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Do Adults with a Childhood Abuse History Delay Preventive Care?

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Master of Science

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Do Adults with a Childhood Abuse History Delay Preventive Care?

By

Meredith Leigh Philyaw

B.A., Duke University, 2007

Advisor: Benjamin G. Druss, M.D.

An abstract of

A thesis submitted to the Faculty of the

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Abstract

Do Adults with a Childhood Abuse History Delay Preventive Care?

By

Meredith Leigh Philyaw

Timely preventive care by adults with a childhood abuse history is critical, given their elevated risk of chronic conditions which benefit from early detection. Yet, adults with a childhood abuse history may face unique psychological and psychosocial barriers to preventive care and evidence of how this population uses preventive care is limited.

Using data collected from 23,830 participants in five states that administered the 2010 BRFSS Adverse Childhood Experiences module, I examined whether adults with a self-reported history of recurrent childhood physical, sexual or emotional abuse reported receiving six preventive services (breast/cervical/prostate/colorectal cancer screenings, HIV tests, and dental cleanings) according to recommended guidelines for disease prevention and early detection. Two additional preventive services, flu vaccines and routine check-ups, were modeled as counterfactuals to illustrate that childhood abuse history selectively impacts preventive care, independent of common barriers to timely preventive care among vulnerable populations.

Multivariate weighted results indicate that women with a childhood abuse history were significantly less likely than women without a childhood abuse history to report receiving a timely breast cancer screening. I also found that, among adults at-risk for HIV, those with a childhood abuse history were less likely to report receiving an annual HIV test until further adjustment for HIV testing site. Adults with a childhood abuse history did not differ from adults without a childhood abuse history in their timely utilization of the remaining preventive services or the counterfactuals.

My findings suggest that adults with a childhood abuse history selectively delay preventive care. Identifying the mechanism(s) driving delayed breast cancer screening among this population is critical for attenuating their greater likelihood of late-stage breast cancer diagnoses. Further, since adults with a childhood abuse history regularly use trauma-reminding preventive services, it is important that providers are aware of sensitive practices when administering these procedures to affected individuals. Future studies are needed which examine the value of care used by adults with a childhood abuse history to inform strategies for slowing the economic impact of this high-need population on the U.S. healthcare system.

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This thesis is dedicated to the memory of my loving grandparents, Robert Terrell and Carolyn Philyaw

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List of Abbreviations

ACS – American Cancer Society

ADA – American Dental Association

AIDS – Acquired Immune Deficiency Syndrome

AOR – Adjusted Odds Ratio

BRFSS – Behavioral Risk Factor Surveillance System

CDC – Centers for Disease Control and Prevention

FPL – Federal Poverty Line

GED – General Educational Development

HIV – Human Immunodeficiency Virus

HMO – Health Maintenance Organization

MSA – Metropolitan Statistical Area

PSA – Prostate-Specific Antigen

PTSD – Post-Traumatic Stress Disorder

OR – Odds Ratio

SAS – Statistical Analysis System

SV – Sexual Victimization

U.S. – United States

Introduction

Early disease detection and prevention via the timely utilization of preventive care is well-understood to prevent or delay avoidable conditions, improve patient outcomes, and slow the transmission of communicable diseases [1, 2]. Yet, poor adherence to clinical guidelines for routine preventive care remains a significant public health problem [3, 4]. Previous studies using nationally-representative data have estimated that, whereas a majority of eligible women receive routine mammograms and pap smears, only 49.9% of eligible adults receive routine colorectal cancer screenings and as few as 28.1% of adults receive annual flu vaccines [5]. Delays in preventive care are magnified among vulnerable populations [3-6]. McMorrow and colleagues found that, compared to higher-income adults, those with incomes at or below 400% of the Federal Poverty Line are significantly more likely to delay breast, cervical, and colorectal cancer screenings and routine check-ups – due, in part, to differences between higher and lower-income adults in their insurance coverage, educational attainment, risk preferences and attitudes towards medical care [5]. While the Patient Protection and Affordable Care Act is poised to narrow insurance-related disparities in timely preventive care utilization among vulnerable populations, it will not address psychological and cognitive factors which also interfere with how vulnerable populations use preventive care [5]. Identifying specific vulnerable populations that face unique psychological or cognitive barriers to timely preventive care is important so that complementary patient-centered care strategies can be implemented which target these barriers. One such vulnerable population is adults with a history of childhood abuse.

In 2005-2006 alone, approximately 553,300 children experienced physical, sexual or emotional abuse at the hands of a caregiver which resulted in demonstrable harm [7]. For many childhood abuse survivors, the ramifications of their early-life adversity persist into adulthood. Compared to their peers without an abuse history, adults with a childhood abuse history are more likely to be socioeconomically disadvantaged [8, 9], not have insurance coverage [9], have poor mental health status [10-12], and are at elevated risk for an array of chronic diseases, including

cancer [13, 14], AIDS [15] and heart disease [13, 16, 17]. Consequently, although timely preventive care is critical for adults with a history of childhood abuse, this population is also at greater risk of delaying preventive care [5, 18, 19]. Adults with a childhood abuse history may also face unique psychological and psychosocial barriers to timely preventive care stemming from their early life adversity. Two such barriers are trauma reliving and poor patient-provider communication.

The Relationship between Childhood Sexual Abuse, Trauma Reliving and Timely Preventive Care

Findings from qualitative studies and descriptive analyses suggest that women with a childhood sexual abuse history experience more psychological anxiety and discomfort before, during and after pap smears and breast exams than women without a trauma history [20-22]. This is due to a variety of factors, including aspects of the screening triggering abuse flashbacks and the patient/provider power disparity being reminiscent of the power dynamic with their abuser [20, 21]. Men and women with a history of childhood sexual abuse likewise report experiencing discomfort during dental visits related to reclining in a chair, not being able to see what the dentist is doing, and the smell of the dentist's latex gloves reminding them of condoms [23]. Consequently, it is possible that the psychological distressed induced by undergoing these procedures may lead adults with a childhood sexual abuse history to delay utilization of breast and cervical cancer screenings and dental cleanings as a means of *experiential avoidance*, or deliberately circumventing situations that produce unpleasant thoughts and feelings [24]. Previous studies have demonstrated that adults with a childhood sexual abuse history exhibit higher levels of experiential avoidance [25, 26] and that, among women generally, high experiential avoidance is associated with fewer women's health screenings [27].

The Relationship between Childhood Abuse, Patient-Provider Communication and Timely Preventive Care

Adults with a childhood abuse history are also more likely than adults without a childhood abuse history to experience interpersonal problems, such as difficulty trusting caregivers and talking openly about intimate topics which may garner disapproval [28, 29]. Previous studies among the general population have found that patient interpersonal problems carry over into the clinical encounter [28, 30] and that aspects of the patient's relationship with his/her provider, including whether the patient trusts the provider and is able to communicate openly with him or her, can impact timely receipt of an HIV test [31], prostate cancer screening [32] and colorectal cancer screening [33]. Consequently, it is plausible that the interpersonal problems of adults with a childhood abuse history may interfere with the quality and openness of their communication with their provider and result in delayed HIV tests, prostate cancer screenings and colorectal cancer screenings.

How Adults with a Childhood Abuse History Use Preventive Care

Despite the aforementioned array of socioeconomic, psychological and psychosocial barriers that adults with a childhood abuse history face to routinely using preventive care, little is known about how this population actually uses preventive care. Of the few U.S. studies examining how adults with a childhood abuse history use preventive care, all have been conducted with clinic-based samples and focus on timely receipt of women's health screenings [34-36]. For example, two studies using a relatively small sample of female Health Maintenance Organization (HMO) members found that women with a childhood sexual abuse history were significantly more likely to delay cervical cancer screenings but not breast cancer screenings [34, 35]. The generalizability of these findings to a population-based sample of women with a childhood sexual abuse history is questionable; since HMO members are more affluent than non-HMO members [37], HMO members with a childhood sexual abuse history are likely more resilient than non-HMO members with a childhood sexual abuse history and consequently may be

less sensitive to the long-term psychological ramifications of childhood abuse on adult preventive care utilization. Further, no known studies have examined: 1) whether childhood abuse history is associated with timely utilization of other preventive services, like dental cleanings, HIV tests, prostate and colorectal cancer screenings; and 2) whether childhood abuse impacts adult preventive care utilization globally, meaning all services are similarly affected, or selectively, meaning only some services are affected.

To address these gaps in the literature, I used a population-based sample to examine whether adults with a childhood abuse history utilize eight preventive services according to recommended guidelines for disease prevention and early disease detection. My findings illustrate the importance of examining the value of care used by adults with a childhood abuse history in order to identify strategies for reducing the burden of this high-need population on the healthcare system.

Literature Review

Although childhood abuse has long been recognized as a social problem, it only recently gained traction as a public health problem [38]. Adults with a childhood abuse history pose a significant burden to the healthcare system, as Fang and colleagues estimated that each case of reported child abuse may be associated with as much as $43,178 in excess lifetime healthcare costs [39]. Such spending levels are unsustainable, as 189,336 children were reported victims of physical or sexual abuse in Fiscal Year 2012 alone [40]. One strategy for attenuating the economic impact of this population on the healthcare system is to ensure that they are regularly using high-quality services. Yet, much of the existing literature in this field has focused on quantifying how much excess reactive care utilization is attributable to being abused as a child [41, 42]. Little is known about the value of care used by individuals with a childhood abuse history and whether disparities in their care value may be contributing to their excess healthcare costs. One type of high-value care which merits further attention among this population is their utilization of preventive services, given the benefits of timely preventive care for populations

which are at elevated risk of developing conditions that are preventable or respond well to early detection [43].

This literature review describes what is currently known about how adults with a childhood abuse history use preventive care. I discuss the significant problems with previous work in this area and illustrate how this study will advance our understanding of how adults with a childhood abuse history use preventive care.

The Relationship between Childhood Abuse and Timely Breast Cancer Screenings

Only one study has previously examined the association between childhood abuse history and timely breast cancer screenings [35]. In this study, Farley and colleagues found that, among 615 female Kaiser Permanente members between the ages of 50 and 72, those with a history of any childhood physical assault or sexual assault before age 13 did not significantly differ from women without a childhood assault history in their receipt of a mammogram within the past 2.25 years. While bivariate comparisons revealed that women with a history of sexual assault after age 13 were significantly less likely to report receiving a timely mammogram ($p=0.045$), this association was no longer significant after the authors adjusted for demographics (e.g. age, race/ethnicity), symptoms of Post-Traumatic Stress Disorder (PTSD) and other types of trauma. Farley and colleagues also found that women who reported experiencing more types of trauma during their lifetime had significantly lower odds of reporting a timely breast cancer screening ($OR=0.98$; $p=0.0001$).

Two related studies have examined the association between timely breast cancer screenings and a history of any lifetime victimization, meaning the victimization could have occurred when the woman was a child or an adult. The first study by Modesitt and colleagues used a clinic-based sample of 125 female cancer patients and found in bivariate comparisons that, among women ages 40 and older, those with a lifetime history of any physical or sexual assault did not differ from women without a lifetime history of violence in their reported receipt of a mammogram within the past year ($p=0.19$) [44]. In contrast, Watson-Johnson and colleagues used

a large, weighted population-based sample of individuals who participated in the 2006 Behavioral Risk Factor Surveillance System (BRFSS) and found that, among women ages 40 and older, those with a lifetime history of any sexual victimization (SV) were significantly less likely to report having received a mammogram in the past two years (74.00% among those with a SV history and 77.10% among those without a SV history), even after controlling for sociodemographics, health insurance status, usual source of care, and receipt of routine check-ups [45].

