

# Variation in Criminogenic Risks by Mental Health Symptom Severity: Implications for Mental Health Services and Research

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## Abstract

Although a growing body of literature has demonstrated that justice-involved people with mental illnesses have criminogenic risk factors at similar or elevated rates as compared to justice-involved people without mental illnesses, more information about how criminogenic risks vary by intensity of mental health symptoms is needed. This information is particularly important for probation agencies who supervise the vast majority of justice-involved individuals with mental illnesses and who are increasingly implementing specialty mental health supervision approaches. To this end, this study examines the relationship between criminogenic risk and intensity of self-reported symptoms of mental illnesses among 201,905 individuals on probation from a large southeastern state. Self-report measures of symptoms of mental illnesses were categorized as low, moderate or high and criminogenic risks were compared among the following three groups: (1) those with no or low self-reported symptoms of mental illness; (2) those reporting moderate levels of symptoms; and (3) those reporting high or elevated levels of symptoms. Our findings suggest that the strength of relationships between symptoms of mental illnesses and criminogenic risks varies by type of criminogenic risk. Also, elevated symptoms of mental illness are associated with higher levels of criminogenic risks. More research about interventions that address mental illnesses and criminogenic risks is needed to inform practice and policy.

**Keywords** Mental health symptoms · Mental health services · Criminogenic risks · Probation

At the end of 2016, nearly 70% of the adult correctional population in the United States was under community supervision (i.e., probation or parole), which amounts to more than 4.5 million individuals [1]. Among those under community supervision, an estimated 16%–27% – between 720,000 and 1,215,000 adults – have a mental illness or mental health condition [2–5]. Individuals on probation who have mental illnesses often have high rates of probation

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violations and revocations and low mental health service adherence rates, which presents significant challenges for state and local criminal justice authorities tasked with enforcing the terms of supervision and ensuring public safety [6–10]. To reduce probation violations and enhance treatment engagement among individuals on probation with mental illnesses, probation agencies need specialized approaches that consider the unique needs and risk factors among individuals with mental illnesses on probation.

Over the last two decades, probation agencies have tailored supervision strategies and interventions to individuals' criminogenic risk factors – i.e., risk factors that are known to predict probation violations and revocations [11, 12]. There are eight criminogenic risk factors that have the strongest associations with criminal behavior: (1) history of antisocial behavior; (2) antisocial personality traits; (3) antisocial cognition; (4) antisocial associates; (5) family and/or marital strain; (6) problems at school and/or work; (7) problems with leisure and/or recreational time; and (8) substance use [11, 12]. These eight criminogenic risk factors have both static and dynamic aspects. The dynamic aspects of each risk factor are known as criminogenic needs, because they are modifiable and amenable to change and, when addressed successfully in treatment, reduce the likelihood that a person will engage in future criminal activities [12]. Evidence suggests that these eight criminogenic risk factors are the same for justice-involved individuals regardless of the presence of mental illnesses and that mental illness alone is a weak predictor of criminal justice involvement [13, 14]. However, a growing body of literature has demonstrated that justice-involved people with mental illnesses have criminogenic risk factors at similar or elevated rates as compared to justice-involved people without mental illnesses [15–17], which some research suggests accounts for the disproportionate representation of people with mental illnesses in the justice system [12].

Moreover, an abundance of evidence indicates that addressing criminogenic risks and needs reduces probation violations and revocations among the general population of those on probation [11–14]; however, there is scant research examining this how criminogenic risks vary by mental health symptom severity. This lack of research is further impeded by probation agency challenges identifying people with mental illnesses on their caseloads – either through standardized instruments or agency records, although there is evidence that locally-created mental health symptom measures can be used effectively in this capacity [5].

Furthermore, the lack of population-based research on the relationship between mental illness and criminogenic risk levels among adults on probation is problematic because it inhibits the development of tailored interventions designed to reduce recidivism and enhance treatment engagement for those with mental illnesses. For example, if people with mental illnesses who are most symptomatic seem to have high levels of impulsivity and poor self-control, interventions that combine symptom recognition, symptom management and self-control could be warranted. To begin to address these research gaps, this study uses agency-developed and validated instruments to examine how criminogenic risks vary by the intensity of self-reported mental health symptoms.

