental illness-related stigma in pharmacy students", *BMC Medical Education*, vol. 12, no. 1, 2012.

100. "Asian American/Pacific Islander Communities and Mental Health", *Mental Health America*, 2018. www.mentalhealthamerica.net/issues/asian-americanpacific-islander-communities-and-mental-health.

101. V.D. Ojeda, & T.G. McGuire. Gender and racial/ethnic differences in use of outpatient mental health and substance use services by depressed adults. Psychiatric Quarterly, 77, 211-222, 2006.

102. M. Shea & C. J. Yeh, C. Asian American students' cultural values, stigma, and relational selfconstrual: Correlates of attitudes toward professional help seeking. Journal of Mental Health Counseling, 30, 157-172, 2008.

103. N. Zhang, & D.N. Dixon (2003). Acculturation and attitudes of Asian international students toward seeking psychological help. Journal of Multicultural Counseling and Development, 31, 205-222, 2003.

104. R. Mojtabai, "Americans' Attitudes Toward Mental Health Treatment Seeking: 1990–2003", *Psychiatric Services*, vol. 58, no. 5, pp. 642-651, 2007.

105. World Health Organization/Wonca. *Integrating Mental Health into Primary Care: a global perspective*. Geneva: World Health Organization, 2008.

106. S. Baker., R. Pearson., J. Glenn. "Inadvertent stigmatization of mental disorders in a primary care setting". *Symposium on Mental Health*, 2015

107. Bronfenbrenner, U. (1977). Toward an experimental ecology of human development. *American Psychologist, 32*(7), 513-531.

108. Lee, O. & Tokmic, F. (2017). An Uncontrolled Study Evaluating the Effectiveness of Mental Health First Aid Training Program on First Aiders of the Latino and Asian American Immigrant Communities. *Mental Health & Prevention*. Manuscript Under Review.

109. National Institute of Mental Health (2017). *Annual Total Direct and Indirect Costs of Serious Mental Illness (2002)*. Retrieved from: https://www.nimh.nih.gov/health/statistics/cost/index.shtml.

APPENDIX A

Pilot Study 1- Original Stigma Index Scale

Dimension	Item
Personal Stigma	I would introduce a friend or a family member who has a behavioral health disorder to a young man/woman I know
	I would recommend a friend or a family member who has a behavioral health disorder as a caretaker of the children of someone I know
	I would recommend a friend or a family member who has a behavioral health disorder for a job working for someone I know
	I would avoid moving to a new home if I will have a neighbor who has a behavioral health disorder
	I wouldn't mind renting a room in my home to someone who has a behavioral health disorder
	I would feel comfortable being seen in public with a person who is known to have a behavioral health disorder
	I would be willing to visit someone who has a behavioral health disorder
	I wouldn't be willing to invite a person who has a behavioral health disorder to my house
	I would accept as a friend someone who has a behavioral health disorder
	I wouldn't mind working on the same job with someone who has a behavioral health disorder
Perceived Stigma	People in my community would invite someone who has a behavioral health disorder to their houses
	People in my community would avoid building a friendship with someone who has a behavioral health disorder
	People in my community would allow having someone who has a behavioral health disorder be a caretaker of their children
	People in my community would engage in a social activity with a person who has a behavioral health disorder
	In my family, a person who has a behavioral health disorder would be treated with respect
	In my community, a person who has a behavioral health disorder is treated with respect
	In my community, healthcare providers treat a person who has a behavioral health disorder with respect
	Most people in my community would accept a friendship with someone who has a behavioral health disorder
	The place of my employment would be open to employing someone who has a behavioral health disorder
	People in my community would think less of a person if he/she has a behavioral health disorder
	In my community, having a behavioral health disorder is associated with shame and embarrassment
	In my community, a family would choose not to disclose to friends and co-workers if one of its members had a behavioral health disorder
	People in my community consider someone who has a behavioral health disorder as dangerous
	People in my community would feel sorry for a person who has a behavioral health disorder
Endorsed Stigma	Someone who has a behavioral health disorder is more likely to harm others than someone who does not have a behavioral health disorder
	The opinion of someone who has a behavioral health disorder should not count in family discussions
	A behavioral health disorder causes problems in the family
	Having a behavioral health disorder is a problem for a person to get married
	A family member of a person who has a behavioral health disorder has difficulty getting married
	A friend of a person who has a behavioral health disorder has difficulty getting married
	A person with a behavioral health disorder has difficulty to get hired for a job
	Having a behavioral health disorder can cause problems in an on-going marriage
	It is easy to tell if a person has a behavioral health disorder