The variation in Watson-Johnson et al.'s findings, compared to Farley et al.'s and Modesitt et al.'s findings, could be due to selection bias in the latter two studies. For example, adults with a childhood abuse history who are recruited from private ambulatory clinics are likely not representative of the general population of adults with a childhood abuse history, who are more likely to be of low socioeconomic status [8], uninsured or on Medicaid [9], and regularly receive medical care in the Emergency Department [46]. Similarly, Watson-Johnson et al. used a large (n=58,219) sample of randomly selected adults which, after weighting, was representative of the population of eleven states; whereas, the other two studies used small (n<700) samples which were non-randomly recruited from, at most, several clinics in one state. However, one shortcoming which should be kept in mind about Watson-Johnson et al.'s finding is their conceptualization of sexual victimization, which lumps together childhood and adult victimization and fails to adjust for potentially co-occurring types of victimization. This lack of specificity makes it impossible to discern whether childhood sexual abuse specifically, adult sexual victimization specifically, lifetime sexual victimization, or another type of victimization entirely puts individuals at-risk for delaying breast cancer screening. Furthermore, since adult assault victims likely use preventive care differently than adults who were abused as children, capturing both of these constructs with one variable may obscure the true impact of each type of victimization on timely breast cancer screening.

The Relationship between Childhood Abuse and Timely Cervical Cancer Screenings

Consistent with the predominate focus on women's health issues in the child abuse literature, several studies have examined how women with a childhood abuse history use cervical cancer screenings. A 2002 study by Farley and colleagues found that, among 736 female Kaiser Permanente members between the ages of 21 and 64 who had not undergone a full hysterectomy, those with a history of any childhood sexual trauma were significantly less likely to have received a pap smear within the past two years [34]. This association was attenuated but remained significant (AOR=0.56, 95% CI: 0.34, 0.91) after controlling for sociodemographics, the perceived benefits and costs of screening, and other reported nonviolent trauma exposures (i.e. experiencing a natural disaster as a child) which were bivariately associated with the outcome variable. Likewise, Olesen and colleagues randomly surveyed 1,685 women between the ages of 40-44 and 60-64 from the electoral rolls of two cities in Australia and found that women with a history of childhood sexual abuse had significantly lower odds of receiving a cervical cancer screening within the past two years (AOR=0.42, 95% CI: 0.20, 0.91) [47]. Improving over the 2002 study by Farley et al., Olesen et al. weighted their results to correct for non-response bias and controlled for other types of abuse, such as childhood physical abuse history. Leeners and colleagues, however, had somewhat different findings. In this study, women in Germany who had recently received psychological support for coping with their childhood sexual abuse history did not bivariately differ from women with a childhood sexual abuse history in their reported routine utilization of gynecological care (70.60% vs. 87.60%, respectively), although women with a childhood sexual abuse history were significantly more likely to have reported recently seeking treatment for acute gynecological problems (37.60% vs. 20.50%, respectively) [20].

Two related studies from the lifetime victimization literature also merit briefly discussing here. The first study by Lang and colleagues found that, among a sample of 221 female veterans who had been treated in a Veterans Affairs primary care clinic in the past year, those who self-identified as having a lifetime history of sexual assault reported receiving significantly more pap

smears in the past five years than women without such a history, even after adjustments were made for socioeconomic status and PTSD severity [48]. The population-based study by Watson-Johnson et al. described earlier, however, found that women with a lifetime history of any sexual victimization did not differ from women without a lifetime sexual victimization history in their reported receipt of a pap smear within the past three years (84.10% vs. 83.30%, respectively) [45].

Along with the problems discussed previously of using clinic-based samples and lifetime measures of victimization, there are two other factors which may be contributing to the inconsistencies between these studies. First, there is considerable variation between the studies in how cervical cancer screening was measured. Whereas Farley et al. and Olesen et al. used two years as their frame of reference for timely cervical cancer screening, Watson-Johnson et al. used three years and Lang et al. captured the number of screenings, rather the timing of the screenings. Second, whereas some studies used self-reported cervical cancer screening history (e.g. Watson-Johnson et al.), others (e.g. Farley et al., Olesen et al.) used administrative records of cervical cancer screening. Such variation makes it difficult to discern whether the differences in these study findings are attributable to study design and measurement issues or actually reflect nuances of this population's screening behavior.

The Relationship between Childhood Abuse and Timely Prostate Cancer Screenings

No known studies have specifically examined how a history of childhood abuse impacts timely prostate cancer screenings. In the lifetime victimization literature, however, Watson-Johnson et al. found that, among men age 50 and older, those who reported a history of lifetime sexual victimization were significantly less likely to report receiving a prostate-specific antigen (PSA) test within the past two years (54.30% vs. 64.80%) until insurance status was taken into account [45].

The Relationship between Childhood Abuse and Timely Colorectal Cancer Screenings

Although the impact of a childhood abuse history on timely receipt of colorectal cancer screenings is unknown, the aforementioned studies by Modesitt et al. and Watson-Johnson et al. also included colorectal screening as an outcome when examining the relationship between lifetime victimization and timely preventive care utilization. As was the case with timely mammogram receipt, Modesitt and colleagues found in bivariate comparisons that, among women age 50 and older, those with a lifetime history of physical or sexual assault did not differ from women without an assault history in their lifetime receipt of a colonoscopy ($p=0.71$) [44]. In addition to the selection bias issues raised earlier and the study's lack of multivariate adjustment for potential covariates, the conclusions which can be drawn from this particular result are even further limited by the small number of women in the sample who were age 50 and older ($n=65$).

Watson-Johnson and colleagues stratified their analysis by gender for this outcome and found that, among women age 50 and older, those with a history of lifetime sexual victimization were significantly less likely than women without a lifetime sexual victimization history to report having received either a fecal occult blood test within the past year or an endoscopy within the past five years (50.20% vs. 57.20%, respectively) [45]. This association was no longer significant after multivariate adjustments for covariates, however. Further, among men age 50 and older, no differences emerged in timely colorectal cancer screening between men with and without a lifetime sexual victimization history.

The Relationship between Childhood Abuse and Timely Routine Check-ups

No previous studies have specifically examined how a history of childhood abuse impacts timely receipt of routine check-ups. Bivariate comparisons in the study by Watson-Johnson and colleagues, however, revealed that, while women with a history of lifetime sexual victimization were significantly less likely than women without such a history to have received a routine check-up in the past year (64.40% vs. 73.90%), men with a history of lifetime sexual victimization did not significantly differ in the timeliness of their last routine check-up [45]. Since routine check-up

was conceptualized as a covariate rather than an outcome variable in their study, this association was not examined multivariately and therefore may simply reflect the greater economic impact of victimization on women compared to men [8].

Possible Explanations for Why Adults with a Childhood Abuse History Delay Preventive Care

Several studies have also preliminarily examined possible mechanisms for why adults with a childhood abuse history may be more likely to delay preventive care. One of the most commonly explored deterrents to preventive care utilization among this population is whether certain services, such as pap smears, are more traumatic for women with a childhood sexual abuse history, given the similarities between the invasiveness of the procedure and their abuse experiences. Both qualitative studies and basic surveys have concluded that women with a childhood sexual abuse history experience more psychological anxiety and discomfort preceding, during and following pap smears and breast exams than women without a trauma history [20-22]. This is due to a number of factors, including: aspects of the screening triggering memories of their abuse (i.e. hearing, "This will not hurt,") [20, 21]; apprehension about being naked [20]; the patient/provider power disparity being reminiscent of the power dynamic with their abuser [21]; and fears that the provider will somehow discover signs of the abuse during the pelvic examination [21]. Men and women with a history of childhood sexual abuse have also expressed concerns about the patient/provider power disparity during dental visits related to reclining in a chair, not being able to see what the dentist is doing, and the smell of the dentist's latex gloves reminding them of condoms [23].

Whether these apprehensions specifically interfere with how this population uses preventive care has only been examined in one study to date. In the 2002 study by Farley and colleagues described earlier, multivariate analyses adjusted for whether the patient endorsed the statement that "Pap would cause sexual assault flashbacks, or healthcare provider to look at me in a sexual way [49]." Although the study results suggest that patients who endorsed this screening attitude did not differ from those who did not in their timely receipt of a cervical cancer

screening, it is plausible that this nonsignificant finding could either reflect the resiliency of the study sample, given their membership in a HMO, or the impact of social desirability bias on how participants responded to this question.

Two additional mechanisms which have been theorized to mediate the relationship between childhood abuse history and timely preventive care are PTSD and insurance status. The study by Lang and colleagues described previously tested PTSD severity as a potential mediating factor and found that introducing this variable into the model strengthened, rather than attenuated, the significance of the focal relationship [50]. Although insurance status has not yet been formally tested as a mediating factor, Watson-Johnson and colleagues suggested that future work should explore its potential role as a mediator after finding that the association between lifetime sexual victimization and timely prostate cancer screening was no longer significant once insurance status was taken into account [45].

Preventive Care Utilization by Adults with a Childhood Abuse History: Summary of Gaps in the Literature

In conclusion, there is scant consensus in the literature regarding how adults with a childhood abuse history use preventive care. Previous work has focused solely on how women with a childhood sexual abuse history use breast and cervical cancer screenings without exploring how utilization of other preventive services might be affected among both men and women. Further, what is known from clinic-based studies about how women with a childhood sexual abuse history use breast and cervical cancer screenings may not generalize to a representative, population-based sample of women with a childhood sexual abuse history. Further investigation is needed which specifically examines how a large, population-based sample of adults with a childhood abuse history use an array of preventive services. Future studies should also move beyond descriptively documenting disparities in preventive care utilization among this population and attempt to identify the mechanisms causing these disparities.

Conceptual Framework

The conceptual framework which guided my analyses fused Andersen's original Behavioral Model of Health Services Use with two theories from social psychology - Skinner's theory of operant conditioning and Bowlby's attachment theory.

Andersen's Behavioral Model

The Behavioral Model was first developed by Andersen in 1968 to conceptualize the confluence of factors which drive how families use formal healthcare [51]. In this original version of the model, Andersen presented three domains of factors which influence healthcare utilization patterns. *Predisposing factors* are characteristics which influence an individual's propensity to use care, including demographics, social structure (e.g. social status, race/ethnicity) and health beliefs. *Enabling factors*, such as income, insurance status and usual source of care, facilitate or hinder an individual's ability to seek care when needed. Lastly, *need* captures an individual's perceived and evaluated physical and mental health and functional state.

Skinner's Theory of Operant Conditioning

According to Skinner's *theory of operant conditioning*, individuals modify their behavior based on the consequences they experience after completing various actions [52]. One mechanism through which this behavior modification operates is *reinforcement*, which occurs when the outcome of a behavior strengthens the likelihood that the behavior will be learned and repeated. Reinforcement can either be *positive*, meaning the individual receives something desirable from the behavior, or *negative*, meaning the behavior removes a stimulus that the individual perceives to be unpleasant. One way that individuals learn behaviors which are negatively reinforcing is through *avoidance learning*, which encompasses learning a behavior that precedes an unpleasant stimulus and delays or prevents it from happening [53].

