Moral Panic, Backlash, and the Noxious Effects of Transphobia: Assessing the Structural Drivers of Trans Health

by

Landon D. Hughes

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Doctoral Committee:

Professor Arline T. Geronimus, Chair
Professor John Bound
Associate Professor Kristi E. Gamarel
Assistant Professor Jaclyn M.W. Hughto, Brown University

Landon D. Hughes

LandonH@umich.edu

ORCID iD: 0000-0001-9558-3779

Dedication

For Granny and Papa

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Abstract

This dissertation draws on Fundamental Cause Theory, the Socio-Ecological Model of Transgender Stigma and Health, and the Weathering Hypothesis, as well as methods from the fields of health services, epidemiology, and sociology to examine how stigma operates across levels of the social ecological model to shape the health of transgender and gender diverse (trans) people in the U.S. This dissertation follows a three-paper model to understand how structural stigma is associated with the health and wellbeing of trans populations in the U.S. and how trans people and their advocates are ensuring access to healthcare despite structural stigma and violence.

In Chapter 2 (paper 1), I examined the risk of cardiovascular disease among a sample of trans people enrolled in private insurance from 2001-2019. I compared the risk of cardiovascular disease to a 10% sample of cisgender (cis) who shared their sex assigned at birth. After matching on social and enrollment characteristics, I found that trans people were at a greater risk for all cardiovascular diseases studied overall and at most ages compared to those who share their sex assigned at birth. In particular, trans people were at the greatest relative risk during early and middle adulthood, suggesting a “weathering” pattern. This study offers an alternative framing to understanding cardiovascular risk among trans populations, including identity threats and weathering.

In Chapter 3 (paper 2), I explored how stigma operated across two levels of the Socio-Ecological Model of Transgender Stigma and Health and was associated with medical gender affirmation, specifically non-prescribed hormones (NPHs) use among one of the largest ever

convenience sample of trans people in the U.S. Using structural equation modeling, I found that among trans adults using hormones, healthcare policy stigma was positively associated with NPHs use and operated through insurance coverage and anticipating stigma in healthcare settings. However, when assessing the model, I did not find a direct association between healthcare policy stigma and NPH use. Instead, I found chains of associations between healthcare policy stigma, insurance coverage, avoiding healthcare due to stigma, and using NPHs. This suggested that the model I tested was sufficient to explain the relationship between healthcare policy stigma and using NPHs.

Chapter 4 (paper 3) aimed to understand how adolescent gender-affirming care providers navigate stigma across structural, interpersonal, and individual levels while continuing to provide gender-affirming care. To that end, I conducted 32 semi-structured interviews with adolescent gender-affirming care providers (AGAPs) from states that have either passed or introduced bans on gender-affirming care for adolescents. I found that providers were navigating stigma across all levels of the Socio-Ecological Model of Transgender Stigma and Health, such as structural or institutional policies restricting gender-affirming care for adolescents, interpersonal threats of violence and harassment from anti-trans activists, and identity management and concealment to avoid stigma or harassment at the individual level. In addition, stigma across all levels of the social ecological model influenced AGAPs' ability to advocate against efforts to restrict access to gender-affirming care for trans adolescents. This chapter showed how AGAPs could buffer the effects of stigma to facilitate access to gender-affirming care for adolescents. Still, these adaptations came at a cost to AGAPs, requiring them to make decisions about the ethical, legal, and personal tradeoffs to maintaining access to gender-affirming care for adolescents.

Chapter 1 Introduction

To live in America is to blame the
dead for their own death, not
the country for creating the conditions that killed them
before they caught up and
made things more clear for the rest of us.
- Alok Vaid-Menon

Two Steps Forward, One Step Back: Rising Trans Visibility, Moral Panic, and Backlash

Over the past two decades in the United States (U.S.), the visibility of transgender and gender diverse (trans)[1] people in society and popular culture has increased substantially. In fact, a 2019 Public Religion Research Institute poll found that more than 24% of Americans reported that they had a close friend or family member who was trans, a 13-percentage point increase from 2011 (Greenberg et al. 2019); and a 2021 Pew Research poll found that 42% of Americans personally know someone who is trans, a 5-percentage point increase from 2017 (Minkin and Brown 2021).

With the increasing visibility of trans people came an increase in political activism aimed at expanding trans rights. In 2014, Laverne Cox was featured on the cover of Time Magazine, as the publication declared a "transgender tipping point" in which the next U.S. civil rights struggle would emerge (Steinmetz 2014). Activism among trans people and their allies has resulted in the passage of legislation across U.S. municipalities, states, and the federal government enshrining

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[1] The term *transgender and gender diverse* has been used to broadly define individuals whose gender identity or expression does not align with culturally held expectations for people who share their assigned sex at birth (King, Hughto, and Operario 2020). Under the umbrella term *transgender and gender diverse*, there are various gender identities (e.g., women, men, transgender men, transgender women, genderqueer, bigender, butch queen, femme queen) (White Hughto, Reisner, and Pachankis 2015).

the rights of trans citizens. To date, 22 states and the District of Columbia have passed laws explicitly prohibiting discrimination based on gender identity, with another six interpreting the state's existing protections against sex discrimination to include protections for gender identity (Movement Advancement Project 2023c). Additionally, 24 states and the District of Columbia have passed laws prohibiting transgender exclusions in health insurance service coverage (Movement Advancement Project 2023a). The rights of trans people have also seen key legal wins. For example, in 2020, the Supreme Court ruled in *Bostock v Clayton County,* holding that trans people could not be discriminated against in employment, enshrining this protection across all 50 states (Gorsuch 2020).

Despite the recent advancement of trans peoples' rights and visibility over the past decade, increased visibility of queer and trans people often evokes structural violence such as state-sanctioned, semi-legal, and extra-judicial violence (Burns 2019; Padilla, del Aguila, and Parker 2007; Ungar 2000). For this reason, journalist Katelyn Burns has described the past two decades as a "double-edged sword," explaining that in 2015, moral panic over the visibility and advancement of trans rights led to intensifying political and social backlash that continues to this day (Burns 2019). In a 2019 poll, while more than 60% of Americans said they have become more supportive of trans rights over the past five years, nearly 25% said they have become more opposed to trans rights (Greenberg et al. 2019). The politicization of trans rights has become apparent in data about Americans who believe that gender is determined by sex assigned at birth, showing deep partisan divides. Indeed, in a 2021 poll, 81% of Republicans believed that gender is determined by sex assigned at birth, compared to just 34% of Democrats (Minkin and Brown 2021). Anti-trans activists have seized on moral panic about changing notions of sex and gender or fear that evolving notions of sex and gender threaten their values or interests (Stryker 2017).

For example, anti-trans activists have described trans people as frauds, child molesters, mentally ill, and boogeymen (Stryker 2017), threatening social order (Stryker 2017; White Hughto, Reisner, and Pachankis 2015).

In 2015, the Family Research Council, an influential conservative and religious advocacy organization designated by a hate group by the Southern Poverty Law Center (Southern Poverty Law Center 2021), published a policy brief about how religious conservatives should address the rise in trans rights and visibility and has served as a blueprint for anti-trans activists (O'Leary and Sprigg 2015). For example, many of the proposals in the Family Research Council's brief have been introduced or implemented by conservative lawmakers at the municipal, state, and federal levels, such as banning trans people from public accommodations that match their gender identity (Burns 2019), disallowing trans troops from serving in the military (Klimas and Bender 2018), prohibiting trans people from changing their gender markers and names on legal documents (Branigin and Kirkpatrick 2022; Movement Advancement Project 2023b), and restricting public funding of gender-affirming healthcare (Gomez et al. 2022). More recently, the anti-trans movement worked to ban trans people from playing sports (Barrera, Millington, and Kremen 2022; Buzuvis 2021; Hughes, Dowshen, et al. 2022) and restrict trans adolescents' access to gender-affirming healthcare (Hughes, Kidd, et al. 2021; Kidd et al. 2020; Kraschel et al. 2022). To date, four (i.e., Alabama, Arkansas, Arizona, and Utah) states have passed legislation that bans some or all forms of gender-affirming medical care for adolescents, with many more states introducing such laws (Freedom For All Americans 2023; Movement Advancement Project 2023a).

The politicization of trans peoples' existence has resulted in efforts to deny trans people fundamental human rights – such as healthcare, employment, housing, and other resources needed to survive. It is in this current social and political context, one of moral panic and the resulting backlash about trans peoples' rising visibility and legal victories, that I developed the studies comprising this dissertation and have shaped my theoretical frame. This backlash, driven by anti-trans stigma, has shaped and continues to shape the health and well-being of trans people in the U.S. by limiting their access to healthcare (Hughes, Kidd, et al. 2021; Rummler 2022), increasing the stress among trans people and their families (Kidd et al. 2020), and exacerbating trans people's fear of victimization (Rogers, Isom, and Rader 2023).

Stigma as a Key Determinant of Health Among U.S. Trans Populations

Over the past decade, research on the health of trans populations in the U.S. has grown exponentially, providing novel understandings of the health needs, behaviors, and risks unique to trans populations in the U.S. (Committee on Understanding the Well-Being of Sexual and Gender Diverse Populations et al. 2020). In particular, research has shown the importance of stigma to the health and well-being of U.S. trans populations as it has been associated with a host of health outcomes (King, Hughto, and Operario 2020; White Hughto et al. 2015).

For this dissertation, I rely heavily on the Socio-Ecological Model of Transgender Stigma and Health as conceptualized by White Hughto and colleagues (2015), which argues that stigma is a key determinant of trans health operating across all levels of the social ecological model as it constrains the opportunities and access to resources which adversely affects the health and well-being of trans populations in the U.S. (White Hughto et al. 2015). As described by Hughto et al. (2015), built on Goffman's (1963) original theorizing, Link and Phelan (2001) put forth a definition of stigma as the co-occurrence of labeling, stereotyping, separation, status loss, and discrimination in instances when power is enacted. In this way, *stigma* is operationalized through dominant groups who label, stereotype, separate, and discriminate against those in a minority group (Goffman 1963). As conceptualized by White Hughto et al. (2015), one dominant cultural ideology has provided the backdrop by which trans people have become stigmatized: the *gender/sex fallacy*. In Western societies, the dominant perspective on gender is that men and women are naturally distinct and inherently contain psychological and behavioral traits and that these traits are derived from reproductive functions (West and Zimmerman 1987). These "inherent" differences justify society's social organization, which includes the division of labor and family structure (West and Zimmerman 1987). However, these normative assumptions about the inherent connection between biological sex and gender ultimately alienate trans people whose gender identity or expression does not align with culturally held expectations for people who share their assigned sex at birth or whose gender identity or expression does not align with the man-woman binary (White Hughto et al. 2015). The ideology that gender is an immutable partner of sex is what I refer to as the *gender/sex fallacy*.

As a result of the *gender/sex fallacy*, trans people have been portrayed as outcasts and mentally ill because they fall outside of the perceived "natural" way of expressing their gender. In fact, as early as 2013, having a gender identity that was different from the one typically congruent with one's sex assigned at birth was considered sexually deviant or disordered by the *Diagnostic and Statistical Manual of Mental Disorders* (DSM) (Stryker 2017; White Hughto et al. 2015). Although today, the DSM recognizes that simply being trans does not make one mentally ill, a diagnosis of *gender dysphoria*, or a state in which an individual is under distress due to sex/gender incongruence, is typically required for insurance providers to pay for gender-affirming prescriptions, surgeries, and procedures (White Hughto et al. 2015).

Hughto et al. (2015) continue by linking trans stigma to *Fundamental Cause Theory. Fundamental Cause Theory* posits that *fundamental causes*, such as socioeconomic status and race, operate through various mediating pathways that affect the health of populations (Link and Phelan 1995). Furthermore, the theory posits that to ameliorate health inequalities derived from these *fundamental causes*, one cannot merely address the mechanisms by which they operate; instead, the fundamental cause itself must be changed (Link and Phelan 1995). Link and Phelan (1995) posit that the association between fundamental causes and health becomes reproduced over time through new intervening mechanisms. Building on Link and Phelan (1995), Hatzenbuehler and colleagues (2013) argue that *stigma* ought to be defined as a fundamental cause of population health inequalities because it: (1) affects health outcomes through several risk factors among a large number of people, (2) "involves access to resources—knowledge, money, power, prestige, and beneficial social connections—that" may aid in avoiding risks, and (3) is consistently related to health inequities across time and place.

For this dissertation, I will use the definition of *anti-trans stigma* developed by King, Hughto, and Operario (2020). *Anti-trans stigma* encompasses the multitude of ways in which gender/sex fallacy is enforced to systemically disadvantage trans people, which may include experienced or enacted stigma (i.e., discrimination, harassment, or victimization), felt, perceived, or anticipated stigma (i.e., feelings of devaluation and expectations of hostility), and internalized stigma (i.e., the acceptance of negative beliefs about one's own trans identity) (Herek 2016; King et al. 2020; White Hughto et al. 2015). Trans health researchers have conceptualized *anti-trans stigma* as one of the fundamental causes of trans health, given the pervasiveness of the *gender/sex fallacy* and the resulting stigmatization that is consistently associated with poor health outcomes of trans people in the U.S. (Herek 2016; King et al. 2020; White Hughto et al. 2015).

Conceptualizing the Surround, Identity Threats, and Weathering Among U.S. Trans Populations

In the U.S., the *gender/sex fallacy* has been structured into nearly all aspects of social life. Geronimus et al. (2016) refer to the social environments which reflect the values of social identities as the *surround*, which provides a backdrop and rationale for the distribution of power between social groups, as it reifies and reflects the values of the broader social system. *Cues*, or value judgments about one's social identity, come from the environment in which one operates; therefore, cues are contextual and may vary in different social environments (Geronimus et al. 2016). For this dissertation, *identity threats* are conceptualized as those cues that trans people view as devaluing their social identity (Geronimus et al. 2016). *Identity threats* may operate at any level of the social ecological model and prompt individuals, consciously or subconsciously, of the stigmatized nature of their social identities (Geronimus et al., 2016). While the term *identity threat* inherently denotes these cues as stressful, cues about one's social identity need not be stressful but may be beneficial (Geronimus et al. 2016; Murphy, Steele, and Gross 2007). To this point, whether a *cue* becomes an *identity threat* is contingent on the social context in which it operates.

In the U.S., social networks, physical spaces, and political and social economies are built on the notions of the *gender/sex fallacy* and contain *identity threats* that devalue trans peoples' social identity (Padilla et al. 2007; Ungar 2000). In the U.S., *cues* about the gender/sex fallacy are embedded in the *surround*, as notions of the inherent link between sex and gender are ubiquitous: on birth certificates, restrooms, apparel, and prescribed normative cultural expectations. For example, identity threats may be embedded into the built physical environment and may cue an individual to the devalued nature of their identity. In the case of trans people, an example of this stigmatized built environment may be as simple as the binary gendering of restrooms and locker rooms. For example, the binary nature of these spaces does not include those whose gender is beyond the bounds of the man-woman binary. In this way, these physical spaces cue trans individuals that their identity is not valid or recognized in the broader society (Geronimus et al. 2016). Further, these gendered spaces may also be reinforced by policies that police gender boundaries, such as so-called “bathroom bills” that require individuals to use the restroom labeled with the gender typically associated with their sex assigned at birth (Stryker 2017). Valentine (2007) describes these identity threats as a form of symbolic violence that communities, organizations, and governments inflict by enforcing certain norms, policies, and procedures that maintain the power and privilege of the cis majority at the expense of trans people (Valentine 2007).

Identity threats have been theorized as impacting the health of stigmatized populations in Geronimus’s *weathering hypothesis* (Geronimus 2023). When individuals encounter a stressor, or in this case, an identity threat, their primary stress response systems are activated, specifically the sympathetic nervous system and hypothalamic-pituitary-adrenal axis (Lazarus and Folkman 1984; McEwen and Stellar 1993). While activation of the body's stress mechanisms is normal and beneficial to survival, chronic and repeated activation of these systems causes them to wear down over time and lead to disease (McEwen and Stellar 1993). McEwen and Stellar (1993) conceptualize stress as a real or implied threat to homeostasis. The authors note that individuals' stress response systems are flexible and maintain an operational range of homeostasis which they define as “allostasis.” From this concept, McEwen and Stellar (1993) coined the term “allostatic load” as the strain on the body produced by repeated ups and downs of physiologic response, as well as by the elevated activity of physiologic systems under challenge, and the changes in metabolism and the impact of wear and tear on several organs and tissues, can predispose the organism to disease.

Geronimus et al. (2010) posit that socially structured stressors illicit chronic activation of the body's stress response systems, resulting in *weathering* or the early health deterioration and aging of individuals with socially stigmatized identities. Therefore, the social stressors encountered by trans people, because of their stigmatized identity, repeatedly activate their primary stress response systems and increase their risk for disease over their life course. Geronimus's work has documented a weathering pattern in Black adults in which disparities in morbidity are most significant in early and middle adulthood and begin to converge in late adulthood (Geronimus 2023; Geronimus et al. 2007). For this dissertation, in Chapter 2, I conceptualize the risk of cardiovascular disease among trans populations as, in part, a function of *weathering*.

In addition to constraining trans peoples' access to health-promoting resources (Hatzenbuehler, Phelan, and Link 2013), anti-trans stigma can directly lead to weathering as trans people are forced to engage in a cis-centric culture that persistently devalues their existence and creates identity threats that activate trans peoples' fight-or-flight mechanisms (White Hughto et al. 2015). For example, trans people often encounter anti-trans stigma in their everyday rounds, such as using sex-segregated restrooms, being harassed in public spaces, coming out to family and friends, or being constantly misgendered (White Hughto et al. 2015). Furthermore, unlike threats in which an individual can either fight or flee, trans people often encounter threats that require them to continue to engage while their body's stress arousal remains heightened, such as sitting in a classroom after being misgendered, working with colleagues that refer to trans people by their deadname, having a meal with family members who have rejected you, or visiting a doctor who is asking inappropriate and irrelevant questions about their gender identity. These experiences of increased cognitive and emotional engagement with chronic stress have been positively associated with hypertension, blood pressure, high cholesterol, and cardiovascular reactivity (Bennett et al. 2004; Geronimus 2000; James 1994). In addition to experiencing instances of identity threat, ruminating and preparing for possible threats also exacts a physical toll creating a state of chronic stress arousal. Chronic stress arousal has been associated with hypertension and diabetes (Anderson 1989; Taylor et al. 2006) and underlies the mechanisms by which anti-trans stigma contributes to weathering among trans populations.