Appendix B
Pilot Study 2 - Stigma Index Scale

Dimension	Item
Personal Stigma	I would recommend a friend or a family member who has a behavioral health disorder for a job working for someone I know (Item 3 of original scale)
	I wouldn't mind renting a room in my home to someone who has a behavioral health disorder (Item 5 of original scale)
	I wouldn't mind working on the same job with someone who has a behavioral health disorder (Item 10 of original scale)
Perceived Stigma	In my community, a person who has a behavioral health disorder is treated with respect (Item 16 of original scale)
	Most people in my community would accept a friendship relationship with someone who has a behavioral health disorder (Item 18 of original scale)
	People in my community would think less of a person if he/she has a behavioral health disorder (Item 28 of original scale)
Endorsed Stigma	A behavioral health disorder causes problems in the family (Item 22 of original scale)
	Having a behavioral health disorder is a problem for a person to get married (Item 23 of original scale)
	Having a behavioral healthcare disorder can cause problems in an ongoing-marriage (Item 27 of original scale)

Appendix C

Validation Study

You are looking for a roommate to share with a 2BR apartment for next semester. The apartment is conveniently located near campus. You posted flyers around campus, asking anyone interested in the ad to send you an email to briefly describe themselves. You received 5 emails in response. Please read each of the emails and answer the following questions.

❖ <u>Person A</u>:
Hi, I was happy to see your flyer because I am looking for a place near campus. I like to hang out with my friends and family in my free time. I also enjoy playing football, despite the headaches I get from a concussion I received few years ago. I can meet you any time after 5 PM tomorrow, right after my appointment at the Health Center. Thank you.

Based on this email, how likely are you to consider Person A as your roommate:
      1 2 3 4 5   [1 being least likely, 5 being most likely]

❖ <u>Person B</u>:
Hi, I came across your flyer today as I was leaving campus. I am very interested in your ad. I am independent and try to stay most of my free times in nature. My friends think I have a good sense of humor, despite my episodes of depression. I am happy to meet you in person tomorrow. Let me know what you think. Thank you.

Based on this email, how likely are you to consider Person B as your roommate:
      1 2 3   4 5   [1 being least likely, 5 being most likely]

❖ <u>Person C</u>:
Hi, I am interested in your ad. I currently live away from campus and I am looking to reside closer to campus next year. I am an outgoing and fun person. I have an appointment tomorrow at the Career Center. I can always meet you afterwards. Let me know. Thank you.

Based on this email, how likely are you to consider Person C as your roommate:
      1 2 3 4 5   [1 being least likely, 5 being most likely]

❖ <u>Person D</u>:
Hi, I came across your flyer today as I was leaving my appointment at the Counseling Center. I am highly interested in your ad as I am looking for a residence near campus. I spend most of my free times in the outdoors. My friends describe me as self-sufficient and fun to be around. I would be happy to meet you in person. Thank you.

Based on this email, how likely are you to consider Person D as your roommate:
      1 2 3   4 5   [1 being least likely, 5 being most likely]

❖ <u>Person E</u>:
Hi, I saw your add yesterday in the student union. I am very interested in sharing the apartment with you, especially that it's located near campus. I rely on myself to do things and always engage in entertaining events. I also enjoy nature activities. Do you want to meet in person? I can meet with you tomorrow after I see my psychiatrist. Thank you.

Based on this email, how likely are you to consider Person E as your roommate:
      1 2 3 4 5   [1 being least likely, 5 being most likely]