Bowlby's Attachment Theory

Bowlby's attachment theory explains how early caregiver interactions influence an individual's future interpersonal relationships [54, 55]. The theory's central tenant is that the

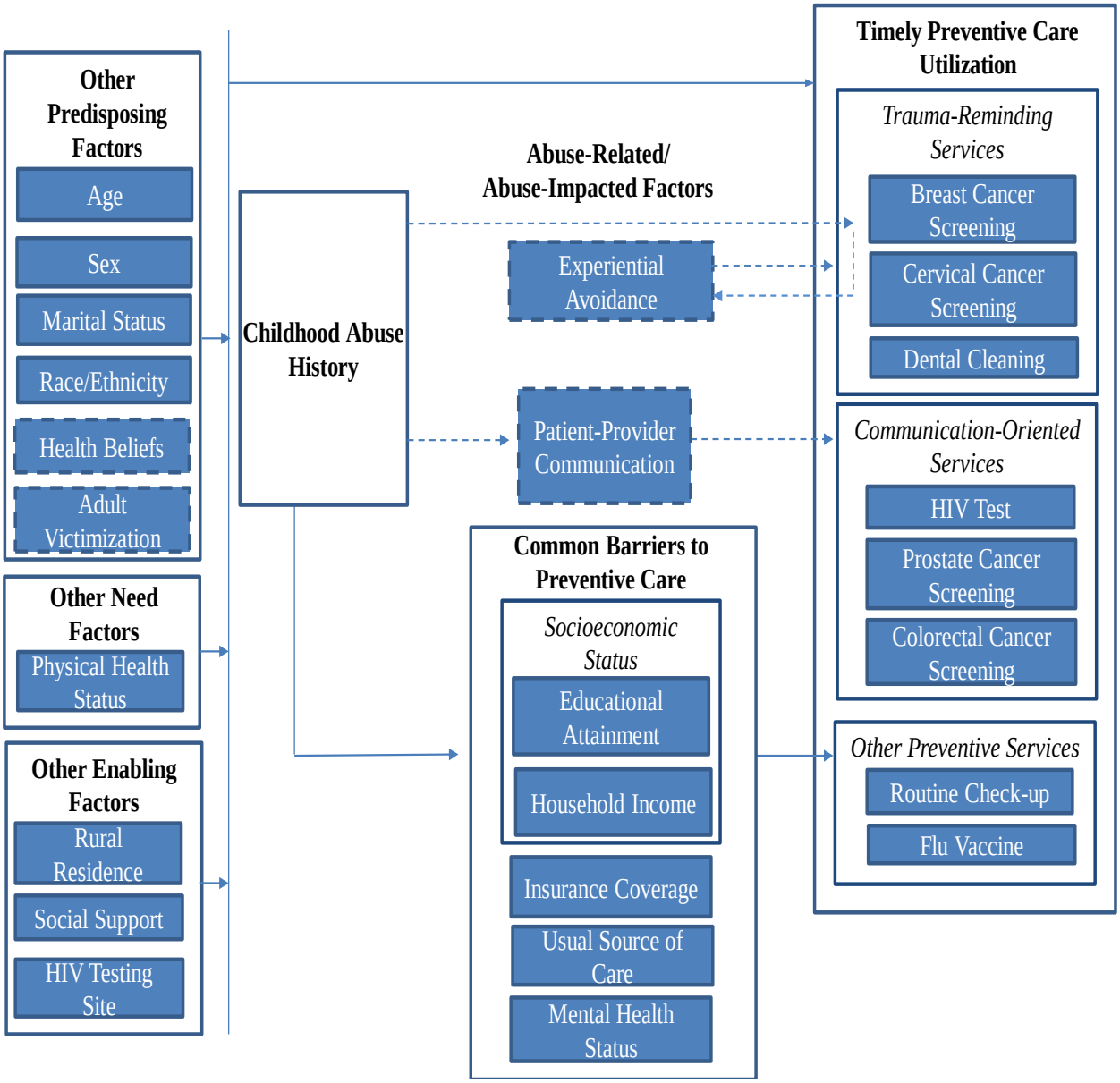
responsiveness of a child's caregiver to his/her needs shapes the child's *internal working model*, or expectations of how others respond during times of perceived vulnerability. Children who experience consistently responsive caregiving expect others to be dependable in times of need and develop a *secure attachment* style. Conversely, children who experience either consistently emotionally unresponsive or harshly rejecting caregiving develop an *insecure attachment* style, which is characterized by mistrust and discomfort depending on others during times of vulnerability. Since these expectations are self-perpetuating, an individual's attachment style is relatively stable by late adolescence or adulthood [56]. An individual's attachment style not only affects the closeness and quality of his/her personal relationships, but has also been demonstrated to impact a patient's illness behavior and aspects of the patient care experience [30]. For example, patients with an insecure attachment style can reject medical advice as a means of maintaining their self-reliance and avoid disclosing personal or risky behaviors to their providers [28, 57].

Illustrating How Adults with a Childhood Abuse History Use Preventive Care

Applying these frameworks to the study at hand, a variety of factors and processes may impact how adults with a childhood abuse history use preventive care. Many of these factors, such as those depicted in the Behavioral Model, are not unique to the experience of being abused and affect timely preventive care utilization among individuals generally – although some factors likely play a more pronounced role in how this population uses preventive care, given the established impact of childhood abuse on adult socioeconomic status and other outcomes. Other processes are more uniquely related to the long-term ramifications of being abused. For example, since some preventive services are trauma-reminders, adults with a childhood abuse history may learn that avoiding these services alleviates the anxiety that accompanies them. Similarly, since individuals who are abused typically exhibit insecure attachment styles [58], the interpersonal difficulties associated with this attachment style may interfere with patient-provider communication and subsequently affect the timely receipt of preventive services which require open, precursory discussions between the patient and provider.

Figure 1 provides a visual representation of how I anticipated abuse-related, predisposing, enabling, and need factors would be associated with timely preventive care utilization by adults with a childhood abuse history. In the following subsections, I will define the constructs falling under each of these categories and describe how they were assumed to influence the focal relationships.

Figure 1. The Impact of Childhood Abuse History on Timely Preventive Care Utilization



Independent Variable: Childhood Abuse History

According to the Centers for Disease Control and Prevention, child abuse encompasses any deliberate actions or words delivered by a parent or caregiver that either result in harm or could result in harm to a child [59]. The three recognized forms of child abuse are: physical abuse, or purposive physical injury to a child; sexual abuse, which entails sexually touching a child, performing sexual acts on a child, and/or forcing a child to perform sexual acts; and emotional abuse, or behaviors which undermine a child's sense of self-worth, such as constant criticism, rejection, or withholding love [60]. I use the term "childhood abuse" instead of "child abuse" to indicate the retrospective reporting of abuse exposure by adults in the source study.

Abuse-Related Factor: Experiential Avoidance

Experiential avoidance is a coping strategy which individuals use to disengage from upsetting thoughts, memories or emotions [24]. Following the principle of avoidance learning, individuals adopt behaviors which will reduce their likelihood of experiencing these unpleasant cognitions and emotions – which can entail learning to avoid or delay the events triggering such sensations. Repeated engagement in experiential avoidance is maintained by negative reinforcement, since these learned behaviors help individuals achieve their desired outcome of avoiding undesired cognitions and emotions.

Abuse-Impacted Factor: Patient-Provider Communication

Patient-provider communication refers to the information transfer and interaction between a patient and provider during the medical encounter [61]. Key aspects of patient-provider communication include whether the provider is able to clearly explain treatments or procedures, the patient is able to elucidate problems he/she may have with a treatment, and the patient's preferences are considered when devising treatment plans [61].

Predisposing Factors

Various factors can affect an individual's propensity to use preventive care in a timely manner. At the core of an individual's propensity to use preventive care is his/her health beliefs,

which constitute the knowledge, attitudes and values the individual holds about health and healthcare [62]. Demographic factors (i.e. age, sex, marital status) and social structure elements (i.e. social status, race/ethnicity) not only shape an individual's health beliefs, but also influence how the individual acts on his/her health beliefs. Age is the chronological amount of time that has elapsed since an individual's birth [63]. Sex reflects the biological and physiological characteristics that are unique to either men or women [64]. Marital status reflects an individual's civil status in relation to the marriage laws and customs of his/her country and encompasses the domestic, family and economic obligations that are tied to the presence or absence of a marital partner [65, 66]. Social status refers to an individual's rank in society, based on such factors as their educational attainment [67, 68]. Lastly, race/ethnicity is a socio-political construct that captures an individual's geographic origin and self-identification (or lack thereof) with the Hispanic culture [69].

One additional factor which may particularly affect the propensity of adults with a childhood abuse history to use preventive care is their history of adult victimization. Adult victimization involves experiencing intimate partner violence or physical or sexual assault at or after age 18 [70].

Need

An individual's physical and mental health status can influence his/her perceived illness susceptibility and perceived need for preventive care. Whereas physical health status is an individual's self-reported account of the various manifestations that disease can take, including symptoms and functional limitations, mental health status refers to an individual's self-perceived psychological distress and well-being [71, 72].

Enabling Factors

When an individual has the predisposition and need to use preventive care, his/her personal repository of financial and logistical resources and access to community resources affect the feasibility of seeking care. One factor which impacts an individual's access to community

resources is rural residence, or living in an isolated area with low population density [73]. Another factor which can influence an individual's access to routine HIV testing is HIV testing site, or the location (e.g. private doctor, counseling/testing site, correctional facility) where individuals are usually tested [74]. Key personal/family resources which also impact how individuals use care are their economic status, insurance coverage, usual source of care and social support. Economic status refers to the level of financial resources an individual has, including income, savings and assets [75]. Insurance coverage refers to the level of health insurance benefits an individual has available to offset the cost-sharing associated with using healthcare [76]. Usual source of care refers to the particular healthcare professional, doctor's office, clinic, health center or other location where an individual usually goes when he/she is sick or in need of health advice [77]. Lastly, social support is an individual's "access to and use of individuals, groups, or organizations in dealing with life's vicissitudes [78]."

Dependent Variable: Timely Preventive Care Utilization

Timely preventive care utilization is an individual's use of clinical services, such as immunizations, disease screenings, and behavioral counseling interventions, according to recommended guidelines for effectively preventing disease and initiating early treatment for conditions that are not yet symptomatic [79]. For the purpose of this study, I classified preventive care into three categories: 1) trauma-reminding services, or preventive services which may trigger the reliving of abuse experiences; 2) communication-oriented services, or preventive services which require patient-provider discussions of patient risk factors and the costs and benefits of screening before administration; and 3) other preventive services, or services which are theorized to be unaffected by a history of childhood abuse.

Connecting Childhood Maltreatment to Timely Preventive Care Utilization

I expected that a history of childhood abuse would be significantly associated with a lower likelihood of utilizing trauma-reminding preventive services and communication-oriented preventive services in a timely manner. These relationships were theorized to be driven by

experiential avoidance and patient-provider communication, respectively, and to persist even after predisposing, enabling and need factors were taken into account. I did not anticipate that other preventive services would be associated with a history of childhood abuse once predisposing, enabling and need factors were taken into account.

Unmeasurable Abuse-Related Factor: Experiential Avoidance

I anticipated that childhood abuse history would be inversely related to the timely utilization of trauma-reminding services through a feedback loop between trauma-reminding service utilization and experiential avoidance. Specifically, I assumed that, after initially utilizing trauma-reminding services and experiencing the memories and emotions triggered by these services, adults with a childhood abuse history would be more likely to engage in experiential avoidance – which would, in turn, be inversely related to their subsequent timely utilization of trauma-reminding services.

Unmeasurable Abuse-Impacted Factor: Patient-Provider Communication

I anticipated that a history of childhood abuse would be inversely related to good patient-provider communication, given the aforementioned interpersonal difficulties that individuals with an insecure attachment demonstrate in medical encounters. Previous work has demonstrated that good patient-provider communication is, in turn, directly related to receipt of communication-oriented services, such as colorectal cancer screenings [80].

Common Barrier to Timely Preventive Care: Adult Socioeconomic Status

Previous work has demonstrated that exposure to childhood abuse is inversely related to adult socioeconomic status [8, 9]. This is because individuals with a childhood abuse history are less likely to graduate from high school or pursue post-secondary education and are more likely to have a household income under the Federal Poverty Line. Lower socioeconomic status is, in turn, inversely related to timely preventive care utilization [81], since: 1) individuals of lower social status are less likely to understand the health benefits of regularly using preventive care;

and 2) individuals of lower economic status have fewer financial resources available to offset the out-of-pocket costs associated with preventive care utilization.