Gaps in Literature on Stigma and Trans Health

Despite the rapid expansion of research on stigma and the health of U.S. trans populations, critical gaps remain in understanding the connection between stigma and trans health. *For example, when studying the risk of cardiovascular diseases (CVDs) in trans populations, to my knowledge, no research has considered how age might moderate the relationship between CVD risk and gender among a sample of trans and cis people.* From a theoretical perspective, understanding how age might moderate the relationship between CVD and gender is essential to testing theories related to identity threat and stigma, namely *weathering*, which has implications for policies and public health practices aimed at ameliorating CVD risk among trans populations. Typically, studies of CVD risk among trans populations have found an increased risk of CVD risk among trans when compared to cis people and framed as attributable to exogenous hormone use or individual health behaviors such as smoking and exercise (Caceres, Jackman, et al. 2020; Cocchetti et al. 2021; Connelly and Delles 2021; Howerton and Harris 2021; Irwig 2018; Knight 2021; Malhotra et al. 2022; Martinez et al. 2018; Seal 2019). However, the weathering hypothesis may provide an alternative framing that centers on the role of anti-trans stigma when considering CVD risk among trans populations. In Chapter 2, I consider how age moderates the relationship between CVD risk and gender among a sample of privately insured U.S. trans people in the long term by studying the risk of CVDs known to be associated with identity threats and stigma in other marginalized populations. While I did not directly measure stigma in these analyses, the patterns of CVD risk in the social context of pervasive anti-trans stigma may suggest a weathering pattern and prompt future study and framing of cardiovascular risk among U.S. trans populations.

Additionally, *studies of stigma and trans health have often focused on interpersonal and individual anti-trans stigma and ignored the role of structural anti-trans stigma*. For example, in a critical review of the literature on anti-trans stigma scales, King, Hughto, and Operario (2020) found that most quantitative studies focused on anti-trans stigma have used measures that assess interpersonal and individual stigma. Furthermore, *even fewer studies have measured different levels of the socioecological framework (i.e., structural, interpersonal, and individual) within one study* (King et al. 2020). In Chapter 3, I work to fill this gap by assessing how structural anti-trans stigma, as conceptualized as laws and policies that demean, devalue, and restrict the healthcare of trans people, have been associated with the ability of trans people to access gender-affirming care. In this study, I tested the association of anti-trans stigmatizing policies to non-prescribed hormone use while considering how stigma operates across two levels of the Socio-Ecological Model of Transgender Stigma and Health and how these forms of stigma are connected.

Lastly, few studies have detailed how influential actors buffer the effects of structural anti-trans stigma. In Chapter 4, I describe how adolescent gender-affirming care providers navigate stigma across structural, interpersonal, and individual levels while continuing to provide gender-affirming care. In this Chapter, I account acts of resistance, resilience, and advocacy that are central to maintaining gender-affirming healthcare for adolescents and critical to their health and well-being. Finally, in Chapter 5, I summarize key findings from earlier Chapters and discuss their broader contributions to the field of population health. I then discuss these studies' implications for future research and the policy and practice implications of these findings.

Chapter 2 Weathering Gender Norms: CVD Risk Among Trans People with Private Insurance

My shoulders gather
shower storms rained by trans girls
cuz of cis terror.
- Venus Selenite

Introduction

Transgender and gender diverse (trans) people are those whose gender identity or gender expression varies from culturally prescribed expectations associated with their sex assigned at birth. Research on the health of trans populations in the United States (U.S.) has grown exponentially in the past decade, with more research being published on the topic than ever before (Committee on Understanding the Well-Being of Sexual and Gender Diverse Populations et al. 2020). Most research on the health of trans populations has suggested disparities across a host of health outcomes between trans and cisgender (cis), or non-transgender, people in the U.S., finding that trans people were typically at a greater risk for poor health, with research typically focused on mental and sexual health (Committee on Understanding the Well-Being of Sexual and Gender Diverse Populations et al. 2020). However, less attention has been given to the population-level risk of conditions outside mental and sexual health domains, like cardiovascular disease (CVD) (Committee on Understanding the Well-Being of Sexual and Gender Diverse Populations et al. 2020; Feldman et al. 2016).

CVD is consistently among the leading causes of death in the U.S. general population (Ahmad and Anderson 2021), and the only known studies to focus on the cause of death among trans populations have found it to be among the leading causes of death (de Blok et al. 2021; Blosnich et al. 2014). Therefore, focusing on the risk of CVD among trans populations is essential to understanding the overall morbidity and mortality among trans populations and how cardiovascular risk might contribute to health disparities between trans and cis populations.

In the general population, age is known to modify the relationship between gender and CVD, with cis women being at a significantly lower risk for CVD than cis men before age 55, but with their risk for CVD doubling after age 55 (Mikkola et al. 2013). This change in risk is associated with the typical age of menopause in cis women (Mikkola et al. 2013). Despite age being a powerful modifier between gender and CVD risk, to my knowledge, no studies have assessed how age might modify the relationship between gender and cardiovascular disease among trans populations. The purpose of this study was to partially fill this gap in the literature by examining how age modifies the relationship between CVD risk and gender in a sample of trans people enrolled in private insurance.

Where studies of CVD risk in trans populations have been conducted, most have found that trans people were at a greater risk of CVD than their cis counterparts but that the risk is heterogenous within trans populations when stratified by gender. For example, using the Behavioral Risk Factor Surveillance System (BRFFS), a probability sample of U.S. respondents, researchers found that trans men were two and four times more likely to report ever having been diagnosed with myocardial infarction than cis men and women, respectively, after controlling for other factors (e.g., age, gender, diabetes mellitus, chronic kidney disease, hypertension, hypercholesterolemia, and exercise) (Alzahrani et al. 2019). In this same study, trans women were more likely to report ever having been diagnosed with myocardial infarction than cis women, but not cis men (Alzahrani et al. 2019). Also, using BRFFS data, Downing and Przedworski (2018) found that compared to cis women, trans women (adjusted odds ratio (AOR): 2.07), trans men (AOR:1.90), and gender non-conforming/nonbinary people (AOR: 6.42) had significantly increased odds of having either coronary heart disease or stroke after accounting for demographic characteristics (e.g., age, race/ethnicity, relationship status, education, health insurance coverage, and state). Compared to cis men, only gender non-conforming/nonbinary individuals had a statistically significant higher risk of coronary heart disease or stroke (AOR: 2.31). Recent findings from the TransPop study, the first national probability sample of trans people in the U.S., did not find any differences in CVD risk between trans and cis populations. However, the sample size was likely too small to identify differences in risk between these two groups (n=114 trans people versus n=964 cisgender people) (Poteat et al. 2021). Additionally, the authors suggested that differences were not found due to the younger age of trans people in the study – although the authors limited the sample to those 40 years and older, the mean age for the trans cohort was 53 or 6 years younger than their cis counterparts (Poteat et al. 2021).

In administrative claims data sources, age-adjusted analyses have found that trans people insured or engaged in care at the Veteran's Health Administration (VHA) were at a greater risk of CVD than their cis counterparts. For example, Brown and Jones (2016) used a case-control design to assess the differences in CVD risk between trans and cis people who accessed care from the VHA. After matching trans and cis people on gender, age, region, sex assigned at birth, and the clinic where most of the patient's encounters occurred, the authors found that trans people were at a significantly increased risk of heart attack (AOR: 1.36), cardiac arrest

(AOR:1.72), stroke (AOR: 1.41), congestive heart failure (AOR:1.35), hypercholesterolemia (AOR: 1.58), hypertension (AOR: 1.51), and ischemic heart disease (AOR: 1.49) (Brown and Jones 2016). When using private insurance data, researchers have found that transmasculine/nonbinary people assigned female at birth are at a greater risk of hypertension, cardiac arrhythmia, and valvular disease than cis and transfeminine/nonbinary people assigned male at birth (Hughes, Shireman, and Hughto 2021). In contrast, transfeminine/nonbinary people had a similar risk of CVD compared to cis men, except they did have an elevated risk of hypertension (Hughes, Shireman, et al. 2021). Together, findings from the BRFFS and administrative claims studies suggest significant variation in CVD risk among trans populations by gender identity and sex assigned at birth, with most studies finding an increased risk of CVD among trans populations compared to their cis counterparts.

Some research has considered that CVD risk is conferred by exogenous hormone use, particularly around the administration of high-dose oral formulations of estrogen, which has been shown to contribute to an increased risk of venous thrombosis among trans people assigned male at birth (Streed et al. 2017, 2021). However, research suggesting the initiation of exogenous hormone therapy as being associated with other cardiovascular morbidity and adverse cardiovascular events remains mixed and inconclusive (Coleman et al. 2022; Streed et al. 2021).

Context of Cardiovascular Risk

In the context of the pervasive anti-trans stigma and discrimination, the lived experience of trans people looks quite distinct from their cis counterparts. Trans people are more likely to experience stress due to the devaluation of their gender identity and expression, which comes at a cost to their health. When individuals encounter a stressor, their body’s primary stress response systems are activated, specifically the sympathetic nervous system and hypothalamic-pituitary-adrenal axis (Lazarus and Folkman 1984; McEwen and Stellar 1993). While activation of the body's stress mechanisms is normal and beneficial to survival, chronic and repeated activation of these systems causes them to wear down over time and lead to cardiovascular disease (McEwen and Stellar 1993).

Geronimus et al. (2010) have posited that socially structured stressors elicit chronic activation of the body's stress response systems, resulting in *weathering* or the early health deterioration and aging of individuals with socially stigmatized identities. In this way, the social stressors encountered by trans people, because of their stigmatized status, repeatedly activate their primary stress response systems and increase their risk for cardiovascular disease and adverse cardiovascular events over their life course when compared to their cis counterparts who do not experience the same social stigmatization. Preliminary evidence has shown 'weathering' mortality patterns in U.S. trans populations (Hughes, King, Gamarel, Geronimus, O. A. Panagiotou, et al. 2022; Hughes, King, Gamarel, Geronimus, O. Panagiotou, et al. 2022). Furthermore, the only study to assess allostatic load, a physical measure of the cumulative burden of stress associated with CVD, among trans people in the U.S. found that allostatic load among transmasculine people was positively associated with stigmatizing geopolitical climates and socio-economic disadvantage, suggesting the "embodiment" of stigma among trans populations (DuBois and Juster 2022; Guidi et al. 2021).

Purpose and Hypotheses

This study aimed to assess the trends of CVD risk over age among trans people enrolled in private insurance and whether the risk patterns vary by gender and age. This study tested two hypotheses. First, I expected that trans people would be at greater risk *overall* for each cardiovascular condition than their cis counterparts that shared their sex assigned at birth (i.e., transmasculine and nonbinary people assigned female at birth (TMN) would be at greater risk for CVD conditions than cis women and transfeminine and nonbinary people assigned male at birth (TFN) would be at greater risk for CVD conditions compare to cis men) when adjusted for age and social factors (e.g., race, region, age at enrollment, and education). Second, I expected that the disparity between trans and cis people who shared the same sex assigned at birth would emerge at early ages and be maintained over age when adjusted for social factors, suggesting the presence of ‘weathering’ among trans populations compared to their cis counterparts. This study seeks to fill gaps in the literature by testing these hypotheses in a large group of trans people in the U.S., utilizing data with long follow-up times, and utilizing outcomes based on healthcare provider-verified diagnoses. This study has the potential to advance the field of transgender health and provide preliminary support for the weathering hypothesis among trans communities who experience chronic stress due to systemic anti-trans stigma and discrimination.

Methods

Data sources and measures

The current study was derived from Optum’s Clinformatics® Data Mart Database. Optum included healthcare claims for 84 million unique enrollees, among which the South and Midwest and overly represented. Optum provided information on all medical claims, including inpatient, outpatient, prescriptions, procedures, and diagnoses, as well as limited demographic and enrollment information. All claims were derived from a large national managed care company that has not been publicly disclosed.

The present study used de-identified insurance claims for privately insured people or those enrolled in Medicare Advantage from 2001-2019 across all 50 U.S. states. Data include only those enrolled in medical and prescription drug coverage to ensure researchers could access all enrollees' claims. These data were chosen as they form the largest identified group of trans people in the U.S., spanning nearly two decades, and contain the diagnoses of the CVD conditions of interest here (i.e., coronary artery disease (CAD), heart failure (HF), hypertension (HTN), hypercholesterolemia (HC), and myocardial infarction (MI)) (J. Hughto et al. 2022). These data provide reliable estimates of the risk of CVDs by age and gender, given the large sample size and that a medical provider has confirmed these diagnoses. This study was ruled exempt by the University of Michigan (HUM00161819).

Outcome measures

The primary outcomes of this study were CVD diagnoses. All measures of CVDs (i.e., CAD, HF, HTN, HC, and MI) were assessed using ICD-9 and ICD-10 diagnoses codes. See **Appendix Table 1** for a list of all the codes used for each measure. Two physicians reviewed each measure's diagnosis codes to ensure they were correctly identified. Once individuals were diagnosed with a condition, they were coded as having that condition in all subsequent years in which they were observed.

Key stratification variable

One of the key independent variables of interest for this study was gender; thus, all analyses were stratified by gender. Since gender was not self-reported in these data, inferential methods were employed to ascertain the gender of those in this study. To identify gender, I first identified those in the data who were trans using an algorithm developed by Hughto et al. using private insurance data (J. Hughto et al. 2022), which classified people as transfeminine and nonbinary people assigned male at birth (TFN), transmasculine and nonbinary people assigned female at birth (TMN), and trans people whose gender expression or sex assigned at birth was not classified (trans unclassified). Briefly, trans enrollees and their gender were identified using a combination of ICD-9 and ICD-10 diagnostic codes specific to trans individuals (e.g., Gender Dysphoria and Gender Identity Disorder; ICD 9: 302.X and ICD10: F64.X); Common Procedural Terminology codes for trans-related surgical procedures (e.g., vaginoplasty, phalloplasty); and prescriptions claims for gender-affirming hormones. This algorithm built on prior work that used trans-related ICD codes alone (Proctor et al. 2016) by also including enrollees who received an Endocrine Disorder Not Otherwise Specified diagnosis (Endo NOS) in conjunction with hormone prescriptions or trans-specific surgeries (Jasuja et al. 2020). Endo NOS is often used for billing for trans-affirming services instead of gender identity disorder to avoid the stigma of labeling the person as trans or avoid insurance denials (Jasuja et al. 2020). Following the Hughto et al. (2022) algorithm, I used a combination of gender-affirming and sex-specific care claims (i.e., procedures that could only be performed on males or females) to categorize trans enrollees as TMN or TFN. Some trans individuals could not be identified as TMN or TFN and were coded as “trans, unclassified.” To ascertain the gender of cis people, I used the sex listed on their enrollment information to identify their gender (e.g., cis people listed as male were coded as cis men, and those listed as female were coded as cis women).

Age

Age at a given time was identified using a person’s birth year and the year of enrollment, enrollment end date, and diagnosis date. Optum only provided individuals’ birth years to ensure the data remained unidentified. Thus, all individuals’ birth dates are coded as January 1st of their birth year. Optum coded any ages over 90 years as 90 to ensure de-identification.

Control Variables

Information on race/ethnicity and education was derived from a nationally recognized consumer marketing data supplier, including consumer-specific demographic, behavioral, and lifestyle information. Optum included the following race/ethnicity categories: non-Hispanic Asian, non-Hispanic Black, Hispanic, non-Hispanic White, and unknown. Optum included the following highest completed education categories: less than 12th grade, high school diploma, more than high school diploma but less than bachelor’s degree, bachelor’s degree or more, and unknown. Region was coded as Midwest, Northeast, South, and West, derived from the address at the time of enrollment.

Study design and sample

All individuals identified as TFN or TMN and 18 years or older were included in this study. Among the remaining cis enrollees 18 or older, a 10% random sample was selected. This approach is commonly used in the literature (Hughes, King, Gamarel, Geronimus, O. Panagiotou, et al. 2022; Hughes, Shireman, et al. 2021; J. Hughto et al. 2022). Individuals’ observed period began when they enrolled in insurance and ended when they either were unenrolled, died, or the study period ended.

Analyses

To test each hypothesis, I matched each trans individual to their cis counterparts who share their sex assigned at birth (i.e., TFN to cis men and TMN to cis women) using exact matches where possible on age, age at enrollment, race/ethnicity, education, and region. Where exact matches were not found (representing only 1.4% of the trans sample), nearest-neighbor matching was used. Trans people were allowed to be matched with as many cis people so long as their matched variables were identical or they had several nearest-neighbor matches with equal scores. Because I observed individuals for more than one year, I clustered the standard errors within each individual and reweighted the data so everyone was equally weighted regardless of how long they were observed.

To test hypothesis 1, I estimated the rates of each CVD separately for those between the ages of 18 and 64 and those between the ages of 65 and 90, as those enrolled after age 65 were typically on Medicare Advantage plans, representing a different population of enrollees than those enrolled in private insurance below the age of 65. To test hypothesis 2, I calculated the rates of each CVD by gender group across five-year age categories with the exceptions of 18-24 and 85-90, as the age categories were not evenly divisible by 5.

As a sensitivity test, I recalculated the estimates excluding trans people who had never accessed prescribed hormones during the study period to see if the findings were similar to the analyses on the whole sample. All analyses were conducted using Stata/MP 14.2.

Results

Descriptive Statistics

Table 2.1 outlines the demographics of the sample by gender. Overall, I identified 27,698 TMN and TFN people between 2001-2019. TMN people comprised 65% of the overall trans population, likely because gynecological care (e.g., cervical screenings, pregnancy) is typically sought at earlier ages than care that would identify those assigned male at birth (e.g., prostate-related care). Given that these data were derived from privately insured individuals, these data skew younger than other payer datasets like Medicare, which further suggests that TMN people were more identifiable. I observed the TMN group for 112,773 person-years and the TFN group for 51,678 person-years. I observed cis men and cis women for about 13 million person-years each.

A plurality of the sample was from the South for each of the gender groups (37-44%), and the least represented region was the Northeast (9-10%). The racial and ethnic composition of the sample was primarily non-Hispanic White (54-64%), and a higher proportion of trans people were non-Hispanic White than their cis counterparts. Although the data for missing education was high, trans people had higher educational attainment at the time of enrollment than their cis counterparts, with 65% holding at least a high school diploma compared to 54% of cis people. The crude prevalence of ever having a specific cardiovascular condition ranged from 0.95-3.35% for less common conditions such as myocardial infarction (MI) and 21.63-39.94% for more common conditions such as hypercholesterolemia (HC). When I compared the crude rates of each CVD among all gender groups, TFN people had the greatest prevalence of every CVD condition. **Appendix Table 2** shows that after matching on the control variables, the trans and cis samples were virtually identical on all variables when compared to those assigned the same sex at birth.