## **Method**

### **Design and Data**

An observational study design and administrative data were used to examine criminogenic risks among a sample of individuals on probation from one large southeastern state during a

five-year period between 2009 and 2013. The state's administrative data contained self-report screening and assessment data for all individuals on probation. Screening and assessment instruments were routinely administered to individuals on probation during an intake period to assess for mental health symptoms and criminogenic risks. Administrative data used for the analyses described below contained demographic variables and a number of agency-developed measures (see below) obtained from individuals on probation between 2009 and 2013. This study was approved by the Institutional Review Board at the University of North Carolina at Chapel Hill.

## Sample

The sample included 231,905 individuals on probation who had at least one probation episode during our study period. For the purposes of our analyses, only individuals' first probation episode during the study period was included, resulting in an unduplicated count of 231,905 individuals. As shown in Table 1, the sample was 73.93% ( $n = 171,440$ ) male, 48.37% ( $n = 112,183$ ) identified as White/Caucasian, 44.91% ( $n = 104,154$ ) identified as Black/African American, 3.27% ( $n = 7585$ ) identified as Native American, 2.63% ( $n = 6103$ ) identified as Hispanic, 0.35% ( $n = 816$ ) identified as Asian, and 0.46% ( $n = 1064$ ) identified as Other. The average age was 37.46 ( $SD = 12.04$ ) and 47.75% ( $n = 110,734$ ) had a high school diploma.

We stratified the sample by self-reported mental health symptoms (see below) and created three mutually exclusive categories: (1) individuals on probation who self-reported no or low levels of mental health symptoms ( $n = 198,031$ ); (2) individuals on probation who reported moderate levels of mental health symptoms ( $n = 20,374$ ); and (3) individuals on probation who reported high or elevated mental health symptoms ( $n = 13,500$ ).

## Data and Measures

The data contained self-report measures of demographics, mental health symptoms and five scales measuring criminogenic risks: self-control, antisocial personality traits, antisocial values, dysfunctional family history, and substance use.

**Mental Health Symptoms** The state probation agency routinely assesses mental health symptoms for each individual on probation using the following four items: (1) I hear or see things that other people say they don't hear or see; (2) I believe that other people can control my mind by putting thoughts into my head or taking thoughts out of my head; (3) I have so much energy that I can go for days without sleep and thoughts just race through my head; and (4) I feel so bad that I think of taking my own life. Each item had a 5-point response pattern: *never true* (0), *rarely true* (1), *sometimes true* (2), *usually true* (3), or *always true* (4).

The 4-item scale demonstrates acceptable internal consistency reliability ( $\alpha = .62$ ) and evidence of convergent validity with measures of substance use, self-control, anti-social values and anti-social personality traits [18]. Moreover, both bivariate and multivariate models suggested evidence of concurrent criterion validity in that individuals on probation who had reported a history of psychiatric hospitalization, medication or treatment had higher mental health scale scores, on average, than those individuals on probation who reported no such histories.

Scores on the mental health scale for the 231,905 individuals in the sample ranged from 0 to 16 ( $M = 0.96$ ,  $SD = 1.91$ ), with higher scores indicating more mental health problems. Using a

**Table 1** Criminogenic risks and symptoms of mental illnesses among adults on probation

Scale	Low Levels of Mental Health Symptoms <sup>1</sup>			Moderate Levels of Mental Health Symptoms <sup>2</sup>			High or Elevated Levels of Mental Health Symptoms <sup>3</sup>		
	Total (198,031) M (SD)	Male (146,787) M (SD)	Female (51,244) M (SD)	Total (20,374) M (SD)	Male (15,001) M (SD)	Female (5373) M (SD)	Total (13,500) M (SD)	Male (9652) M (SD)	Female (3848) M (SD)
SA	49.41 (9.46)	49.89 (9.51)	48.01 (9.17)	52.24 (11.1-3)	52.65 (11.0-2)	51.09 (11.3-3)	55.32 (13.2-9)	55.83 (13.2-9)	54.05 (13.2-1)
ASP	49.18 (9.24)	49.78 (9.54)	47.47 (8.07)	52.90 (11.4-3)	53.61 (11.6-5)	50.94 (10.5-3)	57.55 (13.7-8)	58.43 (14.0-6)	55.36 (12.8-0)
SFC	49.09 (9.56)	48.91 (9.57)	49.61 (9.53)	53.82 (10.3-1)	53.59 (10.2-8)	54.46 (10.3-8)	57.53 (11.2-0)	57.16 (11.2-3)	58.45 (11.0-9)
DSF	49.46 (9.56)	49.21 (9.41)	50.16 (9.96)	52.22 (11.0-0)	51.84 (10.7-7)	53.28 (11.5-6)	54.61 (12.7-0)	54.18 (12.6-2)	55.69 (12.8-3)
ASV	48.66 (8.75)	49.09 (9.02)	47.41 (7.76)	55.05 (11.2-6)	55.73 (11.4-5)	53.15 (10.5-0)	62.02 (14.1-2)	62.94 (14.2-2)	59.73 (13.6-1)