Common Barrier to Timely Preventive Care: Insurance Coverage

Childhood abuse history is also inversely related to having insurance coverage as an adult [9]. Such a relationship may reflect either this population's employment difficulties or the fact that, prior to the passage of the Affordable Care Act, not all low income adults were eligible for Medicaid – and even some who were eligible did not enroll [82]. Not having insurance coverage is, in turn, well understood to be inversely related to timely preventive care utilization, since individuals without insurance coverage are responsible for paying the full out-of-pocket costs associated with using preventive care [83].

Common Barrier to Timely Preventive Care: Usual Source of Care

Although it has not yet been examined in the literature, I assumed that childhood abuse history would also be inversely related to having a usual source of care as an adult. This is because adults with a childhood abuse history are more likely to be of low socioeconomic status and less likely to have insurance coverage – both of which are risk factors among the general population for not having a usual source of care [84]. Not having a usual source of care, in turn, is inversely related to timely preventive care utilization [29].

Common Barrier to Timely Preventive Care: Mental Health Status

Childhood abuse is well understood to be related to poor mental health status as an adult [10, 11], due to its long-term ramifications on an individual's self-esteem, interpersonal functioning and emotional well-being. Poor mental health status is, in turn, inversely related to timely preventive care utilization, since individuals with poor mental health status face greater cognitive, psychological and psychosocial barriers to utilizing preventive care according to recommended guidelines [85].

Other Predisposing Factors

Based on previous studies, I assumed that individuals who are older, male, of minority race/ethnicity and not currently married would be less likely to use preventive care in a timely manner [86-88]. Previous work has also suggested that an individual's health beliefs, such as his/her perceived illness susceptibility, perceived illness severity, and perceived costs/benefits of utilizing care, can directly or inversely impact timely preventive care utilization [86]. I assumed that individuals who have low perceived illness susceptibility, high perceived illness severity, and low perceived benefits from utilizing a specific preventive service would be less likely to use the service in a timely manner. Lastly, the relationship between adult victimization and timely preventive care has not yet been rigorously explored [34, 35]; however, I assumed that the greater propensity of adult victimization to be revealed in the medical encounter (e.g. through routine screenings of women for intimate partner violence exposure) would result in timelier utilization of some preventive services, like HIV tests and cervical cancer screening.

Other Need Factors

Although the relationship between physical health status and timely preventive care utilization is unclear [83, 89], I assumed that poor physical health status would be directly related to timely preventive care utilization, since individuals with poor physical health may have greater perceived illness susceptibility and more opportunities for preventive care receipt during their frequent, need-driven healthcare visits.

Other Enabling Factors

Poor social support has been inversely linked to timely preventive care utilization [90, 91], likely since it exacerbates the financial and logistical barriers that individuals must overcome in order to seek care. Rural residence is also inversely related to timely preventive care utilization [92], since providers are less concentrated in rural areas and therefore the logistical burden of receiving care is higher for the patient. Lastly, previous work suggests that HIV testing patterns among at-risk individuals vary by testing site [74]. Since healthcare professionals are

recommended to routinely screen at-risk individuals for HIV as part of their clinical practice [93], I assumed that timely HIV tests would be more prevalent among individuals who received their last test in an ambulatory care setting (e.g. private doctor or HMO, clinic) or at a referral clinic (e.g. counseling/testing site); whereas, timely testing would be less prevalent among individuals who received their last test during short-term treatment (e.g. at a hospital or drug treatment facility) or in prison, where testing typically occurs at intake or during an initial medical examination.

Study Hypotheses

Given these relationships, I hypothesized that, for trauma-reminding services:

- **Hypothesis #1:** After controlling for other predisposing, enabling and need factors, adults with a history of childhood abuse will be significantly less likely to utilize trauma-reminding services and routine check-ups in adherence with recommended guidelines.
- **Hypothesis #2:** The negative association between childhood abuse history and timely utilization of trauma-reminding services will remain significant after controlling for common barriers to preventive care.

Similarly, I hypothesized that, for communication-oriented services:

- **Hypothesis #3:** After controlling for other predisposing, enabling and need factors, adults with a history of childhood abuse will be significantly less likely to utilize communication-oriented services and routine check-ups in adherence with recommended guidelines.
- **Hypothesis #4:** The negative association between childhood abuse history and timely utilization of communication-oriented services will remain significant after controlling for common barriers to preventive care.
- **Hypothesis #5:** The negative association between childhood abuse history and timely HIV tests will remain significant after also controlling for HIV testing site.

Methods

Study Sample

The data used in this study are from the 2010 Behavioral Risk Factor Surveillance System (BRFSS). The BRFSS is an ongoing collaborative effort between the Centers for Disease Control and Prevention and U.S. state and territory governments to annually collect self-reported data on risk behaviors, health practices and health status among the adult (18+) non-institutionalized population [94]. As part of the surveillance, households with one or more landlines were selected using a disproportionate stratified sampling strategy, and one adult in each household was administered the survey via Computer-Assisted Telephone Interviewing between January 2010 and January 2011. Whereas all participants were asked the core module questions, each state/territory was also given the opportunity to include optional modules and additional questions at the end of the survey. In the 2010 BRFSS, preventive care utilization was inquired about in the core module and five states (District of Columbia, Hawaii, Nevada, Vermont and Wisconsin) opted to administer the Adverse Childhood Experiences optional module, which collected data about childhood abuse history and other types of childhood adversity. The sample for this study was drawn from 26,020 individuals from the five states which administered the Adverse Childhood Experiences optional module. I excluded 2,190 participants (8.42% of sample) with incomplete data on childhood abuse history, leaving a final sample of 23,830 participants.

Study Design

Given the inherent limitations with establishing causality in cross-sectional studies, I incorporated two mechanisms into this study to strengthen the validity of the conclusions which can be drawn from my results [95, 96].

First, I selected two preventive services, flu vaccine and routine check-up, to include in the analyses as counterfactuals. Although both services were theorized to be unrelated to childhood abuse, these relationships were expected to come about differently for each service. I

expected that childhood abuse history would be unrelated to timely flu vaccine receipt after other predisposing, enabling and need factors were taken into account since flu vaccines are not invasive, require minimal patient-provider communication, and receipt is not dependent on being able to access medical care. While routine check-ups are similar to flu vaccines in that they are not invasive and require minimal patient-provider communication, their receipt is more dependent on factors which affect access to medical care, like insurance coverage and having a usual source of care. Therefore, I hypothesized that the direct effect of childhood abuse history on timely routine check-up receipt would be significant until common barriers to preventive care were also taken into account. Taken together, these counterfactuals were chosen to: 1) illustrate that childhood abuse history impacts utilization of some preventive services and not others, independent of common barriers to preventive care; and 2) decrease the likelihood that unmeasurable factors which generally affect preventive care utilization, like health beliefs, actually caused any utilization disparities which emerged among this population.

Second, for each pathway through which childhood abuse history was theorized to impact timely preventive care utilization, I selected three services which were anticipated to be similarly affected by the pathway. Since I did not have measures available to directly test these pathways via mediation, this strategy allowed me to examine whether there was coherence in the direction and significance of how childhood abuse history impacted all three outcomes. I interpreted coherence between the main effects as providing preliminary support of my theorized pathways and incoherence as suggesting that other, unobservable factors were actually driving the relationships which emerged.

Measures

All of the measures used in this study were derived from self-reports. For all items, responses of "Don't Know/Not Sure" or "Refused" were treated as missing.

Independent Variable: Childhood Abuse History

To create a summary measure of any childhood abuse history, I used responses of "more than once" to any of the five physical, sexual, or emotional abuse questions included in the Adverse Childhood Experiences module to indicate the presence of any childhood abuse and responses of "never" or "once" to all five questions to indicate no childhood abuse history. More information about each of the five abuse history questions is provided below. Although the operationalization of this measure is different from what previous studies have used [97, 98], I selected it to approximate how childhood abuse history is more conservatively estimated via other self-report measures, like the Childhood Trauma Questionnaire, which distinguish recurrent abuse exposure from isolated abuse incidents which may not have the same long-term ramifications for affected individuals. Further, I mainly used a generic measure of any childhood abuse history in this study instead of creating several measures to capture each abuse type separately since poly-victimization was common among the study sample; therefore, for outcome variables with relatively small sample sizes, it would have been statistically unsound to draw conclusions about the very small number of individuals who only experienced one specific type of abuse.

Childhood Physical Abuse History

To inquire about childhood physical abuse history, participants were asked how often [Never/Once/More than Once] a parent or adult at home ever hit, beat, kicked or physically hurt them before age 18. This item is adapted from several questions in the Parent-Child Conflict Tactics Scale, which is an instrument designed to capture parental use of violent (i.e. physical and psychological maltreatment) and nonviolent disciplinary techniques with their children [99]. To my knowledge, the psychometric properties of this item have not yet been evaluated.

Childhood Sexual Abuse History

To capture childhood sexual abuse, participants were asked how often [Never/Once/More than Once] someone 5+ years older or an adult "touched you sexually," "tried to make you touch them sexually," or "forced you to have sex" before age 18. These three items were adapted from

questions in the Wyatt Sexual History Questionnaire, which is a structured interview originally designed to capture aspects of female sexualization, including a history of sexual abuse [100]. To my knowledge, the psychometric properties of these three items have not yet been evaluated.

Childhood Emotional Abuse History

To assess childhood emotional abuse history, participants were asked how often [Never/Once/More than Once] a parent or adult at home ever swore at them, insulted them, or put them down. This item was also adapted from questions in the Parent-Child Conflict Tactics Scales instrument and has demonstrated test-retest reliability (weighted-kappa statistic = 0.65) [101].

Common Barrier to Timely Preventive Care: Adult Socioeconomic Status

Two measures of adult socioeconomic status were included in this study – reduced educational attainment and low household income [102].

For educational attainment, participants were asked to report the highest year of school they completed [Never attended or only kindergarten/Grades 1– 8/Grades 9 – 12/ Grade 12 or GED/College 1 to 3 years/College 4 years or more]. Reduced educational attainment was captured with a dichotomous measure of whether the highest level of education completed was "High School Graduate or Less."

Low household income was operationalized as being at or below 200% of the Federal Poverty Line (FPL) [103]. Three variables were used to approximate an individual's financial standing relative to the FPL. The first variable was annual household income from all sources, which was measured categorically in the BRFSS [<$10,000; $10,000-$14,999; $15,000-$19,999; $20,000-$24,999; $25,000-$34,999; $35,000-$49,999; $50,000-$74,999; $75,000+]. The other two variables were the reported number of adults and children in the household, which were summed to create a measure of the total number of individuals in the household. Approximating the 2010 Poverty Guidelines issued by the United States Department of Health and Human Services (see *Table 1*), individuals were classified as having low household income if their

household income was at or below: $24,999 for a family of 1; $34,999 for a family of 2; $49,999 for a family of 3 or 4; and $74,999 for a family of 5+ [104].

Table 1. 2010 Poverty Guidelines - 200% FPL Thresholds by Family Size

Family Size	200% FPL – all states except Alaska and Hawaii	200% FPL - Hawaii
1	$21,660.00	$24,920.00
2	$29,140.00	$33,520.00
3	$36,620.00	$42,120.00
4	$44,100.00	$50,720.00
5	$51,580.00	$59,320.00
6	$59,060.00	$67,920.00
7	$66,540.00	$76,520.00
8	$74,020.00	$85,120.00

Common Barrier to Timely Preventive Care: Insurance Coverage

Not having insurance coverage was measured as a response of "No" to the question, "Do you have any kind of healthcare coverage, including health insurance, prepaid plans such as HMOs, or government plans such as Medicare?"