Table 2.1: Descriptive Statistics by Gender

	Total	**TFN**	**TMN**	**Cis Women**	**Cis Men**
n	8,385,726	9,769	17,929	4,185,106	4,172,922
Age at enrollment, mean(sd)	43.97 (17.56)	40.75 (17.58)	34.92 (14.21)	43.68 (17.75)	42.24 (16.73)
Observed Years, mean(sd)	3.17 (2.82)	5.29 (4.08)	6.29 (4.59)	3.19 (2.83)	3.14 (2.78)
Race/Ethnicity, %					
NH Asian	3.91	2.67	2.64	3.74	4.10
NH Black	8.44	7.87	8.19	9.24	7.63
Hispanic	10.21	7.80	8.76	9.74	10.69
NH White	54.42	62.49	64.42	53.93	54.86
Unknown	23.01	19.16	16.00	23.35	22.72
Education, %					
Less than 12th Grade	0.74	0.36	0.23	0.66	0.82
High School Diploma	22.04	17.61	17.93	21.60	22.50
Less than Bachelor Degree, More than HS	40.09	44.13	45.86	40.36	39.77
Greater than Bachelor Degree	14.25	18.59	19.93	14.03	14.43
Unknown	22.89	19.32	16.05	23.34	22.48
Census Region at Enrollment, %					
South	44.31	37.07	44.02	44.46	44.18
Midwest	24.20	24.04	22.21	24.15	24.27
West	20.37	27.99	24.33	20.4	20.3
Northeast	10.02	10.8	9.33	10.15	9.88
Unknown	1.10	0.11	0.11	0.84	1.37
Overall CVD Rates, %					
Coronary Artery Disease	6.43	13.76	7.11	5.45	7.39
Heart Failure	3.19	7.48	3.44	3.26	3.10
Hypertension	23.72	37.53	27.86	23.74	23.65
Hypercholesterolemia	22.00	39.94	33.35	21.63	22.28
Myocardial Infarction	1.14	3.35	1.23	0.95	1.32

Notes: TFN = transfeminine and nonbinary people assigned male at birth, TMN = transmasculine and nonbinary people assigned female at birth, NH=non-Hispanic, chi-square tests (for categorical variables) and t-tests (for linear variables) testing significant differences between the groups were all significant with p-values <.001; therefore a column denoting these values was removed for ease of presentation.

Assessing Overall CVD Risk

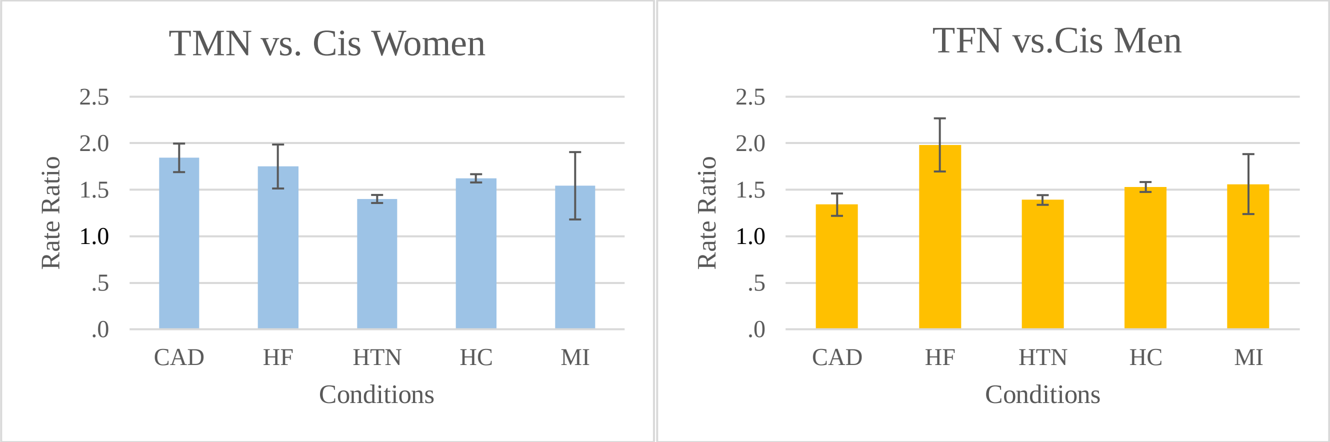
Ages 18-64

As seen in **Figure 2.1,** when I compared 18-64-year-old trans people to their cis counterparts who share the same sex assigned at birth (e.g., TMN to cis women), I found that trans people were at an overall significantly increased risk of all 5 CVDs compared to their cis counterparts who share the same sex assigned at birth when matched on age, age at enrollment, race/ethnicity, education, and region. Comparing the rate ratios between TMN and cis women, I found the rate ratios ranged from 1.401 (95% CI: 1.357-1.444), for hypertension and 1.843 for CAD (95% CI: 1.689-1.996). Comparing the rate ratios between TFN and cis men, I found the rate ratios ranged from 1.339 (95% CI: 1.338-1.442), for CAD and 1.983 for HF (95% CI: 1.696-2.268).

Ages 65-90

As seen in **Figure 2.2,** when I compared 65-90-year-old trans people to their cis counterparts who share the same sex assigned at birth, I found that trans people were at an overall significantly increased risk of all 5 CVDs compared to their cis counterparts who share the same sex assigned at birth when matched on age, age at enrollment, race/ethnicity, education, and region. Comparing the rate ratios between TMN and cis women, I found the rate ratios ranged from 1.190 (95% CI: 1.160-1.221), for HC and 1.754 for MI (95% CI: 1.401-2.107). Comparing the rate ratios between TFN and cis men, I found the rate ratios ranged from 1.163 (95% CI: 1.137-1.189), for HTN and 1.675 for HF (95% CI: 1.534-1.817).

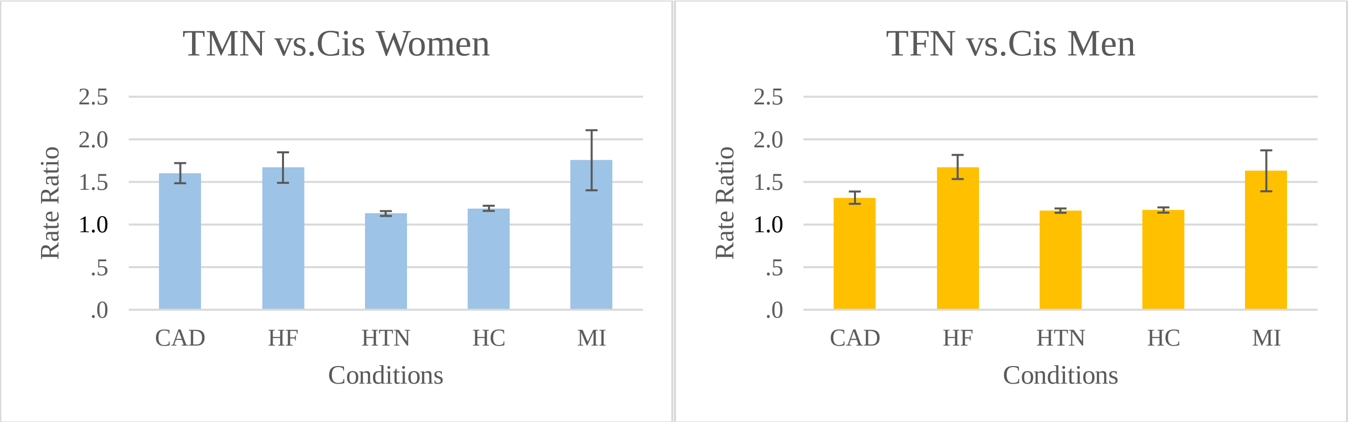
Figure 2.1: Matched Overall Differences in Cardiovascular Conditions, Rate Ratios, Ages 18-64



TMN vs. Cis Women

TFN vs.Cis Men

Figure 2.2: Matched Overall Differences in Cardiovascular Conditions, Ages 64-90



TMN vs.Cis Women

TFN vs.Cis Men

Notes for Figures 2.1-2: Analyses matched by sex assigned at birth on age, age at enrollment, region, edu, and race. 95% Confidence Intervals are represented using error bars. SEs were clustered within each individual, and data were weighted, so each individual was equally represented regardless of the number of observed years. CAD = coronary artery disease, HF= heart failure, HTN= hypertension, HC= hypercholesterolemia, MI= myocardial infarction, TFN = transfeminine and nonbinary people assigned male at birth, TMN = transmasculine and nonbinary people assigned female at birth.

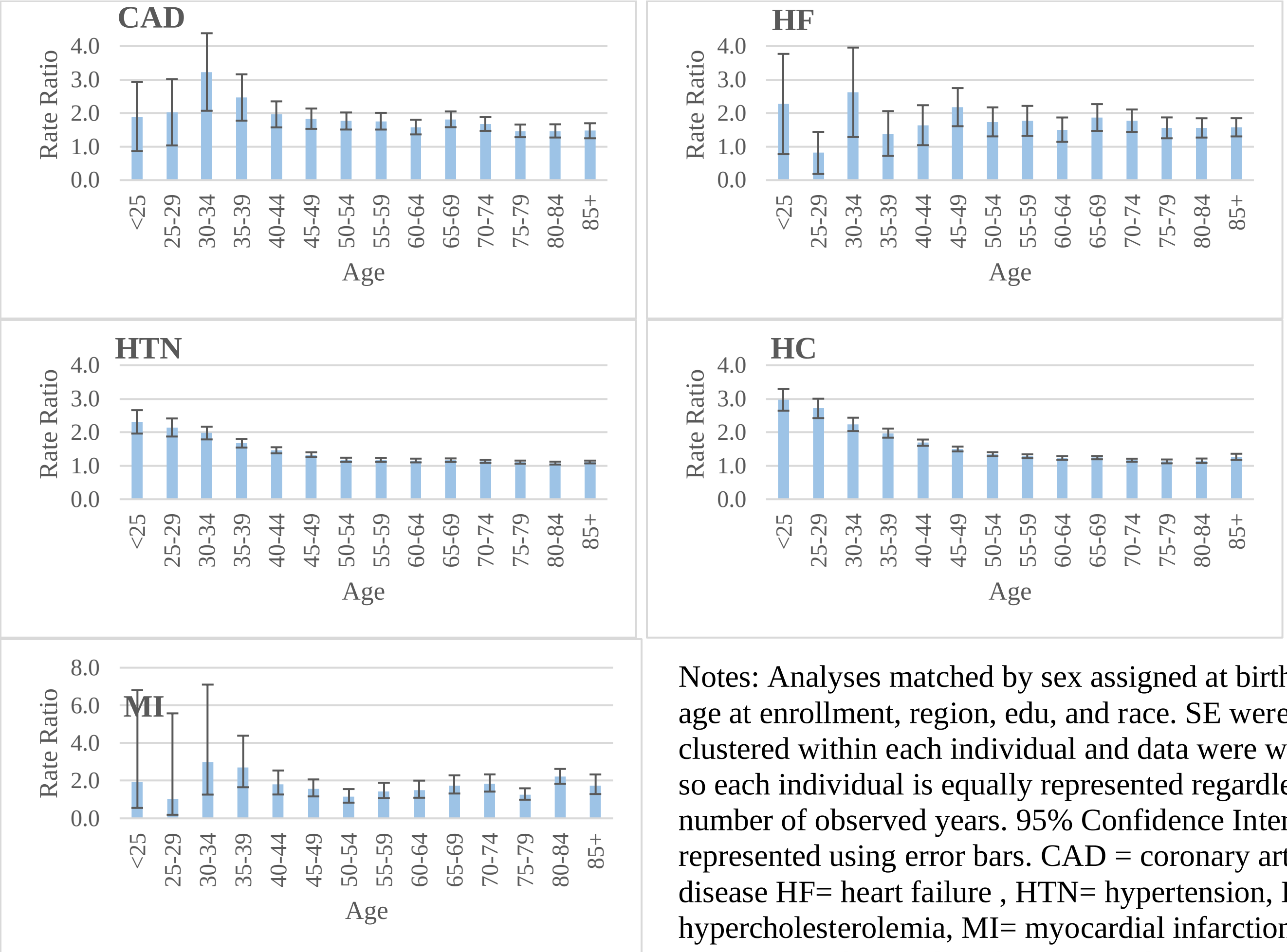
Assessing CVD Risk Over Age

Prevalence estimates of CVDs can be found in **Appendix Figure 1** and **Appendix Figure 2** which showed a trend of increasing risk profiles for all groups over age. **Appendix Figure 3** and **Appendix Figure 4** display the percentage point differences in the prevalence rates between the trans and cis cohorts over age. Generally, these showed increasing percentage point differences over age between the groups, with the trans cohorts being at a greater risk of each CVD at each age. The two conditions for which this did occur were when I assessed HC and HTN. In these cases, the percentage-point differences in the prevalence of HC and HTN between the trans and cis groups peaked around ages 45-55 and remained relatively stable throughout the rest of the period. **Figure 2.3** and **Figure 2.4** display the relative risks of CVDs comparing trans people to their cis counterparts who share their sex assigned at birth.

Coronary Artery Disease (CAD)

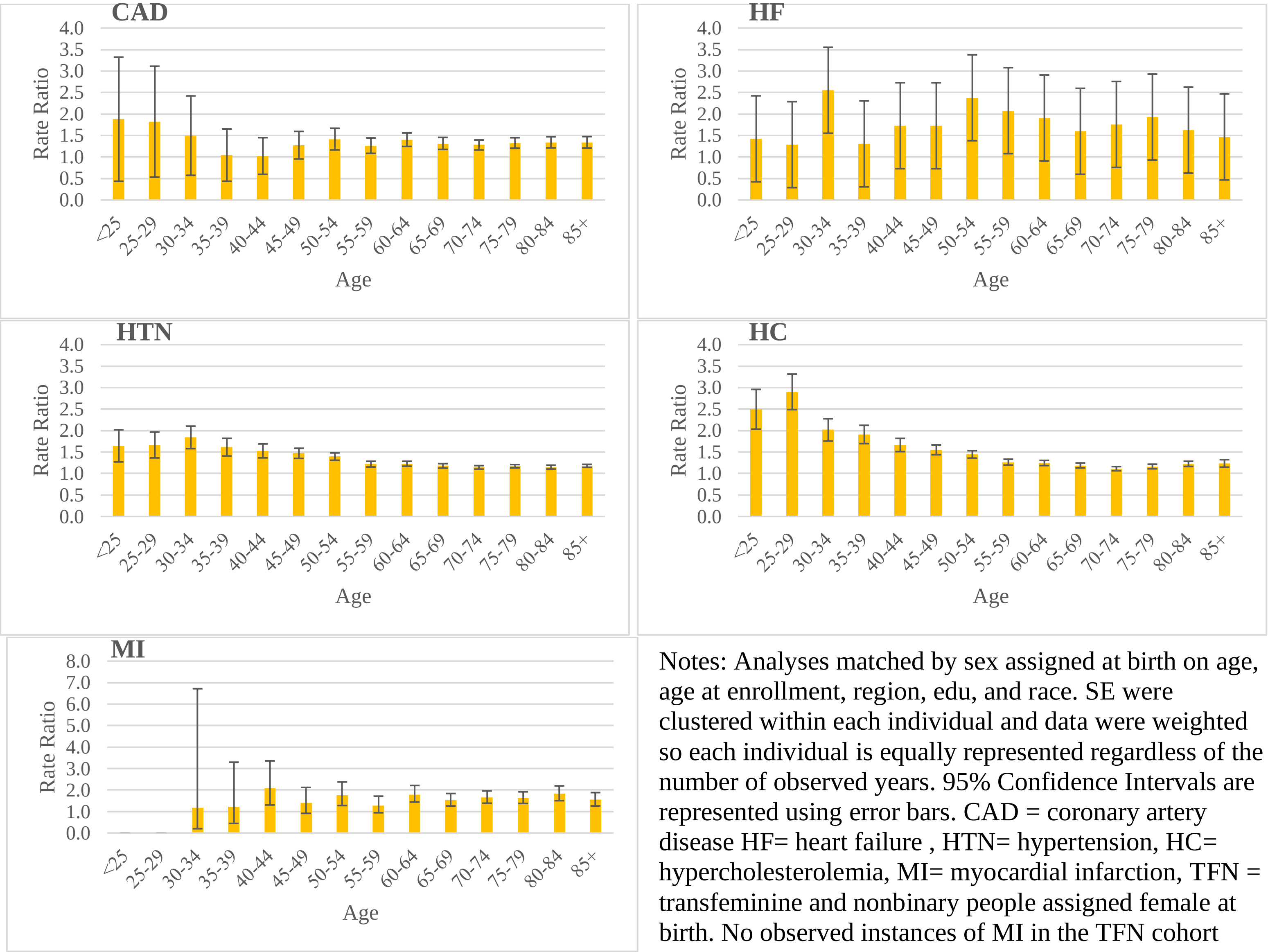
When assessing the risk of CAD among TMN and cis women, these groups began to diverge between ages 25-29 with a relative risk of 2.025 (95% CI: 1.035-3.014), which peaked at 3.229 (95% CI: 2.071-4.387) between the ages of 30-34, and gradually decreased throughout the ages between 40-90 with the lowest relative risk being 1.470 (95% CI: 1.272-1.668) between 80-84. When assessing the risk of CAD among TFN and cis men, these groups began to diverge between ages 50-54 with a relative risk of 1.416 (95% CI: 1.164-1.668) and decreased very slightly from age 55 onward with the lowest relative risk being 1.280 (95% CI: 1.163-1.396) between 70-74.

Figure 2.3: Relative Risk of CVD, TMN divided by Cis Women



Notes: Analyses matched by sex assigned at birth on age, age at enrollment, region, edu, and race. SE were clustered within each individual and data were weighted so each individual is equally represented regardless of the number of observed years. 95% Confidence Intervals are represented using error bars. CAD = coronary artery disease HF= heart failure , HTN= hypertension, HC= hypercholesterolemia, MI= myocardial infarction, TMN = transmasculine and nonbinary people assigned female at birth.

Figure 2.4 Relative Risk of CVDs, TFN divided by Cis Men



Notes: Analyses matched by sex assigned at birth on age, age at enrollment, region, edu, and race. SE were clustered within each individual and data were weighted so each individual is equally represented regardless of the number of observed years. 95% Confidence Intervals are represented using error bars. CAD = coronary artery disease HF= heart failure , HTN= hypertension, HC= hypercholesterolemia, MI= myocardial infarction, TFN = transfeminine and nonbinary people assigned female at birth. No observed instances of MI in the TFN cohort between ages of 18 and 29, thus these columns are not shown.

Heart Failure (HF)

When assessing the risk of HF among TMN and cis women, these groups began to diverge between ages 30-34 with a relative risk of 2.622 (95% CI: 1.285-3.960). Excluding the ages of 40-49, the relative risk gradually decreased after age 49, with the lowest relative risk being 1.506 (95% CI: 1.142-1.871) between the ages of 60-64. When assessing the risk of HF among TFN and cis men, these groups began to diverge between ages 45-49 with a relative risk of 1.178 (95% CI: 1.011-2.445), which peaked at 2.379 (95% CI: 1.685-3.074) between the ages of 50-54, and gradually decreased throughout the ages between 55-90 with the lowest relative risk being 1.467 (95% CI: 1.258-1.676) between 85-90.

Hypertension (HTN)

When assessing the risk of HTN among TMN and cis women, these groups began to diverge between ages 18-25 with a relative risk of 2.312 (95% CI: 1.962-2.662) and remaining around 2.00 until age 35 and then gradually decreased throughout the ages between 35-90 with the lowest relative risk being 1.079 (95% CI: 1.036-1.123) between 80-84. When assessing the risk of HTN among TFN and cis men, these groups began to diverge between ages 18-25 with a relative risk of 1.643 (95% CI: 1.270-2.017), which peaked at 1.841(95% CI: 1.579-2.102) between the ages of 30-34, and gradually decreased throughout the ages between 40-90 with the lowest relative risk being 1.143 (95% CI: 1.101-1.184) between 70-74.