SA = substance abuse scale, ASP = anti-social personality scale, SFC = self-control scale, DSF = dysfunctional family history scale, and ASV = anti-social values scale; <sup>1</sup> Scores of less than one standard deviation above the sample mean on the mental health scale; <sup>2</sup> Scores between one and two standard deviations above the sample mean on the mental health scale; <sup>3</sup> Scores above two standard deviations above the sample mean on the mental health scale

recommended cut-off score [18], individuals with mental health scores of 3.0 or greater (2.87, which is one standard deviation [1.91] above the population mean 0.96) were considered as having moderate levels of mental health symptoms. We defined those with high or elevated mental health symptoms as having a score on the brief mental health scale that was two standard deviations or more above the mean for the population (i.e., scores of 3.82 above the sample mean of .96 for a total score of 4.78) or a score of 5 or higher. Scores below one standard deviation, indicated low levels of mental health symptoms.

The dataset also included a number of measures created by the state's Department of Public Safety designed to assess criminogenic risks: (1) self-control; (2) antisocial personality traits; (3) antisocial values; (4) dysfunctional family history; and (5) substance use. All individuals on probation complete these and other self-report items (e.g., employment, financial status) within the first 60 days of probation. These five scales align with five of the eight criminogenic risks conceptualized by Andrews et al., (2006): (1) history of antisocial behavior (aligns with the self-control scale); (2) antisocial personality pattern (aligns with the antisocial personality traits scale); (3) antisocial cognition (aligns with the antisocial values scale); (4) family and/or marital strain (aligns with the history of dysfunctional family scale); and (5) substance use (aligns with the substance use scale).

**Self-Control** The self-control scale in this study contains six items that measure impulse control and impulsive behavior. The scale has adequate internal consistency reliability ( $\alpha = .65$ ) and evidence of convergent validity with scales that measure antisocial personality

and substance use. Scores on the self-control scale ranged from 0 to 24 ( $M = 11.01$ ,  $SD = 2.85$ ), with higher scores indicating more problems in this area [18].

**Antisocial Personality Traits** The antisocial personality traits scale consists of 10 items that measure characteristics of antisocial traits, such as committing harmful acts against people or animals. The scale has adequate internal consistency reliability ( $\alpha = .68$ ) and has evidence of convergent validity with scales that measure self-control, antisocial values, and substance use. Scores ranged from 0 to 13 ( $M = 1.65$ ,  $SD = 1.97$ ), with higher scores indicating higher levels of antisocial personality traits [18].

**Antisocial Values** The antisocial values scale consists of five items that measure antisocial styles of thinking, such as trying to get even with others and feeling angry when others try to tell them what to do. The scale has adequate internal consistency reliability ( $\alpha = .66$ ) and has evidence of convergent validity with scales that measure self-control, antisocial personality, and substance use. Scores range from 0 to 20 ( $M = 2.37$ ,  $SD = 2.73$ ), with higher scores indicating greater levels of antisocial thinking styles [18].

**Dysfunctional Family History** The dysfunctional family history scale consists of six items that measure family characteristics such as criminal involvement of family members, arguments and fighting within the family, and rules and consequences. The scale has evidence of adequate internal consistency reliability ( $\alpha = .64$ ) and scores range from 0 to 24 ( $M = 9.51$ ,  $SD = 2.79$ ), with higher scores indicating greater levels of dysfunctional family history [18].

**Substance Use** The substance use scale is a 7-item scale that measures frequency of substance use, substance use at the time of crime, and other problems related to substance use. The scale has adequate internal consistency reliability (.70) and evidence of convergent, concurrent, and predictive validity [18]. Scores on the substance use scale range from 0 to 25 ( $M = 2.71$ ,  $SD = 3.18$ ), with higher scores indicating greater substance use problems [18].