Common Barrier to Timely Preventive Care: Usual Source of Care

A response of "No" to the question, "Do you have one person you think of as your personal doctor or healthcare provider?" was used to capture not having a usual source of care.

Common Barrier to Timely Preventive Care: Mental Health Status

Poor mental health status was captured by individuals reporting that their mental health was not good for 14 or more of the past 30 days [65].

Dependent Variable: Timely Preventive Care Utilization

Table 2 provides an overview of the administration guidelines that were used to capture timely preventive care utilization. Since my focus in this study was on how individuals used preventive services that promote disease prevention and early disease detection, I opted to follow the cancer screening guidelines issued by the American Cancer Society rather than those issued by other agencies, like the United States Preventive Services Task Force, which reflect the cost-effectiveness of screening at various age groups.

Table 2. Overview of Preventive Service Administration Guidelines.

Source†	Preventive Service	Administration Guidelines
	Trauma-Reminding Services	
ACS	Breast Cancer Screening	❖ Women in 20s and 30s: Clinical breast exam every 3 years ❖ Women age 40+: Mammogram and clinical breast exam annually
ACS	Cervical Cancer Screening	❖ Women ages 21-65: Pap every 3 years
ADA	Dentist Cleaning	❖ Annually*
	Communication-Oriented Services	
CDC	HIV Test	❖ Annually for high risk individuals
ACS	Prostate Cancer Screening	❖ Between ages 40-50, men should discuss with their provider the pros/cons of screening. ❖ For those who decide to be screened, prostate-specific antigen (PSA) blood test should be given every 1-2 years, depending on the test results.
ACS	Colorectal Cancer Screening	❖ Beginning at age 50, men and women who decide to receive tests that find polyps and cancer (as opposed to primarily cancer) should receive a flexible sigmoidoscopy every 5 years or colonoscopy every 10 years.
	Other Preventive Services	
CDC	Routine check-up	❖ Annually*
CDC	Flu Vaccine	❖ Annually

Note: Given the need for further research into the costs and benefits of prostate cancer screening, ACS issued a recommendation rather than a guideline for prostate cancer screening.
†CDC=Centers for Disease Control and Prevention; ADA = American Dental Association; ACS = American Cancer Society
*These services are recommended to happen "regularly," but no firm guidelines are provided regarding their frequency.

Binary variables were used to capture timely utilization of each preventive service according to these guidelines. More details about how the timely utilization of each service was operationalized are below.

- ***Routine Check-Up.*** All participants were asked to indicate how long it had been since their last routine check-up [Within past year; Within past 2 years; Within past 5 years; 5 or more years ago]. Individuals who responded their last check-up was within the past year were counted as having received a routine check-up.

- ***Flu Vaccine:*** All participants were asked two dichotomous questions of whether they had received a seasonal flu shot or a seasonal flu vaccine that was sprayed in their nose in the past year. Individuals who indicated receiving either type of vaccine were counted as having received a flu vaccine in the past year.
- ***Dental Cleaning:*** Participants who had made a lifetime dentist visit and reported still having at least some of their permanent teeth were asked how long it had been since their last teeth cleaning by a dentist or dental hygienist [Within past year; Within past 2 years; Within past 5 years; 5 or more years ago]. Individuals who responded their last cleaning was in the past year were counted as having received a timely dental cleaning. Conversely, individuals whose last dental cleaning was 2+ years ago or reported never visiting the dentist were coded as not having received a routine dental cleaning.
- ***HIV Test:*** The sample for this outcome was restricted to individuals who indicated participating in at least one HIV high-risk activity during the past year (e.g. using intravenous drugs, paying or receiving money or drugs in exchange for sex, having anal sex without a condom), since there are not formal guidelines for routinely testing individuals who aren't at elevated risk of HIV. Participants under the age of 65 were asked if they had ever received a HIV test and, if so, to provide the month and year of their last HIV test. For individuals who were at-risk of HIV and had received a lifetime HIV test, I calculated the amount of time elapsed since their last test by subtracting their HIV test date from their BRFSS interview date. Individuals who received an HIV test in the past 1.25 years were then coded as having received a timely HIV test. Conversely, individuals who received their last HIV test more than 1.25 years ago or had never received an HIV test were coded as not having received a timely HIV test.

Since cancer screening guidelines are age-dependent, two additional strategies were employed for operationalizing timely cancer screening. First, since some individuals may have

been delayed in their screening onset due to a time lag between aging into the service and their next doctor's visit, a one year buffer was added to all screening guidelines with age specifications. Additionally, individuals who initiated screening prior to the recommended age for the screening were also counted as having received a timely cancer screening.

- ***Breast Cancer Screening:*** All women were asked if they had ever received a clinical breast exam and if they had ever received a mammogram. Women who responded in the affirmative for either or both questions were then asked how long it had been since each exam [Within past year; Within past 2 years; Within past 3 years; Within past 5 years; 5 or more years ago]. Women were counted as having received a timely breast cancer screening if they met one of the following criteria: 1) age 42 or older and received a mammogram and clinical breast exam in the past year; 2) between the ages of 24 and 41 and received a clinic breast exam in the past 3 years; 3) younger than age 42 and received a lifetime mammogram; or 4) younger than age 24 and received a lifetime clinical breast exam. Women who did not meet one of these criteria were coded as not having received a timely breast cancer screening.
- ***Cervical Cancer Screening:*** The sample for this outcome was restricted to women who had not undergone a hysterectomy and were not pregnant. These restrictions were made since: 1) cervical cancer screening is not recommended for women who have had a hysterectomy for benign health reasons [105]; and 2) cervical cancer screening is part of routine prenatal care [106]; therefore, including the screening utilization patterns of pregnant women would have upwardly biased the prevalence of timely cervical cancer screening among the study sample. All women were asked if they had ever received a Pap test and, if so, how long it had been since their last pap [Within past year; Within past 2 years; Within past 3 years; Within past 5 years; 5 or more years ago]. Women were counted as having received a timely cervical cancer screening if they met one of the following criteria: 1) age 24 or younger and received a lifetime pap; 2) between the ages of 25 and 68 and received a pap

test within the past 3 years; or 3) age 69 or older and received a pap test within the past 5 years. Women who did not meet one of these criteria were coded as not having received a timely cervical cancer screening.

- ***Prostate Cancer Screening:*** All men age 40 and older were asked if they had ever received a PSA test and, if so, how long it had been since their last test [Within past year; Within past 2 years; Within past 3 years; Within past 5 years; 5 or more years ago]. Men were counted as having received a timely prostate cancer screening if they met one of the following criteria: 1) age 43 or older and received their last screening within the past two years; or 2) age 42 or younger and received a lifetime prostate cancer screening. Men who did not meet one of these criteria were coded as not having received a timely prostate cancer screening.
- ***Colorectal Cancer Screening:*** All individuals age 50 and older were asked if they had ever received a sigmoidoscopy or colonoscopy, whether their last test was a sigmoidoscopy or colonoscopy, and how long it had been since their last sigmoidoscopy/colonoscopy [Within past year; Within past 2 years; Within past 3 years; Within past 5 years; 5 or more years ago]. Individuals were counted as having received a timely colorectal cancer screening if they met one of the following criteria: 1) age 56 or older and received a sigmoidoscopy within the past 5 years; 2) age 61 or older and received a colonoscopy within the past 10 years; 3) between ages 50 and 55 and received a lifetime sigmoidoscopy; or 4) between ages 50 and 60 and received a lifetime colonoscopy. Individuals who did not meet any of these criteria were coded as not having received a timely colorectal cancer screening.

Table 3 presents the final sample sizes for each preventive service outcome in this study.

Table 3. Final Sample Sizes for Each Study Outcome

Preventive Service	N
Trauma-Reminding Services	
Breast Cancer Screening	13,878
Cervical Cancer Screening	9,913
Dentist Cleaning	22,335
Communication-Oriented Services	
HIV Test	450
Prostate Cancer Screening	7,297
Colorectal Cancer Screening	9,976
Other Preventive Services	
Routine Check-Up	23,641
Flu Vaccine	23,704

Measurable Covariates: Other Predisposing Factors

Age was measured continuously, with values ranging from 18 to 99. Binary variables were created for male sex and not currently married [Never or Previously Married vs. Married]. Four dummy variables were created to indicate minority race/ethnicity [Black, Non-Hispanic; Hispanic; Other, Non-Hispanic; Multiracial, Non-Hispanic].

Measurable Covariates: Other Enabling Factors

Residing in a rural area was captured via not living in a Metropolitan Statistical Area (MSA) [vs. Living: in a MSA center city/Outside the MSA center city but inside the county containing the center city/Inside a suburban county of the MSA/In a MSA with no center city]. Poor social support was captured by rarely or never [vs. Always/Usually/Sometimes] receiving social and emotional support when needed [107].

Four dummy variables were created to capture HIV testing site [Counseling or Testing Site; Hospital; Clinic; or Other], with receiving last HIV test at a private doctor's office or HMO set as the Reference category. The "other" category includes four testing sites – jail, drug treatment facility, at home, or unspecified site – which were collapsed into one category to accommodate the small number of participants who reported receiving their last HIV test at each of these four locations.

Measurable Covariates: Other Need Factors

Poor physical health status was captured by individuals reporting that their physical health was not good for 14 or more of the past 30 days [108].

Additional Measures: Statistical Controls

Childhood abuse rarely happens in isolation from other types of adversity, like household dysfunction [109]. Therefore, I included a count variable with possible values ranging from 0 to 5 of the total number of other adverse childhood situations (witnessing domestic violence; living with someone who was: mentally ill; an alcoholic; used illegal drugs or abused prescriptions; or who served time in prison) that the individual reported experiencing before age 18 [110]. This measure was included to statistically parse out the true impact of childhood abuse history on preventive service utilization.

Additionally, to control for unobserved variation between the states represented in this study, a categorical variable was included in all models with each level indicating one of the five states.

Analysis

Data were analyzed using SAS 9.3 (Cary, NC) and Stata 12.0 (College Station, TX). For outcomes with restricted samples, such as HIV test and cervical cancer screening, the Stata *subpop* option was used with the survey commands to ensure standard errors were correctly calculated [111]. Significance was set at $p<0.05$.

Chi-squared tests of association and T-tests were first used to estimate bivariate differences in timely preventive service utilization by childhood abuse history, common barriers to preventive care, and other covariates. Next, three sets of weighted, multivariate probit models estimated the marginal effect of childhood abuse history on timely utilization of all eight preventive services. Whereas the first set of models adjusted for statistical controls (Equation #1), the second set of models introduced other predisposing, enabling and need factors (referred to as "covariates"; Equation #2) and the third set of models also adjusted for common barriers to

preventive care (referred to as "barriers"; Equation #3). This hierarchical approach was used since common barriers to preventive care may lie in the causal pathway between childhood abuse history and timely preventive care utilization [45]; therefore, adjusting for them could bias estimates of the focal relationship toward the null [112]. For the HIV testing outcome only, a fourth model was also estimated to adjust for HIV testing site (Equation #4).

Following model estimation, posthoc tests were conducted to evaluate model specification and possible multicollinearity between the predictors. For any models in which the focal relationship remained significant after multivariate adjustment, sensitivity analyses were conducted to identify which specific types of abuse were associated with delayed service utilization.