Hypercholesterolemia (HC)

When assessing the risk of HC among TMN and cis women, these groups began to diverge between ages 18-25 with a relative risk of 2.966 (95% CI: 2.642-3.290) and remaining above 2.00 until age 35 and then gradually decreased throughout the ages between 35-90 with the lowest relative risk being 1.130 (95% CI: 1.073-1.188) between 75-79. When assessing the risk of HC among TFN and cis men, these groups began to diverge between ages 18-25 with a relative risk of 2.495 (95% CI: 2.032-2.957), which peaked at 2.900 (95% CI: 2.488-3.313) between the ages of 25-29, and gradually decreased throughout the ages between 30-90 with the lowest relative risk being 1.113 (95% CI: 1.064-1.162) between 70-74.

Myocardial Infarction (MI)

When assessing the risk of MI among TMN and cis women, these groups began to diverge between ages 30-34 with a relative risk of 2.963 (95% CI: 1.260-7.103), then gradually decreasing to 1.139 (95% CI: 0.834-1.554) until age 55 and slightly increasing throughout most ages between 55-90, peaking at 2.208 (95% CI: 1.835-2.624) between ages 80-84. However, between ages 75-79, I observed a significant drop in relative risk 1.260 (95% CI: .990-1.595) compared to the trend. When assessing the risk of MI among TFN and cis men, these groups began to significantly diverge between ages 60-64 with a relative risk of 1.792 (95% CI: 1.445-2.213) and gradually decreased throughout the ages between 65-90, being 1.551 (95% CI: 1.261-1.882) between the ages of 85-90.

Sensitivity Analyses

Appendix Figure 5 and **Appendix Figure 6** display the overall risk ratios between the trans and cis groups when including the full sample vs. including only those with hormones. When comparing 18-64-year-old TMN people to cis women, restricting the sample to only those who used prescribed hormones during the study period did not significantly affect the rate ratio estimates for nearly all CVDs except HC, which showed that the risk decreased from 1.623 (95% CI: 1.578-1.667) in the full sample to 1.219 (1.182-1.256) in the sample including only those with hormones. When comparing 18-64-year-old TFN people to cis men, restricting the sample to only those who used prescribed hormones during the study period did significantly affect the rate ratio estimates for all CVDs, with the restricted sample displaying smaller rate ratios compared to the full sample, with the largest differences being for HF and MI with a decrease in the rate ratio of 0.595 (95% CI: 0.564-0.626) and 0.571 (95% CI: 0.515-0.626), respectively.

When comparing 64-90-year-old TMN people to cis women, restricting the sample to only those who used prescribed hormones during the study period significantly affected the rate ratio estimates for HC and HF. For HC, the risk increased from 1.190 (95% CI: 1.160-1.221) in the full sample to 1.637 (1.585-1.689) including only those with hormones. For HF, the risk decreased from 1.668 (95% CI: 1.489-1.847) in the full sample to 1.069 (0.847-1.291) including only those with hormones. When comparing 64-90-year-old TFN people to cis men, restricting the sample to only those who used prescribed hormones during the study period significantly decreased the rate ratio estimates for CAD, HF, and HC. For CAD, the risk decreased from 1.315 (95% CI: 1.243-1.387) in the full sample to 1.036 (0.937-1.135) including only those with hormones, wiping out any differences between the TFN and cis men. For HF, the risk decreased from 1.675 (95% CI: 1.534-1.817) in the full sample to 1.291 (1.099-1.483) including only those with hormones. For HTN, the risk decreased from 1.163 (95% CI: 1.137-1.189) in the full sample to 1.100 (1..058-1.142) including only those with hormones.

Discussion

To my knowledge, this was the first study to assess whether age moderates the relationship between gender and CVD risk among a sample of trans people in the U.S. The findings from this study indicate that trans people were at a greater risk for CVDs than their cis counterparts who share their sex assigned at birth and, generally speaking, that the greatest differences in risk emerged at early ages. Furthermore, the risk continued to remain greater among the trans populations into older age after matching on demographic and other factors (i.e., race/ethnicity, education, age, region, and age at enrollment). Though I was unable to account for anti-trans stigmatization, my findings of the early emergence of and continued increased risk for CVD among trans people compared to their cis counterparts are suggestive of the *weathering hypothesis* such that trans individuals may experience chronic social stigmatization that affects their physiological health and leads to accelerated aging and onset of CVDs (Geronimus et al. 2020). Given that CVD is a leading cause of death in the U.S. (Ahmad and Anderson 2021), it is likely that findings of an increased risk of mortality between trans and cis populations enrolled in private insurance may be in part due to CVDs (Hughes, King, Gamarel, Geronimus, O. Panagiotou, et al. 2022) as they have been in other U.S. samples (Blosnich et al. 2014).

My analyses supported my first hypothesis that trans people would be at an *overall* greater risk for CVDs than their cis counterparts who shared their sex assigned at birth after matching on demographic factors. In this way, my findings broadly fit into literature that has found subpopulations of trans people at a greater risk for CVDs than their cis counterparts (Alzahrani et al. 2019; Hughes, Shireman, et al. 2021). However, my findings that trans people were at statistically significant overall greater risk for all CVD conditions compared to cis people who shared their sex assigned at birth diverged somewhat from the literature that has not found statistically significant differences between trans women and cis men (Alzahrani et al. 2019; Downing and Przedworski 2018; Poteat et al. 2021). This divergence may have been due to the smaller sample size in these studies than the one presented here and the inability to follow participants for more than a single time point (Alzahrani et al. 2019; Downing and Przedworski 2018; Poteat et al. 2021). Additionally, these studies used data that was reported by the participants themselves. Trans individuals may be less likely to seek medical care due to discrimination (James et al. 2016), which means that the estimates of CVDs in these studies may not accurately reflect the true difference in CVDs among trans people compared to their cis counterparts. Compared to other administrative samples, my findings of increased risk for CVDs among trans populations compared to those who share their sex assigned at birth aligned with those using VHA or private insurance data (Brown and Jones 2016; Hughes, Shireman, et al. 2021). For a detailed discussion and analyses of this study compared to those previously published, as well as these estimates compared to NHANES data, see **Appendix Tables 3-6** and **Appendix Figures 7-9**.

My second hypothesis was that the difference in CVD risk between trans and cis individuals assigned the same sex at birth would emerge at early ages and be sustained through older ages after accounting for sociodemographic factors. This hypothesis was supported by my findings, which showed that the difference in CVD risk between trans and cis individuals of the same assigned sex emerged at early ages, where trans individuals were at the greatest relative risk, and the difference in risk was maintained into older age, albeit at smaller relative risks. This suggests that trans individuals may experience a phenomenon known as weathering, in which the negative effects of anti-trans stigma emerge during early and middle adulthood and are sustained over time and leading to poor health outcomes. Given the differences in lived experience between trans and cis people, it is impossible to fully account for stigmatization when comparing these two groups, as there would be nearly no variation in “anti-trans stigma” among those who identify as cis. However, these findings echo calls by researchers to consider the risk anti-trans stigma plays in contributing to CVD disparities (Streed et al. 2021) and the need to consider stigma as a fundamental cause of health inequity between trans and cis populations (Hatzenbuehler et al. 2013; King et al. 2020; White Hughto et al. 2015).

I conducted sensitivity analyses to determine whether access to hormones using private insurance moderated the differences in CVD risk between the trans and cis groups. When I included only those who accessed hormones, I found that for most CVDs, the risk either did not significantly change or significantly decreased. This was the case for all CVDs except when comparing the risk of HC among 65-90 TMN and cis women. The findings of decreased risk profiles of CVDs among those who accessed hormones during the study period compared to may be due to several factors. Those who did not access hormones may not have been able to access them due to preexisting CVD risk, as some medical providers may have been cautious about prescribing hormones in these cases. Additionally, there may be other risk factors for CVD associated with being unable to access hormones, such as discrimination, employment, or age, which could confound the comparison between these two groups. While this study was unable to address these confounding factors, future research may be able to explore this issue further.

Implications for future research and policymakers

These findings are suggestive of the weathering hypothesis, which should be tested in future research on the CVD risk among trans populations. Studies that assess anti-trans stigma and CVD among trans people in the U.S. should consider analyses that look at the types, frequency, the timing of anti-trans stigma and the environments in which this stigma occurs to assess whether it is correlated with CVD risk among trans populations. This study suggests that this may be a fruitful area of research. Furthermore, other outcomes known to be associated with chronic social stress, such as allostatic load, mortality, and birth outcomes, may also be rich subjects to study and will further test whether weathering is indeed a proper theoretical framing for studying the health of trans populations in the U.S. Weathering has been discussed in great detail about the cost racism exacts on the health and wellbeing of Black Americans (Geronimus

1992, 2020; Geronimus et al. 2007, 2010, 2020) and preliminary work looking at the intersection of gender identity and race has found significant racial differences between trans and cis populations (Hughes, King, Gamarel, Geronimus, O. A. Panagiotou, et al. 2022). As such, future studies are warranted to examine the intersections of race and gender identity to provide a deeper understanding of how social stratification and intersectional stigma shape the health of trans individuals as they age.

These findings also suggest the need to broaden the scope of trans health research to include CVD as an essential health outcome to be monitored among trans populations and to promote programs and interventions across various settings to reduce disparities. This requires effort in the federal government to collect gender identity data in health surveillance systems, fund CVD-related trans health research, work with physicians to address these risks in clinical settings, and work with social workers and other professionals to reduce anti-trans stigma and its noxious effects beyond the clinic walls. Public health researchers and practitioners should focus on the way stigma affects the seven most important predictors of heart health as outlined by the American Heart Association (e.g., smoking, nutrition, physical activity, weight, and monitoring blood pressure, cholesterol, and blood sugar), as well as HIV-risk, exogenous hormone use, sleep, and substance use (Streed et al. 2021). Given the emergence of disparities in early adulthood, it is essential to intervene during this period, particularly for those between the ages of 18-35.

Limitations

This study was not without its limitations. First, the identification of trans people using only insurance claims excluded those trans people who a) did not access gender-affirming medical and billed their insurance during the study period, b) did not wish to access gender-affirming medical care during the observed period, c) accessed gender-affirming care before the observed period, or d) accessed gender-affirming medical care that was indistinguishable from routine medical care. Therefore, while these findings represented a large sample of trans people with private insurance, they could not be generalized to the overall trans population. Trans people experience anti-trans stigma and discrimination in healthcare and employment settings, which results in less access to private insurance (Committee on Understanding the Well-Being of Sexual and Gender Diverse Populations et al. 2020; James et al. 2016). Since access to insurance is correlated with improved CVD outcomes (McClurkin et al. 2015; Wilper et al. 2009), it is reasonable to expect the risk of CVD would be higher in representative samples of trans populations compared to their cis counterparts.

Furthermore, given that the group of trans people identified in this study came in more frequent contact with the healthcare system than their cis counterparts, their rates may have been inflated when compared to cis people for some CVDs. However, this was unlikely for events like myocardial infarction or heart failure because people typically seek medical care for these conditions and do not require preventative or maintenance care visits to be diagnosed with these conditions. Additionally, not all race and ethnicity data were self-reported; thus, misclassifying individuals' race/ethnicity was possible. However, it was more likely that Optum excluded individuals from racial and ethnic categories to which they belonged and coded them as "unknown" than to have misclassified their race (Polubriaginof et al. 2019). Despite these limitations, this study has its strength. This study included one of the largest samples of trans people, which allowed for the study of less common CVDs, like MI and HF, and allowed us to model the interaction of age and gender. Additionally, the CVD data were verified by clinicians allowing for reliable measures of CVD, which are unavailable in data dependent on self-report.

Conclusion

These findings of increased CVD risk among trans people compared to their cis counterparts emerging at younger ages and being sustained throughout older ages suggest that *weathering* may occur among some trans populations in the U.S. and warrants future study. Researchers, clinicians, and public health practitioners should focus on early, and middle adulthood as my findings indicate that these ages where the increased risk of CVDs began to emerge among trans populations compared to their cis counterparts. In addition, particular attention should be given to the social determinants of health that shape the risk of CVDs among trans people in the U.S., and practitioners should consider interventions designed to address these determinants.

Chapter 3 State-Level Policy Stigma and Non-Prescribed Hormones Use Among Trans Populations in the United States: a Mediational Analyses of Insurance and Anticipated Stigma

Introduction

Gender affirmation is the social process by which one's gender identity, expression, or role is recognized and affirmed (Sevelius 2013). Trans people experience gender affirmation in many ways. Gender affirmation is comprised of four different but interconnected dimensions: social, psychological, legal, and medical (Reisner, Radix, and Deutsch 2016). Specifically, Reisner et al. (Reisner et al. 2016:20) describe *social affirmation* as interpersonal recognition (e.g., using correct name and pronouns), *psychological affirmation* as the felt internal sense of self-actualization (e.g., validation of self), *legal affirmation* as the recognition by legal systems of one's gender (e.g., legal name and gender marker changes), and *medical affirmation* as the use of medical technologies to affirm one's gender (e.g., hormones, gender affirmation surgery, and puberty blockers). The majority of research has focused on medical gender affirmation, specifically hormone use (King and Gamarel 2020; White Hughto and Reisner 2016). Hormone use, like other forms of gender affirmation, has been associated with a range of positive health outcomes, including reductions in suicidal ideation, binge drinking, drug use, anxiety, and depression and an increase in quality of life among trans people who use them for medical gender affirmation (Keo-Meier et al. 2011; Murad et al. 2010; White Hughto and Reisner 2016; Wilson et al. 2015).

Hormone use needs and receipt vary within trans populations. For example, 20% of participants in a large national survey indicated they did not want hormones, and among those who wanted hormones, only half had ever accessed them (James et al. 2016). Notably, many people cannot access hormones from a licensed medical professional and turn to non-prescribed hormones (NPHs). Not being able to access prescribed hormones (PHs) can force people to go without or to access NPHs by purchasing them online, obtaining them from friends, or acquiring them via some other non-licensed source (Clark et al. 2018; White Hughto et al. 2017, 2015). Furthermore, merely having access to a doctor does not guarantee access to hormones, as doctors may refuse to prescribe hormones, insurance may refuse to cover hormone prescriptions, or people may be unable to afford hormones due to out-of-pocket costs or lack of insurance (James et al. 2016). Moreover, structural stigma may affect the availability of hormones by operating as an impediment to accessing PHs, which is discussed below .

Given the barriers above, trans people have developed alternative ways to access the healthcare they need, including hormones; however, some of these alternatives may be risky (Glick et al. 2018). Access to PHs is important because NPHs significantly increase the risk of poor health outcomes due to improper dosing and the lack of monitoring (Meriggiola and Gava 2015; Moore, Wisniewski, and Dobs 2003). While the long-term effects of any hormone use are unclear, some studies have shown an increased risk for adverse cardiometabolic indicators after beginning hormone therapy (Streed et al. 2017); therefore, the current medical guidelines recommend that doctors closely monitor their patients’ cardiometabolic health while taking hormones (Martinez et al. 2018). For example, some formulations of oral estrogen increase the risk of venous thromboembolism and are therefore no longer prescribed by most clinicians; however, trans people who use non-prescribed estrogen often take high dosages of these formulations, increasing their risk for venous thromboembolism (Asscheman et al. 2014). Furthermore, some people may use high doses of NPHs in conjunction with PHs because they believe this will achieve faster results, placing them at risk of adverse health effects (Moore et al. 2003). Researchers have also speculated that NPHs may increase the risk of HIV infection due to sharing needles or parenteral administration, although no study has formally linked these two (Sanchez, Sanchez, and Danoff 2009).

Stigma as a Social Determinant of Health

Consistent with the Theory of Fundamental Causes (Link and Phelan 1995), there has been an increasing recognition that stigma is a fundamental cause of population health inequities among trans populations (Perez-Brumer et al. 2015; Testa et al. 2015; White Hughto et al. 2015). Drawing on Goffman's (1963) seminal work on stigma, Hatzenbuehler et al. (2013) define stigma as "the cooccurrence of labeling, stereotyping, separation, status loss, and discrimination in a context in which power is exercised." In the United States, the dominant and pervasive ideology on gender is that men and women are biologically distinct and inherently possess certain psychological and behavioral traits derived from reproductive functions (West and Zimmerman 1987). This ideology conflates gender with sex, creating what I refer to as the *gender/sex fallacy* (West and Zimmerman 1987). The *gender/sex fallacy* alienates people whose gender identity or expression is discordant with the gender typically aligned with their sex assigned at birth or whose gender identity or expression does not align with the man-woman binary. Further, the *gender/sex fallacy* provides a rationale for stigmatization, promoting the discrimination and stereotyping of trans people (White Hughto et al. 2015).

The majority of research regarding stigma in trans populations has focused on interpersonal or individual forms of stigma, such as victimization (e.g., physical or emotional abuse a trans person encounters), internalized stigma (e.g., internalizing negative societal messages about oneself as a trans person), or anticipating and avoiding stigma (e.g., the presumption that one might be victimized and avoids instances where victimization may be a threat) (Hendricks and Testa 2012; King et al. 2020; Testa et al. 2015). While interpersonal and individual stigma is critical to understanding the health of trans people, these are not the only means by which stigma impacts health. In 2015, White Hughto et al. created the Social Ecological Model of Transgender Stigma and Health arguing that we must consider how stigma operates across multiple levels of the social ecological model, including structural forms of stigma, such as policies that limit the resources, opportunities, and wellbeing of trans people. For example, stigmatizing policies may act as structural impediments that constrain trans peoples' access to hormones by mandating that Medicaid cannot cover trans-related care, even if a doctor deems medical interventions necessary (Bakko and Kattari 2020). Furthermore, religious exemption laws allow doctors to deny trans people any healthcare services so long as they claim this exemption (Perone 2020). Religious exemption laws affect not only access to hormones but also *any* healthcare service for trans people. Together, these policies result in *healthcare policy stigma*, which I conceptualize as stigma resulting from policies that govern healthcare systems and demean, devalue, and restrict the healthcare of trans people.

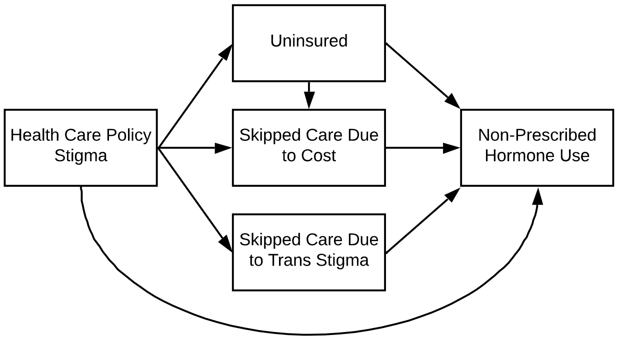
Thus, healthcare policy stigma is a specific form of structural stigma that may constrain the ability of trans people to access care that meets their gender affirmation needs by operating through two pathways: anticipated stigma and cost. Healthcare policy stigma may allow violence and discrimination in medical settings to go unchecked, increasing individuals' fear or anticipation of encountering stigma in healthcare contexts and driving healthcare avoidance (Rotondi et al. 2013). Additionally, healthcare policy stigma may increase the out-of-pocket cost of accessing hormones by allowing insurers to refuse to cover hormone-related care. Lastly, healthcare policy stigma may influence trans people's insurance rates as some may choose not to participate in a healthcare system that is not built to meet their needs (Glick et al. 2018). Thus, healthcare policy stigma may be a critical factor in understanding why people use NPHs.