## Data Analysis

Scores for each of the measures were standardized and univariate and bivariate descriptive statistics were used to describe the sample of individuals on probation. Pearson's chi-square tests were used to explore the associations between categorical variables and Analysis of Variance was used to examine the relationship between categorical independent variables and continuously measured dependent variables, such as scores on the criminogenic risk scales, among those with low, moderate and high scores on the mental health scale.

Multivariate regression with robust standard errors was used to examine the relationship between mental health symptoms and criminogenic risks while holding constant demographic variables. First, criminogenic risk scale scores (e.g., substance use) were regressed on age, race, gender, and education level. Then, in a second step, group status (i.e., low, moderate and high scores on the mental health scale) was added to the model. In each of the models, the reference group for gender was female, the reference group for age was 15–29 year olds, the reference group for race was White/Caucasian, and the reference group for education was lack of a high school diploma. Individuals on probation with low scores on the mental health symptom scale served as the reference group, and separate regression models were estimated

for scores for each of the five criminogenic scales available in the data: (1) self-control; (2) antisocial personality traits; (3) antisocial values; (4) dysfunctional family history; and (5) substance use. All statistical tests were conducted using Stata 14 [19] and two-tailed tests with alpha set at .05 were used.

## Results

The following summarizes results from the Analysis of Variance and multivariate regression models by criminogenic scale and mental health symptomology (i.e., low, moderate and high or elevated symptoms).

### Demographics

Of the sample of individuals on probation who reported low mental health symptoms ( $n = 198,031$ ), 74.12% ( $n = 146,787$ ) were male and 49.47% ( $n = 97,962$ ) identified as White, 43.76% ( $n = 86,668$ ) identified as African American, 3.34% ( $n = 6624$ ) identified as Native American, 2.62% ( $n = 5186$ ) identified as Hispanic, 0.34% ( $n = 668$ ) identified as Asian, and 0.47% ( $n = 923$ ) identified as Other. The average age of the sample was 37.61 years ( $SD = 12.04$ ) and 48.59% ( $n = 96,224$ ) had a high school diploma.

The demographic characteristics of the other two groups were similar, with two exceptions. First, there were differences in race among those with low mental health symptoms, those with moderate symptoms, and those with high levels of mental health symptoms ( $X^2(2) = 802.89$ ,  $p < .001$ ,  $V = .042$ ) in that a greater percentage of individuals with high levels of mental health symptoms identified as African American (53.16%,  $n = 7177$ ) compared to those with moderate (50.60%,  $n = 10,309$ ) and low levels of mental health symptoms (43.76%,  $n = 86,668$ ). Second, the percentage of individuals who had their high school diploma was lowest among those with high levels of mental health symptoms (39.01%,  $n = 5266$ ) compared to those with moderate (45.37%,  $n = 9244$ ) and low levels of mental health symptoms (48.59%,  $n = 96,224$ ;  $X^2(2) = 515.83$ ,  $p < .001$ ,  $V = .048$ ).

### Self-Control

There were significant differences in scores on the self-control scale among the three groups ( $F [2,231902] = 6463.3$ ,  $p < .001$ ,  $\eta^2 = .05$ ). Post hoc Bonferroni tests showed that the average scale score for those with high levels of mental health symptoms ( $M = 57.53$ ,  $SD = 11.20$ ) was approximately eight points higher than those with low levels of symptoms ( $M = 49.09$ ,  $SD = 9.56$ ) and approximately one point higher than the average score for those with moderate levels of symptoms ( $M = 53.82$ ,  $SD = 10.31$ ), with higher scores indicating more difficulty with self-control and impulsivity. The regression models with Huber-White corrections and robust standard errors confirmed these results indicating that, after holding constant all demographic variables, high levels of mental health symptoms accounted for an 8.4-unit increase in scores on the self-control scale ( $SE = 0.098$ ,  $p < 0.001$ ) and moderate mental health symptoms accounted for a 4.7-unit increase, compared to those with low levels of mental health symptoms (i.e., the reference group;  $SE = 0.75$ ,  $p < 0.001$ ).