Equation #1: $\text{Timely Preventive Care Utilization}_i = \beta_{01} + \beta_{11}\,(\text{Abuse History})_i + \beta_{21}(\text{Controls})_{2i} + \mu EU_i + \epsilon_i$

Equation #2: $\text{Timely Preventive Care Utilization}_i = \beta_{02} + \beta_{12}\,(\text{Abuse History})_i + \beta_{22}(\text{Controls})_{2i} + \beta_{32}(\text{Covariates})_{3i} + \mu EU_i + \epsilon_i$

Equation #3: $\text{Timely Preventive Care Utilization}_i = \beta_{03} + \beta_{13}\,(\text{Abuse History})_i + \beta_{23}(\text{Controls})_{2i} + \beta_{33}(\text{Covariates})_{3i} + \beta_{43}(\text{Barriers})_{4i} + \mu EU_i + \epsilon_i$

Equation #4: $\text{Timely Preventive Care Utilization}_i = \beta_{04} + \beta_{14}\,(\text{Abuse History})_i + \beta_{24}(\text{Controls})_{2i} + \beta_{34}(\text{Covariates})_{3i} + \beta_{44}(\text{Barriers})_{4i} + \beta_{54}(\text{HIV Testing Site})_{5i} + \mu EU_i + \epsilon_i$

Results

Just over one-third of adults (33.99%) reported experiencing physical, sexual or emotional abuse on more than one occasion before age 18 (Table 4). Compared to their non-abused peers, adults with a childhood abuse history were significantly younger ($p<0.001$) and significantly more likely to be unmarried ($p<0.001$), uninsured ($p<0.01$) and report poor physical ($p<0.001$) and mental health status ($p<0.01$; Table 5). Adults with a childhood abuse history were also significantly more likely to be at-risk for HIV ($p<0.001$) and, among all individuals at-risk for HIV, were significantly less likely to report having received their last HIV test at a

counseling/testing site ($p<0.01$). While adults with a childhood abuse history were also more likely to have a high school degree or less, a household income at or below 200% of the FPL, and no usual source of care, these differences failed to reach significance.

Table 4. Prevalence of Childhood Abuse History among Study Sample

Type of Abuse History	Weighted %
Any Type of Abuse[1]	33.99
Physical Abuse	12.67
Sexual Abuse	6.73
Emotional Abuse	29.78

[1]Summing the weighted prevalence of each abuse type does not equal the weighted prevalence of any abuse history since individuals may have experienced more than one type of abuse.

Table 5. Differences in Sample Characteristics by Childhood Abuse History

Sample Characteristics	Any Childhood Abuse History (n=23,830)	
	Yes (n=7,600)	No (n=16,230)
Common Barriers to Timely Preventive Care		
≤ High School Degree, %	36.76	34.79
Low Household Income, %	45.66	42.86
Uninsured, %	13.71**	10.54
No Usual Source of Care, %	18.57	16.46
Poor Mental Health, %	15.33**	5.47
Other Predisposing Factors		
Age, Mean (SE)	43.88 (0.41)***	48.26 (0.36)
Male Sex, %	50.97	48.98
Not Currently Married, %	44.16***	38.11
Minority Race/Ethnicity, %		
Black, Non-Hispanic	5.67	5.25
Hispanic	6.77	5.62
Other, Non-Hispanic	6.80***	11.04
Multiracial, Non-Hispanic	6.33***	3.79
Other Enabling Factors		
Rural Residence, %	24.25	26.10
Poor Social Support, %	7.15	6.37
HIV Testing Site[1], %		
Counseling/Testing Site	1.22**	11.95
Hospital	4.39	3.77
Clinic	22.92	16.29
Other	44.46	36.97
Other Need Factors		
Poor Physical Health, %	14.51***	7.88
At-risk for HIV, %	5.17***	2.15

*p<0.05; **p<0.01; ***p<0.001

[1]Bivariate analysis for this variable was restricted to HIV at-risk subsample (n=450)

Among adults generally, compliance to clinical guidelines for routine preventive service utilization varied by service (Table 6). Whereas the majority (89.29%) of women reported receiving a cervical cancer screening within the past three years, just over one-fourth (27.51%) of individuals at-risk for HIV reported receiving an HIV test within the past year. Across most preventive services, common barriers to preventive care were associated with delayed preventive care utilization (Tables 7-9). For example, being uninsured and not having a usual source of care were each significantly associated with delayed utilization of breast, cervical, prostate and colorectal cancer screenings, routine check-ups and flu vaccines (all p-values <0.001). Many of the same characteristics associated with a childhood abuse history also impacted the timeliness of preventive care utilization. For example, individuals with poor mental health status were significantly less likely to report a timely breast cancer screening ($p<0.01$), dental cleaning ($p<0.001$), prostate cancer screening ($p<0.01$), routine check-up ($p<0.05$) or flu vaccine ($p<0.05$). Poor physical health status was also significantly associated with delayed utilization of some services, such as dental cleanings ($p<0.001$), and timely utilization of other services, such as routine check-up ($p<0.01$). Additionally, compared to at-risk individuals who received their last test at a private doctor's office or HMO, individuals who received their last HIV test at a counseling/testing site were significantly more likely to have been tested in the past year ($p<0.01$).

Table 6. Prevalence of Timely Preventive Care Utilization among Study Sample

Type of Abuse History	Weighted %
Trauma-Reminding Services	
Breast Cancer Screening	66.62
Cervical Cancer Screening	89.29
Dental Cleaning	71.34
Communication-Oriented Services	
HIV Test	27.51
Prostate Cancer Screening	54.38
Colorectal Cancer Screening	67.45
Other Preventive Services	
Routine Check-Up	66.15
Flu Vaccine	41.07

Table 7. Differences in Sample Characteristics by Timely Utilization of Trauma-Reminding Services

Sample Characteristics	Breast Cancer Screening (n=13,878)		Cervical Cancer Screening (n=9,913)		Dental Cleaning (n=22,335)	
	Yes (n=8,066)	No (n=5,812)	Yes (n=8,669)	No (n=1,244)	Yes (n=16,588)	No (n=5,747)
Common Barriers to Timely Preventive Care						
≤ High School Degree, %	28.95***	40.23	28.88***	39.48	29.68***	44.78
Low Household Income, %	39.92***	51.42	40.21***	62.00	34.54***	63.13
Uninsured[1], %	6.03***	12.61	7.83***	24.99		
No Usual Source of Care[1], %	8.34***	14.96	9.56***	33.33		
Poor Mental Health, %	8.91**	12.75	9.60	11.12	6.41***	13.69
Other Predisposing Factors						
Age, Mean (SE)	44.54 (0.41)***	57.20 (0.42)	44.38 (0.37)***	48.34 (0.87)	47.14 (0.32)***	43.08 (0.51)
Male Sex, %					48.06***	55.17
Not Currently Married, %	36.23***	43.59	35.98***	47.85	33.86***	53.77
Minority Race/Ethnicity, %						
Black, Non-Hispanic	6.11	5.68	6.22	5.61	4.49***	7.39
Hispanic	5.45	4.13	5.81	4.54	4.66***	9.36
Other, Non-Hispanic	4.68	4.88	8.11***	14.09	9.75	9.91
Multiracial, Non-Hispanic	7.70***	10.65	5.12	6.07	3.78***	7.17
Other Enabling Factors						
Rural Residence, %	25.59	26.60	25.82	30.19	24.03**	27.81
Poor Social Support, %	3.97***	9.36	4.29***	12.16	4.66***	9.94
Other Need Factors						
Poor Physical Health, %	8.15***	16.40	8.27	11.15	7.58***	14.36

*p<0.05; **p<0.01; ***p<0.001

[1]Insurance status and usual source of care were not included in bivariate analyses with dental cleanings, since these variables capture medical insurance and usual medical provider and not whether the individual has dental insurance and a usual dental provider.

Table 8. Differences in Sample Characteristics by Timely Utilization of Communication-Oriented Services

Sample Characteristics	HIV Test (n=450)		Prostate Cancer Screening (n=7,297)		Colorectal Cancer Screening (n=14,809)	
	Yes (n=129)	No (n=321)	Yes (n=4,269)	No (n=3,028)	Yes (n=9,976)	No (n=4,833)
Common Barriers to Timely Preventive Care						
≤ High School Degree, %	30.21	39.96	31.34***	38.96	34.15***	42.89
Low Household Income, %	59.44	58.40	32.84	37.06	34.83***	49.81
Uninsured, %	13.61	16.48	3.39***	13.85	3.84***	11.54
No Usual Source of Care, %	27.12	30.63	6.78***	22.68	4.19***	15.11
Poor Mental Health, %	16.43	22.19	5.60**	8.42	7.16	8.90
Other Predisposing Factors						
Age, Mean (SE)	29.34 (1.43)**	34.24 (1.20)	61.27 (0.34)***	53.56 (0.31)	64.23 (0.19)	64.30 (0.27)
Male Sex, %	61.57	51.38			47.02	45.94
Not Currently Married, %	80.07	66.56	21.27***	30.50	30.03***	41.65
Minority Race/Ethnicity, %						
Black, Non-Hispanic	23.98	11.63	5.44***	3.24	4.85	5.54
Hispanic	13.05	10.99	2.69**	4.79	2.25*	3.54
Other, Non-Hispanic	6.63	6.91	7.70*	10.36	7.38***	11.14
Multiracial, Non-Hispanic	2.73	8.07	2.52*	3.61	2.70***	4.26
Other Enabling Factors						
Rural Residence, %	7.17**	22.88	27.39	27.66	26.85*	29.60
Poor Social Support, %	7.83	6.73	8.62	10.73	7.49***	11.33
HIV Testing Site, %						
Counseling/Testing Site	16.27**	1.74				
Hospital	3.92	4.23				
Clinic	30.26	16.41				
Other	3.93***	55.23				
Other Need Factors						
Poor Physical Health, %	2.76***	13.13	12.74	11.21	14.27	14.59

*p<0.05; **p<0.01; ***p<0.001

Table 9. Differences in Sample Characteristics by Timely Utilization of Other Preventive Services

Sample Characteristics	Routine Check-Up (n=23,641)		Flu Vaccine (n=23,704)	
	Yes (n=16,850)	No (n=6,791)	Yes (n=11,855)	No (n=11,849)
Common Barriers to Timely Preventive Care				
High School Degree or Less, %	35.19	35.49	33.17**	36.93
Low Household Income, %	41.53***	48.05	37.94***	47.79
Uninsured, %	6.14***	22.08	5.56***	15.74
No Usual Source of Care, %	7.31***	36.37	8.45***	23.30
Poor Mental Health Status, %	8.24*	10.03	7.67*	9.60
Other Predisposing Factors				
Age, Mean (SE)	49.56 (0.35)***	41.44 (0.41)	52.35 (0.44)***	42.92 (0.33)
Male Sex, %	44.33***	60.35	44.84***	52.95
Not Currently Married, %	36.64***	46.63	34.57***	43.91
Minority Race/Ethnicity, %				
Black, Non-Hispanic	6.43***	3.42	4.60**	5.97
Hispanic	5.32	7.02	4.24***	7.22
Other, Non-Hispanic	9.31	10.22	10.97**	8.62
Multiracial, Non-Hispanic	4.11**	5.64	4.29	4.88
Other Enabling Factors				
Rural Residence, %	24.64*	27.20	25.30	25.52
Poor Social Support, %	6.22	7.38	6.99	6.39
Other Need Factors				
Poor Physical Health Status, %	11.11%**	8.07%	11.44**	9.22

*p<0.05; **p<0.01; ***p<0.001

Preliminary results adjusting for statistical controls suggest that childhood abuse history selectively impacts adult preventive service utilization (Table 10). Women with a childhood abuse history were 3.98 percentage points less likely to have received a timely breast cancer screening ($p<0.05$), but did not significantly differ from adults without a childhood abuse history in their utilization of cervical cancer screenings and dental cleanings. Similarly, among individuals at-risk for HIV, adults with a childhood abuse history were 17.78 percentage points less likely to have received an HIV test in the past year ($p<0.10$); yet, childhood abuse history was unrelated to timely utilization of the other communication-oriented services. Adults with a childhood abuse history were also 3.09 percentage points less likely to have received an annual flu vaccine ($p<0.10$), although this difference failed to reach statistical significance.