Purpose and Hypotheses

The purpose of this paper is to examine whether healthcare policy stigma is associated with using NPHs and test possible mediational pathways in a sample of trans people who use hormones. Previous research demonstrates associations between state-level policies and health among transgender populations (Du Bois et al. 2018; Gleason et al. 2016; Perez-Brumer et al. 2015), including findings that demonstrate that state-level policy stigma is associated with decreases in hormone use for medical gender affirmation (Goldenberg, T. Reisner, et al. 2020). However, this study builds on this work to demonstrate, for the first time, the mechanisms through which state-level policy stigma may work to influence NPHs use. Importantly, the literature on NPHs has predominantly treated NPH use as a dichotomous outcome: any NPH use versus no NPH use (Clark et al. 2018; de Haan et al. 2015). Simply treating NPH use as a dichotomous outcome may not capture people who supplement their PHs with NPHs, suggesting a third group (Moore et al. 2003). Given that risk factors for only using NPHs may be different from those who supplement their PHs with NPHs, this paper seeks to understand whether healthcare policy stigma is differentially associated with exclusive NPH use or supplemental NPH use.

I posit that healthcare policy stigma operates through two pathways to contribute to any form of NPH use: skipping care due to cost and anticipating stigma. **Figure 3.1** presents the conceptual model to be tested. First, I hypothesize that living in a state with high levels of healthcare policy stigma will be associated with skipping care due to anticipated stigma and cost, which will increase the chances of using supplemental NPHs and using only NPHs compared to those who only use PHs.

Figure 3.1: Multinomial Model Predicting Non-Prescribed Hormone Use



Note: Model controlled for gender identity, race/ethnicity, age, education, Census region, unemployment, sex work, physical/verbal abuse, engagement with other trans people, experiencing homelessness, and family support. Medicaid expansion was included as a control when predicting uninured.

Second, I hypothesize that healthcare policy stigma will be associated with a higher probability of being uninsured and skipping needed healthcare due to cost. Trans people may be less likely or able to participate in a healthcare system that allows for discrimination and will be more likely to pay out of pocket for their care. I posit that, in turn, increases in the uninsured rate and skipping care due to cost will increase the likelihood of both supplemental NPH use and only using NPH compared to those who only use PHs.

Materials and Methods

This study is a secondary data analysis of the 2015 U.S. Transgender Survey (USTS), conducted among a national sample of trans people in the United States and sponsored by the National Center for Transgender Equality (James et al. 2016). Data were collected in August and September of 2015. The National Center for Transgender Equality worked with over 400 organizations across the U.S. to recruit nearly 28,000 respondents via social media and email. While these data were collected in 2015, they remain the largest source of information on NPH use in trans populations in the United States. Surveys were completed on web-enabled devices (e.g., computers, tablets, smartphones) and were made accessible to respondents with disabilities using screen readers. Surveys were available in English and Spanish. For more information on methods, see the 2015 USTS report (James et al. 2016). The original data collection was approved by the University of California Los Angeles Institutional Review Board, and the secondary analyses were ruled exempt by the University of Michigan Institutional Review Board.

Sample

The National Center for Transgender Equality recruited 27,715 people for the project. Eligibility for the project included (1) identifying as trans or some other gender-diverse individual, (2) being at least 18 years of age, and (3) living in the United States. I then limited my analytic sample to those who reported currently using hormones (n=12,044). Respondents who identified as cross-dressers were removed from the sample because their experiences were fundamentally different from those with other trans identities (n=20). Respondents who lived on a military base or one of the U.S. territories at the time of data collection were also removed from the sample because I could not calculate a healthcare policy stigma score for these areas, and the means of accessing hormones on a military base is different than in the rest of the U.S. (n=30). My final overall sample included 11,994 respondents.

Measures

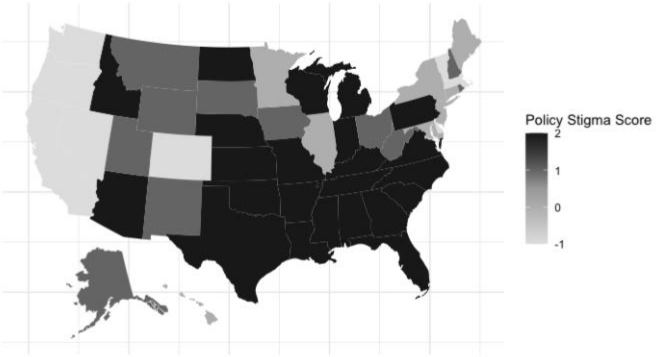
Non-Prescribed Hormones Use

Current non-prescribed hormones use was coded into three nominal categories: currently using PHs only, supplemental NPHs, and NPHs only. Respondents were asked, “Where do you currently get your hormones?” and selected one of three responses. Those who chose “I only go to licensed professionals (like a doctor) for hormones” were coded as PHs only. Those who chose “In addition to licensed professionals, I also get hormones from friends, online, or other non-licensed sources” were coded as supplemental NPHs. And those who chose “I ONLY get hormones from friends, online, or other non-licensed sources” were coded as NPHs only.

Healthcare Policy Stigma

Healthcare policy stigma is a cumulative measure of the severity of policy-level factors that demean, devalue, and restrict the care of trans people. I created the state-specific *healthcare policy stigma* variable by tallying the total number of policies that were supportive of trans people and those that were unsupportive in 2015, the year data were collected. The policies underlying this composite are (1) private insurance protections for trans people, (2) whether or not Medicaid covers trans-specific healthcare, (3) state-wide non-discrimination protections, and (4) religious exemption laws. This measure is adapted from Goldenberg et al.’s state-level trans-specific policies measure. These four policies were chosen because they are relevant to healthcare utilization in that they either stigmatize trans people, restrict access to healthcare services, or provide legal protections in healthcare settings. I gave supportive policies a score of minus one, while I gave unsupportive policies a score of plus one, while states that did not have an explicit policy were held unchanged. In total, the potential scores range from -2 to 2; however, the observed ranges for this variable in the data were -1 to 2. Higher scores indicate states with stigmatizing policies towards trans people. One point was subtracted from a state’s score if that state had private insurance non-discrimination policies or if that state had a state-wide non-discrimination policy. States were given one point if that state restricted trans healthcare for Medicaid populations or had any religious exemption laws. For a map of state-specific values for this variable, see **Figure 3.2**.

Figure 3.2: Map of State-Specific Policy Stigma Values



Mediators

Skipped care due to anticipated stigma was coded as a dichotomous variable (i.e., "Was there a time in the past 12 months when you needed to see a doctor but did not because you thought you would be disrespected or mistreated as a trans person?"). Anyone who indicated "yes" to the question was coded as one, while those who indicated "no" were coded as zero. *Uninsured* was coded as a dichotomous variable, with those having no form of insurance (e.g., private insurance, Medicaid, Medicare) being coded as one and those with any insurance being coded as zero. *Skipped care due to cost* was coded as a dichotomous variable (i.e., "Was there a time in the past 12 months when you needed to see a doctor but could not because of cost?"). Anyone who indicated "yes" to the question was coded as one, while those who indicated "no" were coded as zero.

Covariates

While reporting *current gender identity*, respondents chose one of six options: cross-dresser, woman, transgender woman, man, transgender man, or nonbinary/genderqueer. I excluded respondents who chose “cross-dresser” and created a three-level variable: (1) trans woman/woman; (2) trans man/man; (3) gender nonbinary/genderqueer. Given the small number of persons of color (n=2,063), race was coded as a dichotomous variable for those who identified as “white” and those who identified as a person of color (i.e., 5% Hispanic, 5% Biracial, 3% Black, 2% Asian/Pacific Islander, 1% Native American). While this approach is not ideal, the small cell sizes for NPHs use when cross-tabulated by race made it impossible to include the multi-category covariate. *Age* was collected and used as a continuous variable age in years at the time of data collection. *Unemployment* was coded as a dichotomous variable, with those who were currently unemployed but looking for work being coded as one and all else being coded as zero. *Highest level of education* was coded into four categories: less than high school, high school graduate, some college, and college graduate.

In addition to cost, lack of insurance, and anticipated stigma (Clark et al. 2018; Glick et al. 2018; Rotondi et al. 2013; Stroumsa et al. 2020), prior studies have also shown that NPHs use is correlated with sex work, experiencing homelessness, verbal or physical victimization, having a network of other trans people who use hormones, and family rejection (Clark et al. 2018; Glick et al. 2018; de Haan et al. 2015; Rotondi et al. 2013; Sanchez et al. 2009; Van Schuylenbergh et al. 2019). To control for these additional factors, I relied on measures collected by the U.S. Transgender Survey that mapped onto these constructs. Respondents were asked whether they had *ever* engaged in sex or sexual activity for money or worked in the sex industry, such as erotic dancing, webcam work, or porn films. Individuals who responded “yes” were coded as one for the variable *sex work* and zero if they responded “no.” The variable *experiencing homelessness* was coded as one for those respondents who reported experiencing homelessness in the past year and zero for those who reported “no.” Respondents reported whether they experienced physical or verbal abuse due to their gender identity in the past year. The variable *physical or verbal abuse* was coded as one for those who had reported experiencing either physical or verbal abuse due to their gender identity in the past year and zero for those who reported they did not experience either. *Trans engagement* was coded as one for those who reported socializing with trans people in person and zero for those who reported not socializing with trans people in person. *Family support* was coded into three categories: 1) those who are not out to their family, 2) those who reported their family was unsupportive of their gender identity, and 3) those who reported either not having a family, having a supportive family, or a family that was neither supportive nor unsupportive. Although there may be important differences in the third category of the family support variable, the sample sizes were too small to analyze these groups separately. Because a lack of family support and disclosure have both been associated with adverse outcomes, I coded this variable to examine differences between those with negative family experiences and those who were not out to their family and compared them participants with more neutral or positive family experiences (Gamarel et al. 2020).

To control for variation in NPH use resulting from state-level and geographic factors other than healthcare policies, I included census region and Medicaid expansion as covariates. *Census region* was used to group states together by geographical location based on the taxonomy used by the Census that classifies states into either the Midwest, Northeast, South, or West. Although imperfect, I included Census region as a control because states in similar regions *tend* to have similar political and social climates. Medicaid expansion was one provision of the Affordable Care Act aimed at reducing the uninsured rate. This statute allowed states to opt into increasing of the number of people eligible to receive Medicaid in exchange for more federal funding (Courtemanche et al. 2017). Medicaid expansion has been shown to significantly decrease the uninsured rates in states that have expanded Medicaid (Courtemanche et al. 2017). I controlled for *Medicaid expansion* using a categorical variable identifying whether a state had expanded Medicaid before the data were collected; states were coded as one if they expanded Medicaid and zero if they did not.

Statistical Analyses

I tested the conceptual model outlined in **Figure 3.1** (covariates are omitted to reduce clutter). The model was evaluated using the Mplus 8.0 software for structural equation modeling. The model was fit using robust (Huber-White) maximum likelihood algorithms. The uninsured, skipped care due to cost, and skipped care due to anticipated stigma mediators are dichotomous and were estimated using a logit function. NPH use was treated as a three-level nominal outcome that was regressed onto all variables, except Medicaid expansion, using a multinomial logit function with numerical integration. The referent group for the multinomial equation was those who only use NPHs. Multinomial equations yield coefficients that estimate local odds, whereas my interest was with marginal probabilities for each of the three NPHs use categories. I used the methods described in Muthén, Muthén, and Asparouhov (Muthén, Muthén, and Asparouhov 2016) to estimate the relevant marginal probabilities where all covariates were held constant at their respective mean values (i.e., I used a form of marginal effects analysis at the mean), but where the component probabilities of the marginal effects analysis at the mean were used to form relative risk ratios rather than probability differences using the MODEL CONSTRAINT command in Mplus.

The initial fit of the model revealed global ill-fit due to the need for correlated disturbances between skipping care due to trans stigma and the other two mediators. I, therefore, added parameters to the model to reflect these covariances. No other localized sources of model ill-fit were noted. Missingness was not a major issue with these data. Missing data were treated using the default full information maximum likelihood methods in Mplus. Data were missing for the variables *sex work* (n=9), *skipped care due to anticipated stigma* (n=13), *trans engagement* (n=6), *currently experiencing homelessness* (n=53), *uninsured* (n=30), *skipped care due to cost* (n=45), and *family support* (n=22).

I report the results using profile analyses where I varied selected values on key predictors while holding all other variables constant at their mean values. The advantage of this approach is that it allows us to focus on probabilities and relative risk ratios, which are more interpretable and less misleading than odds ratios. The estimation algorithms do not permit the estimation of total effects from traditional structural equation modeling, so my focus was on contrasts between substantively meaningful predictor profiles.

Results

Table 3.1 presents unadjusted tabulations of demographics by hormone use. Among the respondents, 11,004 (92%) currently accessed hormones only from a licensed doctor (PHs use), 255 (2%) currently accessed hormones only from some other source (NPHs use), and 735 (6%) accessed hormones from both a licensed doctor and some other source (supplemental NPHs use). Without adjusting for covariates, on average, as age increased, individuals were slightly more likely to use NPHs. Compared to white people, people of color were slightly more likely to use either supplemental NPHs or only NPHs. On average, those with higher levels of education were less likely to use either supplemental NPHs or only NPHs. Compared to trans women/women and nonbinary/genderqueer individuals, trans men/men were significantly less likely to use both supplemental NPHs and only NPHs. **Table 3.2** reports the targeted predictor profile contrasts. I discuss each set of contrasts, in turn. To view the full results from the structural equation model, see **Appendix Table 3**.

Table 3.1: Respondent Demographics by Hormone Use

	PHs Only (n=11,004)		Supplemental NPHs (n=735)		NPHs Only (n=255)		
	n or *M*	*%* or SD	*n* or *M*	*%* or SD	*n* or *M*	*%* or SD	Significance
Age (in years)	35	14	35	13	38	14	F(2, 11,991)=6.09; p=.002
Race							
White	9,154	92%	576	6%	201	2%	x2(2)=14; p=.001
People of Color	1,850	90%	159	8%	54	3%	
Education							
< High School	95	89%	6	6%	6	6%	x2(6)=23; p=.001
High School Grad	395	91%	32	7%	7	2%	
Some College	1,746	94%	80	4%	27	1%	
BA+	671	95%	24	3%	8	1%	
Gender							
Trans Men/Men	4,710	97%	145	3%	18	0%	x2(4)=275; p<.001
Trans Women/Women	5,411	88%	508	8%	209	3%	
Non-Binary/Genderqueer	883	89%	82	8%	28	3%	

Note: PHs = Prescribed Hormones, NPHs = Non-Prescribed Hormones

Table 3.2: Profile Analyses, Direct Effects

Profile Contrast	Profile 1 Probability	Profile 2 Probability	Relative Risk	P-Val
Outcome: Uninsured				
ME(no) vs ME(yes)	0.118	0.073	.616 (.521, 712)	<0.001
PS(-1) vs PS(2)	0.044	0.079	1.802 (1.418, 2.186)	<0.001
Outcome: Skip Care Due to Cost				
Uninsured(no) vs Uninsured(yes)	0.201	0.597	2.964 (2.669, 3.258)	<0.001
PS(-1) vs PS(2)	0.187	0.285	1.524 (1.361, 1.687)	<0.001
Outcome: Skip Care Due to Stigma				
PS(-1) vs PS(2)	0.108	0.147	1.357 (1.117, 1.596)	0.004
Outcome: PHs Only				
Uninsured(no) vs Uninsured(yes)	0.947	0.894	.944 (.929, .959)	<0.001
Anti Stig(no) vs Anti Stig(yes)	0.953	0.91	.955 (.945, .965)	<0.001
Skip Cost(no) vs Skip Cost(yes)	0.95	0.926	.974 (.965, .983)	<0.001
PS(-1) vs PS(2)	0.941	0.947	1.007 (.995, 1.018)	0.345
Outcome: Supplemental NPHs				
Uninsured(no) vs Uninsured(yes)	0.045	0.070	1.536 (1.271, 1.801)	0.001
Anti Stig(no) vs Anti Stig(yes)	0.04	0.075	1.886 (1.621, 2.152)	<0.001
Skip Cost(no) vs Skip Cost(yes)	0.041	0.065	1.565 (1.345, 1.785)	<0.001
PS(-1) vs PS(2)	0.053	0.042	.797 (.628, .965)	0.077
Outcome: NPHs Only				
Uninsured(no) vs Uninsured(yes)	0.007	0.036	4.903 (3.751, 6.055)	<0.001
Anti Stig(no) vs Anti Stig(yes)	0.007	0.014	2.002 (1.480, 2.524)	<0.001
Skip Cost(no) vs Skip Cost(yes)	0.008	0.01	1.157 (.869, 1.445)	0.352
PS(-1) vs PS(2)	0.007	0.011	1.691 (1.019, 2.363)	0.036

Note: All other vars are mean centered. Estimates are from full multinomial models. Anti Stig = skipping care due to anticipated stigma, ME = Medicaid expansion, NPHs = non-prescribed hormones, PHs = prescribed hormones, PS= health care policy stigma, Skip Cost = skipping care due to cost

Predicting the Probability of being Uninsured

On average, the uninsured rate was an estimated 4.5% lower in states that expanded Medicaid compared to those which did not (p<.001). On average, states with the lowest healthcare policy stigma score had an uninsured rate of 4.4% compared to those with the highest scores, which had a rate of 7.9%. This is a difference of 3.5% and was statistically significant below p = .001.

Predicting the Probability of Skipping Care Due to Cost

On average, and holding all other variables at their means, those who were uninsured were nearly three times more likely to skip care due to cost than those who were insured: 60% and 20%, respectively (p<.001). On average, 19% of people skipped care due to cost in states with the lowest healthcare policy stigma scores compared to states with the highest scores, where 29% skipped care due to cost (p <.001).

Predicting the Probability of Skipping Care Due to Stigma

On average, and holding all other variables at their means, people in states with the lowest healthcare policy stigma score skipped care due to anticipated stigma at a rate of 10.8% compared to those in states with the highest score at a rate of 14.7%. Thus, those in the most stigmatizing states were nearly 1.4 times more likely to skip care due to anticipated stigma than their counterparts in states with the lowest stigma scores (p=.004)

Predicting the Probability of Using Only Prescribed Hormones

While continuing to look at the direct effect of the covariates and holding the other covariates at their means, I found that those who were uninsured were slightly less likely to only use PHs than their insured counterparts, 89% to 95% respectively (p<.001). I also found that those who skipped care due to anticipated stigma in healthcare settings were slightly less likely to only use PHs than their counterparts who did not skip care due to anticipated stigma: 91% to 95%, respectively (p<.001). I found that those who skipped care due to cost were slightly less likely to only use PHs than their counterparts who did not, 93% to 95%, respectively (p<.001). Lastly, I found that healthcare policy stigma had no significant direct effect on the probability of only using PHs.