## Substance Use

There were significant differences between the three groups and scores on the substance use scale ( $F [2,231902] = 2837.6, p < .001, \eta^2 = .02$ ). Post hoc Bonferroni tests showed that the greatest mean difference in substance use scores was between those with high levels of mental health symptoms ( $M = 55.32, SD = 13.29$ ) and those with low levels of symptoms ( $M = 49.41, SD = 9.46$ ). Also, there was a difference in scores between those with low levels of mental health symptoms and those with moderate levels (48.01 vs. 51.01, respectively), as well as those with moderate levels and high levels mental health symptoms (51.01 vs. 54.05, respectively). After holding constant all demographic variables, results of the multivariate regression with Huber-White corrections using robust standard errors suggested high levels of mental health symptoms accounted for a 6.1-unit increase in scores on the substance use scale ( $SE = 0.115, p < 0.001$ ) and moderate mental health symptoms accounted for a 3.02-unit increase, compared to those with low levels of mental health symptoms ( $SE = 0.79, p < 0.001$ ).

## Antisocial Personality

There were significant differences in scores on the anti-social personality scale among the three groups ( $F [2,231902] = 5630.14, p < .001, \eta^2 = .05$ ), with the highest scores among those with high levels of mental health symptoms ( $M = 57.55, SD = 13.78$ ), followed by individuals on probation with moderate symptoms ( $M = 52.90, SD = 11.42$ ), and those with low levels of symptoms ( $M = 49.18, SD = 9.26$ ). Although these differences were significant, the effect sizes were low to medium at .05 (Cohen, 1988). After holding constant all demographic variables, high levels of symptoms accounted for an 8-unit increase in scores on the antisocial personality scale ( $SE = 0.116, p < 0.001$ ) and moderate symptoms accounted for a 3.5-unit increase, compared to those with low levels of symptoms ( $SE = 0.79, p < 0.001$ ).

## Dysfunctional Family History

There were significant differences in scores on the dysfunctional family history scale among the three groups ( $F [2,231902] = 2267.85, p < .001, \eta^2 = .02$ ), consistent with a small effect size [20]. Post hoc tests showed that the greatest mean difference in dysfunctional family history scores was between those with high levels of mental health symptoms ( $M = 10.79, SD = 3.54$ ) and those with low levels of symptoms ( $M = 9.36, SD = 2.66$ ). After holding constant all demographic variables, multivariate models indicated that those with high levels of mental health symptoms had scores on the dysfunctional family history scale that were 2.6 units higher than those with low levels of symptoms ( $SE = 0.08, p < 0.001$ ) and those with high levels of mental health symptoms had scores that were 4.8 units higher than those with low levels of symptoms.

## Antisocial Values

There were significant differences in scores on the anti-social values scale among the three groups ( $F [2,231902] = 16,054.72, p < .001, \eta^2 = .12$ ), with the highest scores among those with high levels of mental health symptoms ( $M = 62.02, SD = 14.12$ ), followed by individuals with moderate symptoms ( $M = 55.05, SD = 11.27$ ) and those with low levels of symptoms ( $M = 48.66, SD = 8.74$ ). The effect size was medium to large at .12 [20]. Multivariate models

indicated that those with high levels of symptoms accounted for a 13.14-unit increase in scores on the antisocial values scale compared to those with minimal symptoms ( $SE = 0.121$ ,  $p < 0.001$ ) and those with moderate symptoms had scores that were 6.21-units higher than those with low levels of symptoms ( $SE = 0.05$ ,  $p < 0.001$ ).

## Discussion

This unique population-based study used statewide administrative data to assess self-reported criminogenic risks and severity of mental health symptoms among a large sample of individuals on probation. This study advances our understanding of the criminogenic risks among justice-involved individuals with mental health conditions, particularly our understanding of how criminogenic risks vary by mental health symptoms. Our findings suggest: (a) the strength of the relationships between mental health symptoms and criminogenic risks vary (e.g., stronger relationship between mental health symptoms and antisocial values versus a weaker relationship between mental health symptoms and history of dysfunctional family); and (b) intensity of mental health symptoms is associated with higher scores on each of the criminogenic risk scales after holding constant all demographic variables. These results support findings in the criminal justice literature that justice-involved people with mental illnesses have higher levels of criminogenic risk compared to those without mental illnesses [12–17] and extends these findings to individuals on probation. Further, these results support the need for tailoring interventions to address the specific criminogenic risks and needs among individuals with mental illnesses on probation in order to reduce their involvement in the criminal justice system [21].