Table 10. Preliminary Differences in Timely Preventive Service Utilization by Childhood Abuse History

Preventive Service	Any Childhood Abuse History		Percentage Point Difference
	Yes	No	
Trauma-Reminding Services			
Breast Cancer Screening, %	63.94	67.92	-3.98*
Cervical Cancer Screening, %	89.89	89.21	0.67
Dental Cleaning, %	70.49	72.14	-1.65
Communication-Oriented Services			
HIV Test, %	18.88	36.66	-17.78†
Prostate Cancer Screening, %	52.81	54.86	-2.06
Colorectal Cancer Screening, %	68.94	67.10	1.84
Other Preventive Services			
Routine Check-Up, %	64.39	67.20	-2.82
Flu Vaccine, %	38.94	42.03	-3.09†

†p<0.10; *p<0.05; **p<0.01; ***p<0.001
Note: Models adjusted for other childhood adversity and state of residence

Timely Utilization of Trauma-Reminding Services

After adjusting for other predisposing, enabling and need factors, women with a childhood abuse history were 5.12 percentage points less likely to have received a timely breast cancer screening compared to women without an abuse history (p=0.001; Table 11, Model 1). This disparity widened slightly after common barriers to timely preventive care were also controlled for, as final multivariate results indicate that women with a childhood abuse history were 5.83 percentage points less likely than women without a childhood abuse history to have received a timely breast cancer screening (p=0.000; Model 2).

Adults with a childhood abuse history were unexpectedly more likely to have received a timely cervical cancer screening and dental cleaning, although neither association reached significance (p=0.73 and p=0.86, respectively). The magnitude of both associations increased after common barriers to timely preventive care were taken into account (p=0.58 and p=0.69, respectively).

Sensitivity Analysis: The Impact of Specific Abuse Types on Timely Breast Cancer Screening

Sensitivity analyses indicate that the negative association between childhood abuse history and timely breast cancer screening was not caused by a history of sexual abuse, as the qualitative literature would suggest, since women who only experienced childhood sexual abuse did not significantly differ from women without a childhood abuse history in the timeliness of their last breast cancer screening (p=0.26; Table 14). Rather, the association appears to be driven by a combined history of childhood physical and emotional abuse, as women with a history of both types of abuse were 8.74 percentage points less likely than women without a childhood abuse history to have received a timely breast cancer screening (p=0.004). Experiencing sexual abuse along with physical and emotional abuse did compound the negative impact of childhood abuse history on timely breast cancer screening, though, as women with a history of all three types of abuse were 12.18 percentage points less likely than women without an abuse history to have received a timely breast cancer screening (p=0.003).

Timely Utilization of Communication-Oriented Services

Among adults at-risk for HIV, those with a childhood abuse history were 11.68 percentage points less likely to have been tested for HIV in the past year compared to adults without a childhood abuse history (p=0.051; Table 12, Model 1). This disparity was attenuated after common barriers to care were taken into account (p=0.067; Model 2), but still approached significance. After controlling for HIV testing site, however, at-risk adults with a childhood abuse history no longer differed from at-risk adults without a childhood abuse history in their receipt of a HIV test in the past year (p=0.23; Model 3).

Adults with a childhood abuse history were unexpectedly more likely to have received timely prostate and colorectal cancer screenings, although neither association was significant (p=0.52 and p=0.18, respectively). Taking common barriers to preventive care into account increased the magnitude of the association between childhood abuse history and timely colorectal

cancer screening (p=0.15), but attenuated the association between childhood abuse history and timely prostate cancer screening (p=0.74).

Timely Utilization of Other Preventive Services

Compared to adults without a childhood abuse history, those who had been abused were less likely to have received a routine check-up and flu vaccine in the past year, although neither association was significant (p=0.50 and p=0.57, respectively; Table 13, Model 1). While controlling for common barriers to care increased the magnitude of the association between childhood abuse history and routine check-up (p=0.23), it slightly attenuated the association between childhood abuse history and flu vaccine (p=0.64; Model 2).

Table 11. Marginal Effect of Childhood Abuse History on Timely Utilization of Trauma-Reminding Services

Sample Characteristics	Breast Cancer Screening (n=13,878)		Cervical Cancer Screening (n=9,913)		Dental Cleaning (n=22,335)	
	Model 1	Model 2	Model 1	Model 2	Model 1	Model 2
Any Abuse History	-0.051 (0.02)**	-0.058 (0.02)***	0.005 (0.01)	0.007 (0.01)	0.003 (0.02)	0.007 (0.02)
Common Barriers to Timely Preventive Care						
≤ High School Degree		-0.022 (0.02)		-0.003 (0.01)		-0.043 (0.02)**
Low Income		-0.051 (0.02)**		-0.07 (0.01)***		-0.167 (0.02)***
Uninsured[1]		-0.186 (0.03)***		-0.08 (0.03)***		
No Usual Care[1]		-0.144 (0.03)***		-0.18 (0.03)***		
Poor Mental Health		-0.036 (0.03)		0.01 (0.02)		-0.062 (0.03)*
Other Predisposing Factors						
Age	-0.009 (0.0003)***	-0.010 (0.0004)***	-0.002 (0.0003)***	-0.003 (0.0004)***	0.002 (0.0004)***	0.001 (0.0005)*
Male Sex					-0.054 (0.01)***	-0.058 (0.01)***
Not Married	-0.027 (0.01)*	0.003 (0.01)	-0.045 (0.01)***	-0.005 (0.01)	-0.133 (0.02)***	-0.089 (0.02)***
Minority						
Black	-0.016 (0.04)	-0.001 (0.04)	0.0004 (0.03)	0.019 (0.03)	-0.126 (0.03)***	-0.053 (0.03)
Hispanic	0.013 (0.03)	0.041 (0.03)	0.024 (0.02)	0.041 (0.02)	-0.136 (0.04)***	-0.072 (0.04)
Other	-0.052 (0.03)	-0.050 (0.03)	-0.041 (0.02)	-0.042 (0.03)	-0.018 (0.03)	-0.002 (0.03)
Multiracial	-0.031 (0.03)	-0.025 (0.03)	-0.016 (0.03)	-0.0005 (0.02)	-0.120 (0.04)**	-0.070 (0.03)*
Other Enabling Factors						
Rural Residence	-0.030 (0.02)	-0.019 (0.02)	-0.041 (0.01)**	-0.034 (0.01)*	-0.091 (0.02)***	-0.071 (0.02)***
Poor Social Support	-0.113 (0.03)***	-0.092 (0.03)**	-0.118 (0.03)***	-0.064 (0.03)*	-0.127 (0.03)***	-0.076 (0.03)**
Other Need Factors						
Poor Physical Health	-0.084 (0.02)***	-0.058 (0.02)*	-0.006 (0.02)	-0.012 (0.02)	-0.142 (0.02)***	-0.093 (0.02)***

*p<0.05; **p<0.01; ***p<0.001 Values are marginal effects (SE).

Notes: Model 1 adjusts for other predisposing, enabling and need factors. Model 2 also adjusts for common barriers to preventive care.

[1]Insurance status and usual source of care were not included in associative model for dental cleanings, since these variables do not capture whether the individual has dental insurance and a usual dental provider.

Table 12. Marginal Effect of Childhood Abuse History on Timely Utilization of Communication-Oriented Services

Sample Characteristics	HIV Test (n=450)			Prostate Cancer Screening (n=7,297)		Colorectal Cancer Screening (n=9,976)	
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 1	Model 2
Any Abuse History	-0.117 (0.06)†	-0.108 (0.06)†	-0.023 (0.02)	0.014 (0.02)	0.007 (0.02)	0.023 (0.02)	0.025 (0.02)
Common Barriers to Timely Preventive Care							
≤ High School Degree		-0.042 (0.05)	0.041 (0.02)†		-0.059 (0.02)**		-0.028 (0.02)†
Low Household Income		0.026 (0.08)	0.058 (0.02)**		-0.021 (0.02)		-0.097 (0.02)***
Uninsured		0.031 (0.09)	0.010 (0.03)		-0.161 (0.04)		-0.168 (0.04)***
No Usual Care		-0.012 (0.09)	-0.0354 (0.02)		-0.193 (0.03)***		-0.278 (0.03)***
Poor Mental Health		0.048 (0.09)	0.028 (0.03)		-0.071 (0.04)†		-0.035 (0.03)
Other Predisposing Factors							
Age	-0.006 (0.002)*	-0.005 (0.002)*	-0.003 (0.0009)**	0.014 (0.0006)***	0.013 (0.0007)***	0.002 (0.0008)*	0.002 (0.0008)*
Male Sex	0.013 (0.05)	0.037 (0.05)	0.050 (0.02)*			0.002 (0.01)	0.02 (0.02)
Not Married	0.085 (0.06)	0.072 (0.06)	0.040 (0.02)†	-0.120 (0.02)***	-0.079 (0.02)***	-0.113 (0.02)***	-0.07 (0.02)***
Minority							
Black	0.154 (0.10)	0.144 (0.09)	0.125 (0.04)**	0.081 (0.04)*	0.119 (0.04)**	-0.056 (0.04)	0.003(0.04)
Hispanic	0.196 (0.12)†	0.220 (0.12)†	0.171 (0.06)**	-0.073 (0.05)	-0.058 (0.05)	-0.080 (0.05)†	-0.018 (0.04)
Other	0.002 (0.10)	-0.013 (0.11)	0.011 (0.05)	-0.045 (0.04)	-0.051 (0.04)	-0.088 (0.03)**	-0.072 (0.03)*
Multiracial	-0.125 (0.09)	-0.125 (0.08)	0.011 (0.05)	-0.015 (0.04)	-0.027 (0.04)	-0.092 (0.03)**	-0.073(0.04)*
Other Enabling Factors							
Rural Residence	-0.134 (0.06)*	-0.132 (0.06)*	-0.051 (0.03)†	-0.007 (0.02)	0.017 (0.02)	-0.072 (0.02)***	-0.059 (0.02)***
Poor Social Support	0.069 (0.11)	0.088 (0.11)	0.064 (0.04)†	-0.088 (0.03)**	-0.038 (0.03)	-0.069 (0.02)**	-0.014 (0.02)
HIV Testing Site[1]							
Counseling/Testing			0.309 (0.14)*				
Hospital			-0.176 (0.07)**				
Clinic			-0.101 (0.06)†				
Other[4]			-0.305 (0.06)***				
Other Need Factors							
Poor Physical Health	-0.079 (0.06)	-0.117 (0.06)*	-0.061 (0.03)*	-0.0007 (0.03)	0.013 (0.03)	0.007 (0.02)	0.022 (0.02)

†p<0.10; *p<0.05; **p<0.01; ***p<0.001 Values are marginal effects (SE).

Note: Model 1 adjusts for other predisposing, enabling and need factors. Model 2 also adjusts for common barriers to preventive care. Model 3 also includes HIV testing site.

[1] Reference group is being tested in a private doctor's office or HMO.