Predicting the Probability of Supplemental Non-Prescribed Hormone Use

I found that those who were uninsured were more likely to use supplemental NPHs than their insured counterparts: 7% to 5%, respectively (p=.001). Those who skipped care due to anticipated stigma in healthcare settings were more likely to use supplemental NPHs than their counterparts who did not skip care due to anticipated stigma: 8% to 4%, respectively (p<.001). Those who skipped care due to cost were more likely to use supplemental NPHs than their counterparts who did not: 7% to 4%, respectively (p<.001). However, this did not reach statistical significance when analyzing local odds (p=.079); thus, the results should be interpreted with caution. Lastly, I found that healthcare policy stigma had a negative direct effect on the probability of supplemental NPHs, although statistical significance remained suspect (Relative Risk Ratio =.797, p=.077).

Predicting the Probability of Using Only Non-Prescribed Hormones

Those who were uninsured were more likely to only use NPHs than their insured counterparts: 4% to 0.7%, respectively (p<.001). Those who skipped care due to anticipated stigma in healthcare settings were more likely to only use NPHs than their counterparts who did not skip care due to anticipated stigma: 1.4% to 0.7%, respectively (p<.001). I did not find that those who skipped care due to cost were statistically more or less likely to only use NPHs than their counterparts who did not skip care due to cost. Lastly, I found a direct effect of healthcare policy stigma to only using NPHs. Those in states with the greatest healthcare policy stigma were more likely to only use NPHs than those in states with the least healthcare policy stigma: 1.1% to 0.7%, respectively (p=.036).

Testing the Mediational Chains from Healthcare Policy Stigma to Hormone Use Type

The pattern of results for the profile analyses implies statistically significant mediation effects using the logic of joint significance tests as described in Fritz & MacKinnon (Fritz and MacKinnon 2007); Fritz et al. (Fritz, Taylor, and MacKinnon 2012). For example, given that healthcare policy stigma was statistically associated with an increase in the uninsured rate and being uninsured was, in turn, statistically associated with an increase in supplemental NPHs use and only using NPHs, under the property of the joint significance test, healthcare policy stigma was associated with an increase in using supplemental NPHs and only using NPHs as operating through insurance coverage. Similarly, given that healthcare policy stigma was statistically associated with an increase in skipping care due to anticipating stigma and skipping care due to anticipating stigma was statistically associated with an increase in supplemental NPH use and only using NPHs, under the property of the joint significance test, healthcare policy stigma was associated with an increase in using supplemental NPHs and only using NPHs as operating through anticipated stigma. Lastly, given that healthcare policy stigma was statistically associated with an increase in skipping care due to cost and skipping care due to cost was statistically associated with an increase in supplemental NPHs use, under the property of the joint significance test, healthcare policy stigma was associated with an increase in using supplemental NPHs as operating through anticipated stigma. Again, this last mediational chain was not statistically significant when analyzing local odds (p=.079). The pathway from healthcare policy stigma to using only NPHs was insignificant.

Table 3.3 reports the predicted probabilities for the cumulative effect of the best versus the worst outcomes from the full multinomial model using profile analyses. The probabilities for the best-case group are the estimated probability of PHs use only, supplemental NPHs use, and NPHs use only when the control variables are mean-centered, and the pathway variables are set to their most favorable values (e.g., uninsured, skipping care due to stigma, and skipping care due to cost are all equal to 0; Medicaid expansion is set to 1, and healthcare policy stigma is set to -1). The probabilities for the worst-case group are the estimated probability of using PHs only, supplemental NPHs use, and NPHs use only when the control variables are mean-centered, and the pathway variables are set to their least favorable values (e.g., reverse-scored values from above).

Table 3.3: Profile Analyses: Best- vs. Worst-Case

Profile Contrast	Best-Case Probability	Worst-Case Probability	Relative Risk	P-Val
Outcome: Uninsured				
	0.038	0.117	3.10 (2.504, 3.696)	<0.001
Outcome: Skip Care Due to Cost				
	0.162	0.663	4.093 (3.622, 4.564)	<0.001
Outcome: Skip Care Due to Stigma				
	0.108	0.147	1.357 (1.117, 1.596)	<0.001
Outcome: PHs Only				
	0.958	0.793	.827 (.793, .862)	<0.001
Outcome: Supplemental NPHs				
	0.037	0.126	3.381 (2.439, 4.324)	<0.001
Outcome: NPHs Only				
	0.005	0.081	17.965 (9.084, 26.847)	<0.001

Note: All other vars are mean centered. Estimates are from full multinomial models. PHs = Prescribed Hormones, NPHs = Non-Prescribed Hormones

I found that the best-case probabilities were positively associated with desired outcomes and negatively associated with undesirable outcomes. Of note, compared to the best-case scenario, the worst-case scenario showed an 18-fold increase in the probability of using NPHs only (0.5% to 8%) and a 3-fold increase in using supplemental NPHs (4% to 13%). Each of these findings was statistically significant, below a p-value of 0.001.

Discussion

My findings are consistent with other studies that demonstrate that structural stigma, specifically healthcare policies, is associated with medical gender affirmation practices of trans people in the United States (Goldenberg, Reisner, et al. 2020; White Hughto and Reisner 2016). My study extends the existing literature on NPH use by positing and testing a conceptual model for NPH use that accounts for the interplay of structural- and individual-level stigma across the Social Ecological Model of Transgender Health (White Hughto et al. 2015). I show that healthcare policy stigma is associated with NPHs use and operates, in part, through avoiding healthcare due to stigma and cost, as well as insurance coverage in a sample of adults accessing hormones in the U.S. I found that NPHs use should be treated as, at least, a three-category variable: PHs use only, supplemental NPHs use, and NPHs use only. Given my findings, the field would benefit from research that focuses on the distinctions between those who use only NPHs and those who use supplemental NPHs to understand how healthcare policy stigma contributes to adverse health outcomes among trans people in the United States.

My analyses support my conceptual framework that healthcare policy stigma is positively associated with NPH use and operates, in part, through insurance coverage and anticipated trans stigma. Compared to trans people accessing hormones in states with higher healthcare policy stigma, those in states with less healthcare policy stigma had a lower likelihood of using NPHs. Furthermore, my analyses partly confirm my second hypothesis that skipping care due to cost and anticipated stigma would mediate the association between healthcare policy stigma and

NPHs use. However, I found that skipping care due to cost was only associated with supplemental NPHs use and not significantly associated with using only NPHs. While seemingly counter-intuitive, this may be because people are prioritizing trans-related care over other forms of healthcare, and thus the relationship between insurance remains while the effect of skipping care due to costs is diminished. However, future research is warranted to understand these associations better. While the rate of using either supplemental NPHs or only NPHs in this sample is small, my best-case vs. worst-case analyses show just how sensitive these figures are to the main variables in my conceptual model. The rate of those using only NPHs increases as much as eighteen-fold when comparing the best-case to the worst-case. Thus, the variables outlined in my conceptual model are appropriate when predicting NPH use and should be considered in further research.

Prior literature has treated NPH use as a dichotomous phenomenon (e.g., any NPH use vs. none). Notably, I found different direct associations between my structural variables, insurance coverage and healthcare policy stigma, and *using only NPHs* and *using supplemental NPHs.* Treating NPHs use as a dichotomous phenomenon, therefore, masks important conceptual differences as to *why* individuals might only use NPHs or supplement their PHs with NPHs. For example, I find that being uninsured increased the likelihood that a person would use *only* NPHs by nearly 500 percent but increased *supplemental* NPH use by only 50 percent. This finding suggests that insurance coverage plays a larger role for those who only use NPHs than those who supplement their PHs with NPHs.

Consistent with prior research, I found that trans women were at higher risk of NPU compared to other groups (Clark et al. 2018), which may be due to limited access to insurance and engagement in care (Wilson et al. 2015). Those who use supplemental NPHs are engaged in traditional healthcare systems, which often require insurance coverage, while those who only use NPHs may be less likely to engage in care due to their uninsured status. Furthermore, I found a significant direct effect of healthcare policy stigma to using *only* NPHs, but not using *supplemental* NPHs. While this finding suggests I adequately accounted for the pathways from healthcare policy stigma to supplemental NPH use, it also suggests that my conceptual model does not account for all possible mediators between healthcare policy stigma and using only NPHs. One mediator that may be relevant to understanding the effect of healthcare policies on the use of NPHs use is access to PHs. While the U.S. Transgender Survey does not specifically assess factors associated with accessing PHs, such as the ability to access a pharmacy, others have documented inconsistent access to trans-competent pharmacological care amongst trans individuals that may be influential in understanding NPHs use (Lewis et al. 2019). Exploring potential mediators between healthcare policy stigma and using only NPHs may prove an important topic for future research. Mixed-methods research may be particularly useful in exploring potential mediators (e.g., interpersonal interactions and intrapersonal factors such as cognitions, preferences, and behaviors) that might be driving the use of NPHs only as opposed to supplemental NPHs use.

A notable finding that I had not hypothesized was how the association between healthcare policy stigma and the probability of being uninsured would compare to that of Medicaid expansion. Remarkably, compared to states with the most healthcare policy stigma, states with the least healthcare policy stigma have a lower predicted uninsured rate of 3.5 percent; while states that have passed Medicaid expansion have a lower predicted uninsured rate of 4.5 percent. This finding suggests that trans-specific healthcare policies are nearly as influential at insuring trans people as gender-blind policies, like Medicaid expansion. My findings suggest healthcare systems, including state policies, that are not explicitly designed to protect trans people (e.g., do not cover gender-affirming care or protect from discrimination and victimization) may result in avoidance of care, or trans people may be shut out from participation. This finding supports prior research by Glick et al. (Glick et al. 2018) that trans people often go outside of mainstream healthcare services for their care, like accessing hormones from non-licensed sources, if they are not supported by mainstream institutions.

Notably, I found that nonbinary adults were at higher risk for NPH use compared to trans men and trans women. It is plausible that nonbinary individuals may turn to NPH because the current World Professional Association for Transgender Health (WPATH) Standards of Care may be too restrictive and reinforce normative binary conceptualizations of gender conceptualization of gender identity and expression (Castañeda 2015). WPATH's Standards of Care are currently being updated to be more inclusive of nonbinary patients (Radix 2019). It is also plausible that providers may not have knowledge or competency regarding proper care for non-binary people, which may reinforce binary conceptualizations of gender (Korpaisarn and Safer 2018). These findings suggest future research is warranted to understand better NPHs use among nonbinary individuals to help inform clinical practice and training.

Existing studies suggest the need for policies that protect trans people from discrimination in healthcare settings, given the evidence that discrimination against trans people in healthcare settings is related to adverse physical and mental health outcomes (Reisner et al. 2015). My research builds on this work to demonstrate the importance of trans-specific public policy to not only addressing NPH use, but also to insuring trans people. In June 2020, the Department of Health and Human Services finalized a rule that removed existing protections from healthcare discrimination for an estimated 1.4 million trans adults (Flores et al. 2016;

Janssen and Voss 2020). This rule allows healthcare facilities, insurers, and providers to deny care to trans people simply because of their gender identity (Janssen and Voss 2020).

My findings suggest that it is plausible a lack of trans-inclusive healthcare policies may increase the number of trans people who are uninsured, skip care due to stigma and cost, and use NPHs. Trans-inclusive policies that guarantee adequate access to safe, effective hormones are crucial to ensuring health equity for trans people. While documenting the potential effects of harmful policies is an important step, it is by no means the last. Public health practitioners *must* work to create interventions that meaningfully reduce structural stigma and build political coalitions to enact policies that protect trans people.

Beyond practical implications, this study also suggests a few implications for researchers working with categorical variables and cross-sectional data. Chiefly, my findings highlight the importance of thinking critically about how to operationalize categorical variables. Researchers ought to carefully examine their categorical variables and exhaust combinations relevant to their research topic. My analyses also showcase the ability to conduct preliminary mediational research in a cross-sectional setting. While I am unable to *"prove"* causality in this study due to its cross-sectional nature, I was able to test whether my conceptual model is *plausible* given my data. This is an important first step in examining my conceptual model and testing my hypotheses, especially in situations where it is unethical to conduct cause-probing studies (e.g., randomized control trials.) In this way, cross-sectional mediational analyses allow for testing the *plausibility* of mediational models without the unethical methods required to "*prove"* them.

Limitations

These findings should be interpreted within the context of the following limitations. The U.S. Transgender Survey is a convenience sample, which limits generalizability. The study also relies on self-reported data on sensitive topics (e.g., NPHs use, sex work) such that there may be social desirability bias. Furthermore, there is reason to believe the number of people reporting NPH use and being insured may be smaller in my sample than in the overall population, given that the study recruited some participants via medical centers; thus, these individuals may be actively engaging in mainstream healthcare settings. Furthermore, the USTS sample is predominantly non-Hispanic white, which made it impossible to conduct analyses on specific racial and ethnic categories. The small number of people of color also limited my ability to conduct interaction analyses between race/ethnicity and gender identity groups. When predicting the probability of supplemental NPHs use, some have shown that body satisfaction, or how happy a person is with their physical body, may be a key indicator of supplemental NPHs use (Radix, Lelutiu-Weinberger, and Gamarel 2014). My inability to control for individuals' body satisfaction may be masking differences or acting as a confounder in my analyses. Future research should consider other risk factors for those who use supplemental NPHs: this is particularly important given that, at least in this sample, more individuals use supplemental NPHs than rely on NPHs alone. Logistic and multinomial logistic modeling have limitations in that the estimated effects are dependent on values of the covariates given the non-linear nature of the modeling (Norton, Dowd, and Maciejewski 2018). The generalizability of the results must therefore be viewed cautiously. Additionally, formal mediational and total effects analysis is difficult with nominal outcomes and dichotomous mediators. Future research would benefit from developing continuous measures of these constructs for use in more traditional structural equation models, such as how often a participant uses NPHs. Lastly, as the data are cross-sectional, causality cannot be determined from this study.

Conclusions

These findings demonstrate a pathway from healthcare policy stigma to NPH use, with more inclusive policies being protective against NPH use. I found that this association is partially mediated by insurance coverage, skipping care due to anticipated stigma, and skipping care due to cost. However, my research also demonstrates that these mediational factors vary in importance when predicting supplemental NPH use versus predicting NPH use only. This highlights the importance of tailoring interventions to address the specific needs of trans people who are using NPHs. For example, interventions that focus on those using supplemental NPHs may be best served by focusing on anticipated stigma, while interventions focusing on those who only use NPHs need to consider how being uninsured limits one's ability to access PHs. Due to these kinds of differences, my work stresses the importance of treating NPH use as at least three categories: PHs use only, supplemental NPHs use, and NPHs use only.

My findings also demonstrate the importance of trans-inclusive policies and insurance coverage among trans populations. I found that stigmatizing policies were associated with an increase in the likelihood of trans people being uninsured. This suggests that to lower the uninsured rates of trans people, states cannot simply enact gender-blind policies aimed at insuring entire populations, such as Medicaid expansion, but must *also* consider trans-specific protections. Finally, this study also connects individual-level forms of stigma, such as avoiding healthcare services due to fear of discrimination, with structural forms of stigma, such as states' healthcare policy environments. Policies that stigmatize trans people are highly associated with how trans people navigate healthcare; the more stigmatizing a state's policies are, the more likely trans people may be to go without the care they need. In this way, policies 'get under the skin' because they may lead people to use NPHs, which can have serious consequences for their health. Future research using longitudinal designs must consider the limits of trans individuals' health behaviors in the presence of pernicious forms of structural stigma, such as stigmatizing healthcare policies, that constrain their ability to access safe hormones.

Chapter 4 Provider Adaptations to Legislative Efforts to Ban Gender-Affirming Care for Adolescents

Introduction

Gender affirmation is “the social process of being recognized or affirmed in one's gender identity, expression, and/or role” (Reisner et al. 2016; Sevelius 2013) and has been considered a key social determinant of transgender and gender diverse (trans) populations’ health (Reisner et al. 2016). Gender affirmation has been considered to have at least four dimensions: (1) social gender affirmation, or peers and family members using a person’s correct name and pronouns, (2) legal gender affirmation, or the ability to have one’s legal documents such as birth certificates and licenses use the correct name and gender marker, (3) psychological gender affirmation, or the internal sense of validation that one’s gender is respected and validated and (4) medical gender affirmation, which includes the use of medical interventions to affirm one’s gender such as puberty blockers and hormones (Reisner et al. 2016). It is important to note that although gender affirmation has at least four dimensions, there is no “one size fits all” approach to how trans people affirm their gender (Coleman et al. 2022). For example, some may seek legal gender affirmation but not medical gender affirmation, while others might seek all four forms of affirmation. Gender non-affirmation across all four domains has been associated with numerous health consequences. For example, unmet social and psychological gender affirmation has been associated with delaying preventative screenings and avoiding seeking healthcare when sick or injured (Poteat, German, and Kerrigan 2013; Reisner et al. 2015). Unmet legal gender affirmation has been associated with delaying needed healthcare and stable employment among trans women of color (Hill et al. 2018). Whereas met medical gender affirmation needs have been associated with numerous health benefits, such as decreased suicidality, increased psychosocial and psychological function, and improved peer relations that last into adulthood (Allen et al. 2019; Coleman et al. 2022; Costa et al. 2015; van der Miesen et al. 2020; Salas-Humara et al. 2019; Turban et al. 2020; de Vries et al. 2011, 2014; White Hughto and Reisner 2016). In this way, medical gender affirmation is vital to the health and well-being of trans people and is the focus of this paper.

Gender Dysphoria and the Importance of Medical Gender Affirmation

Trans adolescents may experience *gender dysphoria*, or "clinically significant distress or impairment in social, occupational, or other important areas of functioning associated with having a gender identity or expression that differs from than that sex assigned at birth and/or gender roles typically associated with that sex" (American Psychiatric Association 2013; Reisner et al. 2016). Risks of prolonged gender dysphoria in adolescents include increased suicidal ideation, anxiety, and depression (Allen et al. 2019; Coleman et al. 2022; Costa et al. 2015; Salas-Humara et al. 2019; Toomey, Syvertsen, and Shramko 2018; Turban et al. 2020; de Vries et al. 2011). The standards of care for trans adolescents experiencing gender dysphoria are well-established and include mental health counseling, prescription of puberty blockers, gender-affirming hormone therapy, and in rare cases gender-affirming surgeries (Coleman et al. 2022; Hembree et al. 2017; Rafferty et al. 2018).