## Limitations

This study has a number of strengths and makes a unique contribution to the literature regarding our understanding of criminogenic risks and intensity of symptoms of mental illness among people on probation; however, the study has a number of weaknesses. The data come from one large southeastern state and the extent to which the results presented here can be generalized to other jurisdictions or those on probation with mental illnesses in other states is unknown. In addition, the measures used in this study were created by the state criminal justice authority; thus, the extent to which results are affected by methodological artifacts due to the use of state-created measures is unknown but cannot be ruled out as an alternative explanation for our findings. Our findings should be replicated to further inform practice, policy and research.

Further, this study utilized a screening instrument for symptoms of mental illness and not a diagnostic assessment. Consequently, those individuals categorized as having moderate and elevated symptoms of mental illness may not have a diagnosed mental illness. In addition, due to the large analytic sample used, even small between-group differences were statistically significant. Thus, readers should examine both tests for significance and effect sizes to better understand the strengths of the relationships between mental health symptoms and criminogenic risks.

Furthermore, only five of the eight criminogenic risks [12, 14] identified in the literature – history of antisocial behavior, antisocial personality traits, antisocial cognition, substance use, and family or marital strain/lack of support – were used in this study. Measures of antisocial



associates, poor performance/lack of satisfaction in work or school, and lack of leisure or recreation were omitted given these were not available in the administrative data used for the study. Moreover, we did not have an independent measure of mental illness and relied on scores on a brief, self-report mental health measure that was created by a state's criminal justice authority.

## **Implications**

Nevertheless, these results further our understanding of the levels of criminogenic risk factors among people with mental health issues on probation. Moreover, this study illuminates how the levels of criminogenic risks vary with mental health symptoms which has the potential to inform the treatment and care of individuals with mental illnesses who are on probation in a number of ways. First, our analyses showed that individuals with elevated mental health symptoms self-reported higher scores on each of the five criminogenic risk scales compared with those self-reporting moderate or low mental health symptoms. Given the wealth of evidence linking criminogenic risks with future criminal justice contacts, our finding that greater mental health symptoms are associated with greater levels of criminogenic risk indicates the need for probation entities to prioritize treatment coordination for individuals with elevated mental health symptoms through tailored supervision approaches (e.g., specialty mental health probation) or through greater coordination and collaboration with mental health treatment providers.

Further, the strength of the relationship between elevated mental health symptoms and criminogenic risks was highest for the self-control scale (i.e., impulsivity) and the antisocial values scale, which may indicate the need to prioritize some criminogenic risk factors over others. For example, probation agencies may consider adaptations to probation approaches and interventions that focus on reducing impulsivity and enhancing individual self-control and problem-solving skills for those who are particularly symptomatic. Broadly, information about how criminogenic risk varies by intensity of mental health symptoms can guide interventions that simultaneously address the criminogenic risks and mental health needs of individuals on probation to improve mental health outcomes and reduce recidivism among this high-risk, high-need population.

The implications of our study findings for mental health and criminal justice practice, policy, and research are interconnected. For instance, in order to adapt supervision practices to address issues of impulsivity and poor decision making, as well as antisocial values, among individuals on probation with elevated symptoms of mental illness, probation officers will need access to specialized training and evidence-based strategies and interventions designed to address these criminogenic risk factors. In addition, these results suggest that cognitive behavioral interventions that address antisocial attitudes and impulsivity should be incorporated into mental health services, such as forensic assertive community treatment [22–24], for those who show the highest levels of criminogenic risk.

## **Conclusion**

Levels of criminogenic risk appear to be higher among individuals with high levels of mental health symptoms; however, there is little available research about interventions that reduce

criminogenic risk levels among those with mental illnesses on probation. More research about the relationship between criminogenic risks and mental illnesses is needed in order to adapt interventions for adults on probation in order to improve mental health and criminal justice outcomes.

**Data Availability** Data are not available for public use.

## Compliance with Ethical Standards

**Conflict of Interest** The authors declare that they have no conflicts of interest.

**Ethics Approval** All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. The study was approved by the Institutional Review Board at the University of North Carolina at Chapel Hill. In addition, all study materials and methodology for this study was approved by the Institutional Review Board (#09–1392) at the University of North Carolina at Chapel Hill.

**Informed Consent** Not applicable.

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