Table 13. Marginal Effect of Childhood Abuse History on Timely Utilization of Other Preventive Services

Sample Characteristics	Routine Check-Up (n=23,641)		Flu Vaccine (n=23,704)	
	Model 1	Model 2	Model 1	Model 2
Any Abuse History	-0.011 (0.02)	-0.020 (0.02)	-0.010 (0.02)	-0.009 (0.02)
Common Barriers to Timely Preventive Care				
≤ High School Degree		0.027 (0.02)		-0.024 (0.02)
Low Household Income		-0.006 (0.02)		-0.046 (0.02)**
Uninsured		-0.157 (0.03)***		-0.100 (0.03)**
No Usual Source of Care		-0.354 (0.03)***		-0.133 (0.03)***
Poor Mental Health		-0.035 (0.02)		-0.025 (0.03)
Other Predisposing Factors				
Age	0.006 (0.0004)***	0.004 (0.0005)***	0.007 (0.0004)***	0.006 (0.0005)***
Male Sex	-0.125 (0.01)***	-0.080 (0.01)***	-0.062 (0.01)***	-0.047 (0.01)**
Not Currently Married	-0.056 (0.01)***	-0.007 (0.02)	-0.049 (0.01)***	-0.023 (0.02)
Minority				
Black	0.124 (0.03)***	0.134 (0.03)***	-0.065 (0.03)*	-0.064 (0.03)*
Hispanic	0.035 (0.04)	0.090 (0.04)*	-0.035 (0.04)	0.010 (0.04)
Other	0.033 (0.03)	0.045 (0.03)	0.036 (0.03)	0.06 (0.04)
Multiracial	0.009 (0.03)	0.015 (0.03)	-0.038 (0.03)	-0.001 (0.03)
Other Enabling Factors				
Rural Residence	-0.035 (0.02)*	-0.031(0.02)*	-0.041 (0.01)**	-0.029 (0.02)
Poor Social Support	-0.067 (0.02)**	-0.052 (0.03)*	-0.022 (0.02)	0.003 (0.03)
Other Need Factors				
Poor Physical Health	0.042 (0.02)	0.041 (0.02)	0.018 (0.02)	0.022 (0.02)

*p<0.05; **p<0.01; ***p<0.001

Notes: Values are marginal effects (SE). Model 1 adjusts for other predisposing, enabling and need factors. Model 2 also adjusts for common barriers to preventive care.

Table 14. Marginal Effect of Childhood Abuse History Type on Timely Breast Cancer Screenings.

Sample Characteristics	Breast Cancer Screening (n=13,878)
Abuse History Type (n=4,370)	
Physical Only (n=191)	-0.103 (0.06)
Sexual Only (n=443)	-0.044 (0.04)
Emotional Only (n=1,933)	-0.039 (0.02)
Physical & Sexual (n=36)	-0.083 (0.10)
Physical & Emotional (n=869)	-0.087 (0.03)**
Sexual & Emotional (n=355)	-0.045 (0.04)
Physical, Sexual & Emotional (n=543)	-0.122 (0.04)**
Common Barriers to Timely Preventive Care	
≤ High School Degree	-0.021 (0.02)
Low Income	-0.051 (0.02)**
Uninsured	-0.186 (0.03)***
No Usual Care	-0.141 (0.03)***
Poor Mental Health	-0.030 (0.03)
Other Predisposing Factors	
Age	-0.010 (0.0003)***
Not Married	0.002 (0.01)
Minority	
Black	-0.002 (0.04)
Hispanic	0.043 (0.03)
Other	-0.051 (0.03)
Multiracial	-0.024 (0.03)
Other Enabling Factors	
Rural Residence	-0.019 (0.02)
Poor Social Support	-0.090 (0.03)**
Other Need Factors	
Poor Physical Health	-0.053 (0.02)*

*p<0.05; **p<0.01; ***p<0.001 Notes: Values are marginal effects (SE).

Conclusions

Missed opportunities for disease prevention are a significant public health problem [3, 5]. Among adults in this study, more than one-third of eligible individuals reported delayed utilization of five of the eight preventive services I examined. Delayed preventive care is particularly concerning among vulnerable populations, such as adults with a childhood abuse history, who are at elevated risk of developing conditions for which early detection can significantly alter the patient's disease trajectory. My results suggest that adults with a history of childhood abuse may experience unique barriers to using select preventive services according to recommended guidelines. Several findings in particular are worth highlighting.

First, women with a childhood abuse history were significantly less likely to have received their last breast cancer screening according to American Cancer Society's guidelines for early cancer detection. This disparity widened after adjusting for common barriers to preventive care among vulnerable populations. While this finding is inconsistent with previous findings from a clinic-based study [35], it is consistent with another population-based study, which found that women with a history of lifetime sexual victimization were significantly less likely to have received their last mammogram in the past two years [45]. Among women with a childhood abuse history in this study, however, disparities in timely breast cancer screening were not associated with a history of childhood sexual abuse, but rather with a combined history of childhood physical abuse and emotional abuse. This unexpected finding, along with the lack of association of childhood abuse history with timely cervical cancer screenings and dental cleanings, suggest that experiential avoidance is not culpable for delayed breast cancer screenings among adults with a childhood abuse history. Rather, since a combined history of childhood physical and emotional abuse has been found to intensify the adult psychosocial problems associated with each abuse type individually [113], it is possible that the interpersonal aspects of the medical encounter, such as patient-provider communication, may contribute to delayed breast cancer screening among this population. A recent study found that, among women generally, those who reported having good

patient-provider communication and being involved in treatment decisions by their usual provider were significantly more likely to receive timely breast cancer screenings than women who did not report good patient-provider communication [114]. Future work is needed to identify the mechanisms driving breast cancer screening disparities among this population, since delayed screening may be contributing to their higher prevalence of late-stage breast cancer diagnoses [44, 45].

I also found a clinically significant disparity in the likelihood of receiving a HIV test in the past year among at-risk adults with a childhood abuse history, which was attenuated after adjusting for HIV testing site. This finding appears to reflect systematic differences both in where adults with a childhood abuse history are usually tested for HIV and in HIV testing patterns between sites. Specifically, my results indicate that at-risk adults with a childhood abuse history were significantly less likely to have received their last HIV test at a counseling/testing site than in a healthcare or institutional setting – suggesting that this population may be more likely to undergo testing when it is routinely offered in facilities they visit for unrelated reasons. Yet, among individuals at-risk for HIV generally, those who received their last HIV test at a counseling/testing site were unexpectedly significantly more likely to have been tested in the past year than at-risk individuals who received their last test at a private doctor's office. Although future studies with a larger sample of at-risk adults should examine the robustness of this finding, a number of factors are understood to interfere with HIV screening of at-risk patients in healthcare settings, including patients failing to honestly disclose their engagement in high-risk behaviors [115] and lack of provider confidence in their competency to provide pre- and post-test counseling [116, 117]. Since adults with a childhood abuse history are frequent healthcare users [42], healthcare facilities can play an important role in increasing repeat HIV testing rates among this population. While addressing system barriers to repeat HIV screening will be a critical part of this process, future work should also explore the efficacy of targeted strategies for increasing

repeat testing rates among at-risk adults with a childhood abuse history, such as including childhood abuse history in HIV risk assessments.

Adults with a childhood abuse history did not differ from adults without an abuse history in their utilization of the remaining four preventive services of interest in this study. While this study's finding about cervical cancer screening patterns among women with a childhood abuse history differs from what has been shown previously [34, 47], this variation could reflect unique characteristics of the samples used in previous studies, as their overall cervical cancer screening adherence rates were notably lower than the adherence rates among this study's sample and other nationally-representative U.S. samples [118]. Since adults with a childhood abuse history regularly use dental cleanings and cervical, prostate and colorectal cancer screenings, it is imperative that providers are aware of patient-centered strategies which can alleviate the trauma-related anxiety and communication challenges that adults with a childhood abuse history may encounter while using these services [119]. For example, providers can ease the fears of patients with a childhood sexual abuse history during cervical cancer screenings and dental cleanings by asking the patient if there are aspects of the service which make him/her feel uncomfortable, thoroughly explaining each step of the procedure, letting the patient know he/she can stop the procedure at any point, avoiding abuse-reminding triggers (e.g. saying "This will not hurt"), and using grounding techniques to keep the patient from having flashbacks of their abuse [20, 21, 23]. For such patient-centered strategies to be effectively implemented, however, providers must first be aware of whether their patients have a childhood sexual abuse history – and previous work suggests that providers do not regularly screen for childhood abuse history among their adult patients [120]. Future work is needed to evaluate whether the benefits of routinely screening for childhood abuse history among adult patients outweigh the potential costs, as current screening practices may be a missed opportunity for improving the quality of care and health outcomes of adults with a childhood abuse history.

To strengthen the validity of the conclusions which can be drawn from this study, I included two additional preventive services, flu vaccine and routine check-up, as counterfactuals to illustrate that childhood abuse history selectively impacts preventive care utilization, independent of common barriers to timely preventive care. I originally hypothesized that timely flu vaccine receipt would be unrelated to childhood abuse history after other predisposing, enabling and need factors were taken into account - which was modestly supported by the results. I also hypothesized that timely routine check-up receipt would be significantly inversely related to childhood abuse history until common barriers to timely preventive care were also taken into account. However, the results indicate that, whereas childhood abuse history was significantly negatively associated with timely routine check-ups in bivariate comparisons ($p=0.02$; results not shown), this association was no longer significant once I controlled for other childhood adversity and state of residence ($p=0.10$). This finding may reflect the fact that adults with a childhood abuse history in this study did not differ from adults without a childhood abuse history on three of the five common barriers to preventive care. Regardless, both counterfactuals in tandem with my other findings lend support to my original assumptions that adults with a childhood abuse history selectively delay preventive care, above and beyond factors which typically interfere with how vulnerable populations use healthcare.

The results from this study should be interpreted with at least five caveats in mind. Most notably, since the data from the source study are cross-sectional and not longitudinal, the current results cannot be construed as indicating that child abuse causally impacts timely preventive care in adulthood. However, I used strategies to strengthen the validity of the conclusions which can be drawn from this study, such as examining coherence between outcomes which were theorized to be similarly affected by childhood abuse. Second, since the BRFSS did not include questions which would have enabled me to stratify this analysis by childhood abuse severity, my measure of childhood abuse history may be overly inclusive and capture individuals who experienced isolated abuse incidents. Such a measurement error may have downwardly biased the results and

could explain why, in bivariate comparisons, adults with a childhood abuse history did not differ socioeconomically from adults without a childhood abuse history. Third, both childhood abuse history and preventive service utilization were self-reported by the study sample – meaning self-report bias may be affecting both sides of all statistical models. Previous work suggests, however, that retrospective recall of childhood abuse leads to underreporting [121] and individuals are more likely to overestimate preventive service utilization in self-reports [122], which would have also downwardly biased the results. Fourth, since adults with a childhood abuse history from only five states were included in this analysis, the relationships presented here may not generalize to a nationally-representative sample of adults with a childhood abuse history. However, these five states are sociodemographically and culturally diverse from one another and the generalizability of my findings are a marked improvement over those of previous studies, which used clinic-based samples recruited from several cities within one state. Lastly, due to data restrictions, I was unable to adjust for health beliefs and adult adversity in this analysis. Omitting health beliefs did not appear to systematically bias the focal relationships, given the selective impact of childhood abuse history on timely preventive care. It is plausible, however, that not capturing adult adversity may have conservatively estimated the screening disparities experienced by adults with a childhood abuse history. Future studies are needed which can test the robustness of this study's findings by correcting for these potential limitations.

Despite these limitations, this is the first known study which uses a large, U.S. population-based sample to examine whether adults with a childhood abuse history use an array of preventive services according to recommended clinical guidelines for promoting disease prevention and early detection. I adjusted for a number of covariates which are well-understood to interfere with how vulnerable populations use preventive care and also controlled for non-abusive childhood adversity to statistically tease out the unique impact of childhood abuse on adult preventive care utilization. My estimates of how adults with a childhood abuse history use preventive care are also conservative, since the study sample does not include institutionalized

adults who would likely be more severely affected by the long-term ramifications of childhood abuse. Perhaps most importantly, however, this study takes a much needed step in changing the conversation about what can be done from a public health perspective to address the burgeoning economic impact of child abuse on the U.S. healthcare system. Primary and secondary prevention of child abuse is critical, but not sufficient for slowing the healthcare costs attributable to childhood abuse. Effective tertiary prevention strategies are also needed which ensure that individuals who have already been abused are using high-value care to manage their complex health needs. Identifying and understanding disparities in the use of high-value services by this population is an important and understudied area that merits greater attention going forward.

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