State Efforts to Restrict Access to Gender Affirming Medical Care

Despite the backing of all major medical associations, over the past two years, legislators in nearly half of the states introduced bills or passed legislation that criminalizes the provision of gender-affirming medical care to trans minors (Freedom For All Americans 2023), a tactic that the leading medical organizations have ubiquitously condemned (American Psychiatric Association 2021; Lopez et al. 2017; Rafferty et al. 2018). To date, Arkansas, Alabama, and Utah have passed a law that would meaningfully[2] restrict gender medical affirming care for adolescents, although most have been stayed by Federal Courts (Movement Advancement Project 2023a). In addition, some Governors have utilized executive orders or appointments to circumvent state legislatures to restrict adolescents' access to gender-affirming medical care. For example, Texas Governor, Greg Abbott, directed the Department of Family and Protective Services to investigate and charge families who allow their children to access gender-affirming medical care with child abuse (Perez 2022). Additionally, under the direction of Florida Governor Ron DeSantis, the Florida Board of Medicine and the state Board of Osteopathic Medicine passed a rule banning gender-affirming medical care for adolescents under 18 (Sarkissian 2022).

These state and local political and legal efforts have complicated the work of Adolescent Gender Affirming Providers (AGAPs), who sit at the center of decision-making with patients and their families but must now navigate a changing political and legal landscape. Legislative efforts would impose criminal and/or civil liability on AGAPs, with possible penalties ranging from revocation of a medical license to 20 years in prison (McKnight 2021; Moon 2021). News reports suggest that these political efforts have already affected AGAPS. Specifically, these reports have suggested increasing harassment and threats, including bomb threats (Moghe 2022), death threats (Sands 2022), clinic protests (Gluck, Friedman, and Shoup 2022), and political pressure causing some providers to close their clinics (Rummler 2022). Prior work has shown

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[2] Arizona passed a ban on gender-affirming surgeries for minors, an incredibly rare practice. Tennessee passed a law that bans puberty blockers for prepubertal minors, a practice that does not occur.

that AGAPs view these efforts as an intrusion of politics into their profession, undermine the health and well-being of trans adolescents and their families, and have caused them to receive violent threats (Hughes, Kidd, et al. 2021).

Stigma as a Determinant of Medical Gender Affirmation

Applying White Hughto and colleagues' Socio-Ecological Model of Transgender Stigma and Health (White Hughto et al. 2015) to the unmet medical gender affirmation needs of trans adolescents, anti-trans stigma can be considered a determinant that operates across structural, interpersonal, and individual levels to restrict access to medical gender affirmation for trans adolescents. According to the model, structural stigma, such as laws and policies restricting gender-affirming medical care or failing to train medical providers to provide gender-affirming medical care, limits access to gender-affirming medical care for trans adolescents. Second, interpersonal stigma, such as violence and intimidation against AGAPS, parental or guardian gender non-affirmation, and discrimination of trans adolescents, further restricts access to medical gender affirmation for adolescents. Third, individual stigma due to the confluence of other levels of stigma may limit access to gender-affirming medical care such that adolescents may feel that they need to conceal their identity and/or not share their needs to avoid stigma from parents/guardians, healthcare providers, or their peers.

Purpose

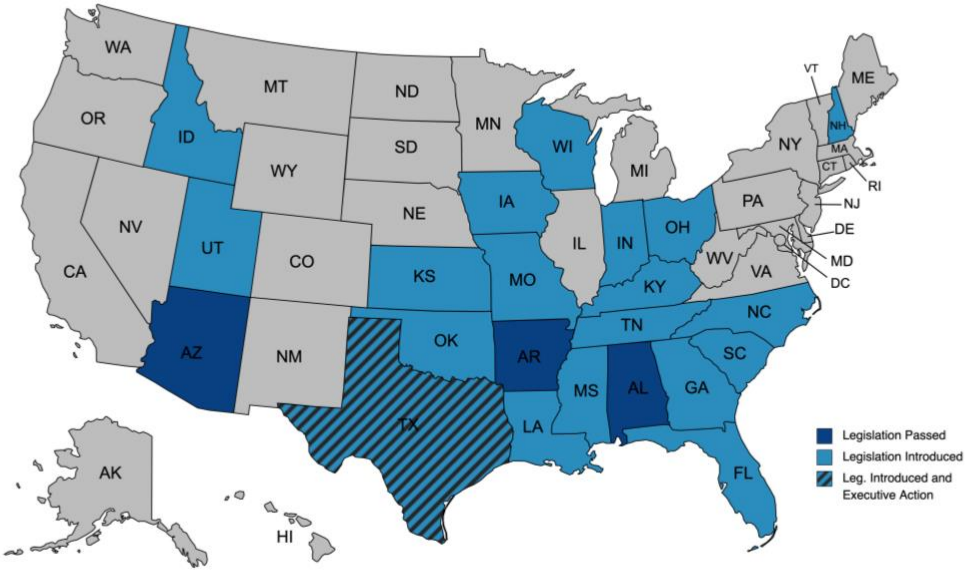
While the perspectives of AGAPs on legal efforts to restrict gender-affirming medical care for adolescents have been documented elsewhere (Hughes, Kidd, et al. 2021), research on how AGAPs have adapted, or expect to adapt, in response to these efforts has not been studied. Such research would provide insights into how influential actors navigate structural and interpersonal sigma affecting adolescents' access to gender-affirming medical care. Therefore, this study aimed to explore how AGAPs are adapting to the introduction of bills or policies that would restrict gender-affirming medical care for adolescents and how they expect to adapt to these legislative efforts should they be passed and enacted.

Methods

Sampling

From March to July 2022, I conducted in-depth interviews with AGAPs to gather data on the adaptations of providers in response to legislative and political efforts to ban gender-affirming medical care for adolescents, primarily in the South and Midwest. AGAPs were eligible to participate in the study if they: (a) currently offer gender-affirming healthcare to trans adolescents (which included affirming medical, mental, social, or spiritual care) and (b) work in states that have either passed a ban on gender-affirming medical care or have introduced bills to ban gender-affirming medical care for adolescents. See **Figure 4.1** for a map of the states that had either introduced or passed bills to ban gender-affirming medical care for adolescents as of March 2022. Participants were recruited via professional listservs known to be frequented by AGAPs and by contacting those who previously participated in similar studies (Hughes, Dowshen, et al. 2022; Hughes, Kidd, et al. 2021). In addition, participants were asked to recommend the study to others who might be eligible. Sampling ended when participants were recruited from all states that had introduced or passed bills banning gender-affirming medical care for adolescents and once the saturation of major themes was achieved.

Figure 4.1: State Bans on Gender Affirming Medical Care for Adolescents as of March 2022



Interview Guide

I developed the interview guide in consultation with AGAPs, specifically two Pediatricians. I beta-tested the interview guide by conducting a mock interview with an AGAP from the University of Michigan. There were three main interview questions: (1) “Your state legislature has introduced a bill that would restrict gender-affirming care (e.g., hormone blockers, hormones) to adolescents, making it a crime or civil offense to provide or facilitate the provision of gender-affirming care to youth. What are your initial thoughts on these sorts of bills?”, (2) “What might be the effects of these bills, if passed, on your clinic/organization?”, and (3) “Some providers have participated in advocacy efforts in opposition or support of these bills. Have you participated in any advocacy efforts? If so, tell me a little about those experiences.”

Demographic Survey

Participants also completed a survey about demographic information and their experience providing gender-affirming care. Participants were asked to describe their gender identity using an open-ended prompt. To understand the racial and ethnic identity of participants, they were asked: “How would you describe your race/ethnicity? (select all that apply)” with the options being (1) Asian or Asian American, (2) Black or African American (3) Hispanic, Latine, Latinx, or Spanish origin, (4) Middle Eastern or North African, (5) Native American, Indigenous American, or Alaskan Native, (6) Native Hawaiian or Pacific Islander, (7) White, (8) Another race/ethnicity (please specify), and (9) Prefer not to respond. To ascertain participants’ current occupation, they were asked: “What best describes you?” with the following options, Nurse (RN), Nurse Practitioner (NP), Physician’s Assistant (PA-C), Physician (MD/DO), Clinical Psychologist, Counselor/Therapist, Case Manager, Other please describe, prefer not to respond. Providers also listed the states in which they worked. Providers were asked how many years they have provided gender-affirming care using an open-ended question. Lastly, using an open-ended question, providers were asked about how many trans adolescents they currently saw.

Consent and Incentives

Consent for the study was collected electronically, and participants could refuse to answer any question or stop the interview at any time. The interviews were conducted in English and over Zoom, and a demographic survey was administered to participants using Qualtrics. Transcripts were de-identified, and the audio files from the interviews were destroyed. Participants were each given a $40 Amazon gift card as an incentive. The study was deemed exempt from review by the University of Michigan’s Institutional Review Board (HUM00196292).

Analyses

I and two others - a queer, cisgender Ph.D. student and a trans post-doctoral fellow with a Ph.D. in Public Health, conducted a thematic analysis of the interview transcripts using both an inductive and deductive coding approach. Following a deductive approach, I conducted all interviews, created a preliminary codebook drawing on my knowledge of the interview content as well as the literature, including the socio-ecological model of transgender stigma and health (White Hughto et al. 2015), gender affirmation research (Reisner et al. 2016; Sevelius 2013), and research based on the experiences of other providers navigating state restrictions on healthcare, chiefly abortion providers (Britton et al. 2017; Martin et al. 2014; McLeod, Pivarnik, and Flink-Bochacki 2022; Mercier et al. 2015). Next, the three independent coders applied these codes to three transcripts each, noting codes that needed clarity, new and emerging codes, and any difficulty discerning between the codes. Following an inductive approach, the codebook was revised to include emergent codes. Additionally, all three coders coded the same interview once to ensure the codes were applied similarly. Once the final codebook was established, all interviews were coded using this latest version, including previously coded interviews. All qualitative analyses were conducted using the qualitative software package MAXQDA Plus, version 22.4.0. Univariate analyses characterizing the study sample were conducted using Stata BE version 17.0.

Results

In total, I conducted 32 interviews ranging from 31 to 65 minutes (mean = 45; standard deviation = 7). **Table 4.1** displays the demographics of the sample. Of the participants, 53% identified as cisgender women, 19% identified as cisgender men, and 22% identified as either nonbinary, genderqueer, genderfluid, trans men, or trans women. The sample predominantly identified as non-Hispanic White (75%). Half of the sample practiced as a Physician (MD/DO), 19% were Clinical Psychologists, 16% were Counselors or Therapists, 6% were Nurse Practitioners, and I interviewed one was a Chaplain.

Table 4.1: Participant Demographics (n=32)

	n	(%)
Gender Identity		
Cisgender Women	17	(53)
Cisgender Men	6	(19)
Nonbinary, Genderqueer, or Genderfluid	4	(13)
Prefer Not to Respond	2	(6)
Trans Man	2	(6)
Trans Woman	1	(3)
Race/Ethnicity		
Non-Hispanic White	24	(75)
Non-Hispanic Asian	3	(9)
Hispanic or Latinx	2	(6)
Non-Hispanic Black	1	(3)
Native American, Indigenous American, or Alaskan Native	1	(3)
Prefer Not to Respond	1	(3)
Current Occupation		
Physician (MD/DO)	16	(50)
Clinical Psychologist	6	(19)
Counselor/Therapist	5	(16)
Nurse Practitioner	2	(6)
Clinical Social Worker	2	(6)
Chaplain	1	(3)
Census Region Where Providers Practice*		
South	16	(50)
Midwest	9	(28)
West	8	(25)
Northeast	1	(3)
Time Providing Gender-Affirming care to TGDA		
Less than one year	1	(3)
1-3 years	6	(19)
4-6 years	9	(28)
7-9 years	8	(25)
10-19 years	7	(22)
missing	1	(3)
Number of TGDA Patients		
≤10	10	(31)
11-49	6	(19)
50-99	6	(19)
100+	10	(31)

*Greater than total n as participants are able to choose more than one option TGDA= trans and gender diverse adolescents

Half of the participants practiced in the South, 28% practiced in the Midwest, 25% in the West, and one participant practiced in the Northeast. All participants resided in a state where a ban on gender-affirming medical care had been introduced into legislation. Most participants had provided gender-affirming care to trans adolescents for more than four years (78%), with half reporting that they were treating more than 50 trans adolescents.

To organize the thematic results, I first described the adaptations already occurring in response to the introduction or passage of bills restricting gender-affirming care for adolescents. Then, I described the anticipatory adaptations that would likely occur if these bills were to become law. For exemplary quotes by theme, see **Table 4.2**.

Theme 1: Violence and Invasive Intimidation

Providers discussed the threats they have faced because of the politicization of their care, including bomb threats, hateful phone calls and letters, and protests at their clinic. Providers described instances of violence and invasive intimidation that have emerged from the rise in the politicization of gender-affirming medical care for adolescents and the resulting fear that stems from this intimidation. For example, one provider said,

> “I'm terrified. I know that people talk about me on the right-wing radio shows. And of course, those are the sort of people who sometimes think violence is a good solution. I get hate presents. Want to see my hate presents? I’ll show you. [Participant holds up a batch of letters]. I’ve been doing this for ten years. It's way worse the last two years. It gets worse every year.”

Table 4.2: Exemplary Quotes by Theme

Theme 1: Violence and Intimidation "The diversity center of [redacted] is a great resource center for the LGBT community around here and they've been they've been vandalized on several occasions. he same with the Equality Center in [redacted]. So if you're waving your flag around, you can absolutely be a target."	**Theme 4: Adapting to Institutional Decisions** "They didn't even tell patients. The website disappeared and the phone number disappeared. If you emailed the clinic, it bounced back. And so that email doesn't exist. No messaging even went to our current patients until about a week after that happened."
Theme 2: Advocacy "I think I'm getting to a place where I feel more comfortable advocating, but I'm just so emotional about it. It's so hurtful to just be so discriminatory to these kids. Like, they're just kids. I don't think I would be able to talk in front of the state legislature without cursing them out."	**Theme 5: Navigating Where to Focus Efforts** "As far as like how [these bills] affects our practice, we're trying without like wearing out all of our staff because most of them are gender diverse and so we are trying to stay on top of what is happening without like wearing anyone out and burning someone out for making sure we're still legally able to provide services where we are."
Theme 3: Consoling Patients and Families "So many families are already teetering and imagine if they can't access care. I mean, this [law] in particular would have stopped medical providers. It wouldn't have stopped me [as a mental health provider]. They made sure to say you can still go to therapy. There's only so much I can do, you know? How long can I help a kid cope? Some of them can, but some of them are already coming in with a lot of suicidal ideation. How long can I hold them off? How can I help them until they turn 18 or 21? Y. And then there's a whole host of other issues. If we can catch these things at puberty and put a stop on puberty, there's a lot of things that they don't have to suffer with down the road.	**Theme 6: Anticipatory Provider Adaptations** "So regardless of these bills, but it would be more so if these bills were to get passed, it's not that I won't see people who need care and who have gender dysphoria, we will just have to get more creative in terms of what can we do to alleviate this dysphoria." "So outwardly, you know, it would look like I'm following the laws, but it would be rainbows and trans flags everywhere just so you know, so I could signal to folks that, you know, this is a place they can come and be whole."

Providers often described instances of violence targeting medical professionals or LGBT organizations in their communities, making them fearful for themselves and their patients.

Avoiding Violence and Invasive Intimidation

Providers discussed ways they have adapted to avoid or mitigate violence or invasive intimidation. Providers mainly discussed ways of managing their public and professional identity to minimize risk. Several providers described purchasing professional services to scrub their identity from the internet. More than one provider had discussed removing their name from the title of their home to ensure their home address couldn’t be easily found. For example, one provider said, “We have plans to move within the next few years, and we have definitely talked about like when we buy our next place, that I'm not going to be on the title.” One provider noted that they felt like they were avoiding threats because their institution has remained publicly silent that they provide gender-affirming care to adolescents.

> “Fearing for my life? Well again for me, because I'm not a large practice that's advertising, I'm not making it extremely obvious. And, you know, the bigger centers, they can be targets. But because my institution isn't making open comments, then I'm not getting any kind of threats.”

Negotiating Safety with Employers

Some providers talked about frustrations with their employers while trying to avoid violence and intimidation, mainly regarding their name and other identifying information being made public. For example, one provider explained that their employer required staff to have their name and picture posted on their website to attract more business and that they “had to really fight tooth and nail to not have my photo up on all of our websites.”

Some providers described their employers as being more proactive in managing safety concerns. For instance, one provider said their employer had purchased digital scrubbing software for all staff. In a separate instance, one provider described that their employer had hired security due to the increasing threats they were facing. However, the provider felt ambivalent about the increased safety presence, saying:

> “To be honest, I feel really complicated about having more of a security presence here. Now, we have a lot of Black patients and a lot of Brown patients, and that's not going to make them feel safer. So, I don't really want to have a security guard or like a car or whatever. That certainly doesn't feel good.”

Overall, most providers had been in active discussions with their employers to review and update safety procedures at their clinic, including installing panic buttons, discussing safety protocols in their weekly clinic meetings, and ensuring staff are not working alone.

Theme 2: Advocacy

Providers felt compelled to advocate against efforts to restrict gender-affirming care for adolescents. Many participated in advocacy by writing op-eds, testifying at legislative hearings, and protesting at state legislative buildings.

<u>Considerations of Advocacy</u>

Often, providers described considerations they made regarding if, when, and how to advocate against efforts to restrict gender-affirming care for adolescents. Given the rise in violence and intimidation against AGAPs, providers were concerned that public advocacy against these efforts might invite violence and intimidation against themselves, their families, or their practice. For example, one provider said:

> "I have felt that fear a little bit in being approached to ask about serving as an advocate in various ways that are more public than others. I had the thought of like, what would it mean for someone to look my name up and does my home address come up and is there, you know, personal safety that I need to be concerned about, in particular from perhaps some community retribution?"

Additionally, some providers were concerned that their advocacy might affect their professional reputation and may prompt parents of their cisgender patients to boycott their practice. In one case, a provider described how misinformation about AGAPs might affect parents' decisions to work with them. They said,

> "I definitely fear sometimes that being an outspoken advocate, sometimes I feel like having this as a line on my resumé will make certain people not want to have their children work with me. Or, you know, to be fearful that I will harm their children."

Despite these considerations, many providers felt that the costs of remaining silent far outweighed the costs of advocacy. One provider aptly said, "It comes back to this: I don't want to let people who are ignorant or using intimidation tactics stop me from what I believe is right or what I know because I see the change from kids who get affirming care."

Advocating while Navigating Institutions

Many providers discussed navigating institutional policies when advocating against efforts to restrict gender-affirming care for adolescents. They described that institutional considerations were often at odds with their desire to advocate because, in some instances, their institutions depended on the state legislatures for funding. One provider said,

> "And so that's why [the institution] is concerned, is because they could say, like, hey, we've got these four or five, whoever from our institution go and testify and the

> legislators get ticked. They can just introduce an amendment to the budget to zero out our funding, even if I'm not there on behalf of [the institution], and then they can't do anything about it."

Some providers worked with legislative liaisons from their institutions to ensure their testimony at state legislative hearings wouldn't harm the institution or to provide guidance on preparing for public testimony. Other providers worked with their state professional organizations to organize against efforts to restrict adolescent gender-affirming care. Some providers felt supported by their state professional organizations as they published statement letters opposing legislative bans; however, some felt their state professional organizations were slow to respond to these legislative efforts. For example, one provider said,

> "I started questioning our State [redacted] Association. Like, why hasn't the legislative committee been putting out alerts on this? Now, they've gotten better, but older folks would say that wasn't traditionally what the association did, that it was more of a networking professional group than advocacy. So, I told the state Association, look, I'm facing prison time, and we need to get on this. They did respond. We have task forces now preparing for the next legislative session."

Tolls of Advocacy

Providers described the tolls their advocacy against efforts to restrict gender-affirming care for adolescents had taken on their mental health. In particular, several providers felt upset, depressed, anxious, or burnt out recalling instances of advocacy at state legislative meetings. For example, one provider said,

> "I went through a pretty bad anxiety and depression period after [testifying at the legislature] because it felt gross. I have definitely been exposed to pieces of people that I

> didn't necessarily ask to be exposed to. I guess I did because I went out there and did this advocacy. But you know, like, I would have preferred to just have that lady be the mom of the kid who's in my kid's class. I just think that this has been super emotionally hard for me. Um, and it's going to affect my resiliency with the next [legislative] session, I think."

Some providers attended legislative meetings with their patients and provided an account of the stress they felt in these meetings. For example, one provider recalled,

> "I'm sitting there with my patient next to me, and the chair of the committee looks you in the eyeballs and says, I'm putting this to the floor. You know, I'm sitting there with my trans girl patient. He's right across from her, looking her in her eyes, and says, 'I'm bringing this to the floor.' How is that not stressful?"

Additionally, providers described having to quickly learn their states' political landscape, which made them uncomfortable and distracted them from their clinical work. For instance, one provider said, "I still haven't invested a great amount of time in learning who the players are. Like I don't want to be a 'player.' I just want to do my job, you know?"

Theme 3: Consoling Patients and Families

Most providers said that their patients or their patients' parents and guardians have brought up the efforts to restrict gender-affirming care for adolescents in the clinic, which has led them to console their patients or patients' families during clinic hours. For example, one provider noted,

> "A number of the families I work with when they thought that that might be the case, were trying to figure out like, 'Do I need to apply for a different job? Are we moving out of state? Like my family or extended family lives here. We can't stay here if we can't

> continue accessing necessary medical care for our child.' So it's a huge, huge, huge stressor."

One provider described the effect that conversations about the bills had on their patient and how that affected their mental health. They said,

> "My initial, like it's not even a thought, it's a feeling. Like I said, I'm like part of this community. So, it's devastating. I have a lot of similar experiences and feelings as my patients, and then I also need to hold space for them and their experiences and feelings. And like one of my [redacted]-year-olds, like when a lot of this started coming up with midterms, wrote me and was saying, 'It's coming at us from every side, and it just makes me feel like everyone thinks I'm a pervert.' And, like, this is a kid who hasn't even had sex with anyone, you know? She's just trying to be herself. That was just really striking and upsetting."

One provider described how some parents and guardians have started asking more questions about the timeline for their child's medical transition in their clinical visits and whether or not those should change in response to the introduction of bills that would restrict gender-affirming care for adolescents. For example, one provider said,

> "[Parents and guardians] are just really worried, right? I've had them ask, 'Should we start puberty blockers sooner or will puberty blockers be available when my kid starts puberty?' or 'Is this going to be a horrible thing?' Which, again, I don't know. The answer is no, we won't do that. You know, I've had kids wonder about black-market testosterone or estrogen. I have had families say that they will leave the state if they have to for their kids. I've heard parents tell their kids that. I think they're just worried that they

> won't be able to continue care or get care when they're ready for it. You know, it's definitely added to some anxiety."

Theme 4: Adapting to Institutional Decisions

Several providers noted that their institutions have already limited access to gender-affirming care for adolescents by pausing the acceptance of new patients to the gender clinic or shutting down the clinic altogether to avoid political efforts to limit this care. In addition, many providers described being blindsided by their institution's decision to restrict gender-affirming care.

> "We were the only public-facing clinic in the state. There are many others in the other big cities, but they all kind of operate on the down low. So we had a website, a name, and so that led to the leadership of my employer [to make the decision] to we had to stop seeing any new patients for care."

One provider said their institution planned on restricting care but realized that decisions might put them in legal trouble, so they decided not to. They said,

> "And so our institution actually had talked with our medical director about stopping care, but I think what they quickly realized is that would be patient abandonment because there is nobody within whatever mileage range to do this care. And so the existing patients could sue, and I don't think they wanted to deal with that so that kind of died out."

Additionally, providers described how their institutions have limited public-facing material about their clinics in response to the politicization of gender-affirming care for adolescents. This typically included removing content on their website or key email addresses and phone numbers related to their clinics. Some providers said that behind closed doors, their institutions would support them; however, they would remain publicly silent on the care they were providing. One provider described it as follows, “[the institution] is like absolutely keep doing what you do, support your patients, go out there and talk about it. But we as an institution are not going to advertise that this is what's happening here.”

Theme 5: Navigating Where to Focus Efforts

Some providers felt overwhelmed and uncertain about where to focus their time and energy when navigating the effects of the politicization of their work. They felt simultaneously like they needed to advocate against these bills that restrict care, work within their institutions and state professional associations to organize against these bills, console patients and families, meet with legal counsel about the steps they might need to take should these bills pass, ensure their safety and the safety of their patients and families, and take care of their mental health - all while maintaining their clinical practice. In addition, providers felt pressure to do as much as they could despite the politicization of the care they provide because they viewed the stakes to be so high. For instance, one provider said:

> “You know, what we're doing is life-saving care, and I'm really concerned that a lot of our kids are going to self-harm and or, you know, die without care. I mean, I've had one patient already who just didn't make it to the clinic in time, and then they took their own life, and it's scary. It’s really scary.”

Another said,

> “I'm so passionate about trans care because I have had the wonderful benefit of watching people truly blossom into themselves and to see people going from the depths of depression and feeling so hopeless that they don't think they could live another day. And watching them kind of conquer their world and come out of that because we're providing gender-affirming care and then to think about that being criminalized is astounding.”

One more said,

> “I feel really scared for my kids, my patients. I worry about their physical safety, and I worry about their mental wellness. And, you know, I know all the data about supporting gender diverse youth and how important it is to protect them from outcomes of all sorts of stuff. I feel like the storm is coming, and they're just going to get swept away.”

Theme 6: Anticipatory Provider Adaptations

Providers discussed how they would adapt should efforts to restrict gender-affirming care for adolescents become law or state policy.

Provide Other Forms of Affirming Care

Should efforts restricting gender-affirming care for adolescents become law or state policy, providers described how they would continue to provide other forms of gender-affirming care that weren’t outlawed, like mental health care, binders, or menstrual suppression. One provider said,

> “I would still be seeing them for their gender dysphoria binding issues. If they're anxious, depressed, and they need medication, I would be providing that. I would still be doing the contraception if requested, because I could get away with that because of providing mental control.”

Despite many saying they would maintain access to care, one provider noted that depending on how broad a law’s language could be, some mental health providers might choose not to see trans patients out of fear that they could be accused of providing gender-affirming care, which would put them in legal jeopardy.

> “[Trans adolescents] already have worse health outcomes, but this is going to be exacerbated by mental providers shying away and self-selecting, not see trans kids

> because they don't want to be mistaken as providing gender-affirming care…[some versions of these bills] have the requirement that we couldn't talk to a trans youth about their gender identity being anything different than their sex assigned at birth without parent consent. So, I would have to then stop session to break confidentiality, and which then puts our ethics code in conflict with the law… and then when we break confidentiality for trans kids, we again further become the enemy and then they're afraid to come to therapy to get the support they need.”

Several providers noted that they would need to ensure they did not use diagnostic codes that could ‘out’ their patients as trans to ensure they could still access these other forms of gender-affirming care. For example, one provider said,

> “So, I would simply bill under something else. So, it's not inauthentic because you can just as easily make the case for major depressive disorder or anxiety.”

Maintain Access to Care

Providers described two main ways to maintain access to care for their patients should efforts to restrict gender-affirming care for adolescents become law or state policy. First, providers discussed using their professional networks to refer patients to out-of-state providers who could legally deliver gender-affirming care. However, several providers noted this option was unappealing as patients often lived far from the nearest AGAPs in other states. Some providers have already started creating these lists for their patients. For example, one provider said,

> “We have a list of folks in [adjacent state] that they can see, but that's really as far as we've gone right now because, fortunately, we haven't had to go beyond that. But still, the closest clinics are at least 3 hours from [here].”

Several providers noted their willingness to move to other states to continue providing gender-affirming care for youth. For example, one provider said, “I might have to move and get licensed in another state. I guess that might be an option. I would have to figure out how we could work it out.”

Some providers discussed that referring to out-of-state providers might be illegal depending on how the law is written. In these cases, they noted that they would try to provide informal resources, such as lists of clinics and providers, so their patients could maintain access to care in other states without formally referring them to this care.

Several providers noted that they would not stop providing gender-affirming care despite laws that would ban such care. Instead, some said they would move this sort of care “underground” to evade any laws restricting this form of care. For instance, one provider said, “I think that the providers would probably go underground. There's like no way we're going to stop. Like, it's not an option.” Another believed underground care networks would emerge similar to abortion care networks that emerged before Roe v. Wade.

> “Everything goes underground. You know what this makes me think of? In the anti-abortion time, back like in the maybe sixties or so, I mean there was a group, they called them Jane's Network, that helped women get abortions and it was other women supporting that. And I feel like that's the kind of thing that would need to erupt. To find the people you can trust so that your clients know who they can trust. I'm just thinking of things like, you know, getting binders. There's like clothing stores that cater to trans youth, and that kind of thing's going to go away. So, there would, I mean, they could maybe disguise it as something else, have a different name.”

While many providers were committed to maintaining access to gender-affirming medical care for adolescents if efforts to restrict gender-affirming care for adolescents became law or state policy, others ultimately believed that they would be forced to stop providing any gender-affirming care. For example, one provider said:

> "If it passed, we'd have to close. I work for an institution that isn't looking to piss off the legislature. I mean, they have come to our call and are opposing these bans when they come up. But at the end of the day, it becomes a liability to them to provide this care. They're not going to provide it."

Strained Resources

Providers described several ways laws or policies restricting gender-affirming care for adolescents would strain already overstretched resources. Some providers said that new restrictions would complicate their work and make it more challenging to continue to provide care while navigating new legal barriers. For example, one provider said,

> "If it's a law saying that gender-affirming care for people under 18 is just outlawed, then we would close. But if it like places further restrictions on care, it would just put a huge strain on our resources and what we do and make it a lot harder for us to pay attention to our actual population."

Some providers said that their clinic might be the only ones in the state able to adequately navigate new restrictions imposed by the state legislature, which could significantly increase the number of patients they would see. For example, they said,

> "The historical version [of the bill] has said that there must be three physicians that agree and sign off on authorizing gender-affirming care. And so, for us, we may be the only

> clinic in the state that can do that. And so how do we prepare for the onslaught of people that might be seeking care, and how would we restructure clinics to meet that demand?"

Others described the increased mental healthcare needs their patients would have due to an inability to access gender-affirming medical care, which would compound their already strained mental health resources. One mental health provider said, "I already have a three- or four-month waiting list. And, you know, that is probably going to double or triple if people cannot get the care. Medical transition, that's a powerful intervention. Very, very important."

Discussion

Medical gender affirmation is considered a key determinant of health among trans populations (Reisner et al. 2016; Sevelius 2013), but stigma operating across all levels of the Social-ecological Model of Transgender Stigma and Health restricts trans adolescents' access to gender-affirming medical care, which has severe consequences for their health (King et al. 2020; White Hughto et al. 2015). Accessing medical gender affirmation during puberty is particularly important, as early treatment of gender dysphoria can decrease serious psychological distress and obviate the need for costly medical interventions later in life (Coleman et al. 2022). AGAPs are a critical component to the ability of trans adolescents to access gender-affirming care and have been on the frontline of efforts to maintain adequate access to this care (Hughes, Kidd, et al. 2021; Kidd et al. 2020; Kuehn 2022; Matsuda 2022). Given the rise in legislative and political efforts to restrict gender-affirming medical care for adolescents (Freedom For All Americans 2023), I sought to understand how AGAPs are adapting to these efforts and how they are navigating stigma across structural, interpersonal, and individual levels while working with patients and their families. Additionally, I sought to understand how AGAPs are expected to adapt to laws and policies banning gender-affirming medical care for trans adolescents should they be enacted.

My findings showed that AGAPs were already adapting to the introduction and passage of laws or policies restricting gender-affirming medical care for adolescents by navigating stigma across structural, interpersonal, and individual levels (White Hughto et al. 2015). At the structural level, AGAPs were adapting to changing political and institutional realities, such as their employers' decisions to stop providing gender-affirming medical care to adolescents, stop accepting new patients seeking gender-affirming medical care, or drastically reduce their advertising. This comports with media reports of clinics shutting down in response to the politicization of gender-affirming care for trans adolescents (Rummler 2022). In this way, the politicization of gender-affirming care for adolescents has already eroded access to gender-affirming care for adolescents. In response to these efforts, providers have advocated against laws and policies restricting gender-affirming care for adolescents by testifying at state legislative hearings, writing op-eds in local newspapers, and working with their employer and state-wide advocacy organizations to release statements or enact policies to protect their ability to provide care. Several providers drew parallels to abortion providers when navigating structural stigma. For example, like abortion providers, many of the AGAPs participated in advocacy around their work and had to be careful when navigating their advocacy with their institutions due to the political realities these institutions faced (Britton et al. 2017; Martin et al. 2014; McLeod et al. 2022). In this way, structural considerations constrained the ability of individual AGAPs to respond to the stigma they faced.

At the interpersonal level, AGAPs were adapting threats of violence and intimidation by anti-trans activists such as hate mail, bomb threats, and other forms of intimidation, which is consistent with media reports of increased threats of violence and harassment experienced by AGAPs (Gluck et al. 2022; Moghe 2022; Sands 2022). Many of the threats faced by AGAPs drew parallels to those of abortion providers, and many of the tactics they sought to ensure their safety (i.e., conceal their public identity, scrub public profiles, install panic buttons) have been described in literature on maintaining the security of abortion care providers (McLeod et al. 2022).

AGAPs also drew parallels to abortion providers when discussing how they console patients and their families while navigating the uncertainty of their provision of medical care to trans adolescents. Like abortion providers navigating restrictive laws (Mercier et al. 2015), AGAPs discussed the emotional toll consoling patients and families had on the providers' mental health and how they would often frame conversations with patients as families that they were a resource to navigate barriers to care as opposed acting as gatekeepers."

At the individual level, AGAPs grappled with identity management and concealment as a response to stigma at the other levels. For example, some AGAPs described being cautious about disclosing information about their provision of gender-affirming care to youth out of fear it might affect their professional reputation or make them and their families susceptible to threats of violence. In addition, AGAPs discussed how identity management issues were factors they considered when deciding if and how to advocate against efforts to restrict gender-affirming medical care for youth. Expanding on research by Hughto and colleagues (2022), these findings suggest that not only does anti-trans legislation impact the mental health of trans people, but their providers as well (J. M. Hughto et al. 2022).

AGAPs also discussed how they would respond should policies or laws restricting gender-affirming care for adolescents be enacted. Mainly, AGAPs believed that they would use their out-of-state professional networks to maintain access to care, continuing to provide banned gender care by going “underground” or working around existing laws to provide other forms of gender-affirming care that remained legal. In addition, AGAPs believed that should policies or laws restricting gender-affirming care for adolescents be enacted, their institutions would stop providing gender-affirming care, in some cases even care that remained legal and that institutional resources would be strained given a rise in the need for mental healthcare. In this way, structural stigma, in the form of anti-trans policies, constrains access to gender-affirming care while also constraining the ability of advocates at different levels of the social ecological model (i.e., AGAPs and their institution) to resist anti-trans efforts (White Hughto et al. 2015).

This study had several limitations. First, none of the laws banning gender-affirming care for adolescents had gone into effect during the study period. Therefore, AGAPs were speculating on how they or their institutions would adapt to the passage of these laws. Next, I relied on a limited sample of recruits through email listservs and referrals; therefore, these findings may not be transferrable to all AGAPs. Next, the participants in this study were overwhelmingly Non-Hispanic White, and most identified as cisgender women. Future research is needed to understand the perspectives of providers of color and those who are trans-identified. Despite these limitations, this study builds on that of Hughes et al. (2021) by exploring how AGAPs and their institutions are adapting in response to efforts to restrict gender-affirming care for trans adolescents and draws on thematic parallels to the literature on how abortion providers navigate stigma and restrictive policies (Britton et al. 2017; Martin et al. 2014; McLeod et al. 2022; Mercier et al. 2015). Finally, unlike Hughes et al. (2021), this study focused solely on AGAPs in states that have sought to ban gender-affirming medical care for adolescents, representing each state in this sample.

Conclusion

I found that providers were on the frontline of efforts to maintain access to gender-affirming care and were navigating policies, threats, and structures that would deny trans people access to gender-affirming medical care. In this way, stigma, operating across levels of the Social Ecological Model of Transgender Stigma and Health, should be considered a fundamental cause of adverse health outcomes for trans adolescents (Hatzenbuehler et al. 2013; Link and Phelan 1995; White Hughto et al. 2015). Political and legal efforts to restrict gender-affirming medical care for adolescents have significantly impacted how providers and their institutions deliver gender-affirming care and highlight the critical role providers play in advocating for and maintaining access to gender-affirming care. Given that 2023 has already seen an unprecedented rise in anti-trans legislation compared to years prior (Freedom For All Americans 2023), supporting AGAPs and their patients remains crucial. These findings demonstrate the need for advocates and policymakers to work diligently to mitigate the harms caused by these legislative efforts and maintain access to gender-affirming care for adolescents.

Chapter 5 Conclusions

For this dissertation, I considered stigma a key determinant of the health of U.S. trans populations. Applying White Hughto and colleagues' Socio-Ecological Model of Transgender Stigma and Health (White Hughto et al. 2015), I conceptualized stigma as operating across structural, interpersonal, and individuals levels to affect the health of trans people throughout the life course and in different contexts within the healthcare system.

To consider the effects of stigma across middle- and older- adulthood, Chapter 2 examined the pattern of cardiovascular (CVD) risk among trans people to determine if these patterns exhibit a "weathering" pattern suggestive of premature aging and health deterioration as a function unrelenting identity stress and stigma (Geronimus 2023). To consider the effects of stigma on the health of trans populations in the short term and across levels of the Socio-Ecological Model of Transgender Stigma and Health (White Hughto et al. 2015), Chapter 3 examined the associations between structural stigma, conceptualized as anti-trans laws and policies, and individual forms of stigma, conceptualized as avoiding healthcare due to stigma, and how stigma at these levels contributed to non-prescribed hormones use among trans people in the U.S. Finally, in Chapter 4, I studied structural stigma, in the form of laws and policies restricting access to gender-affirming medical care for adolescents and considered how adolescent gender-affirming care providers (AGAPs) were adapting to stigma across multiple levels in response to these efforts. After discussing the significant findings from each study, I will describe the broader contributions this work has made to research on stigma and trans health and its implications for policymakers, trans health advocates, and providers of gender-affirming care.

Dissertation Summary

In Chapter 2, I assessed the trends of CVD risk (i.e., rates of coronary artery disease (CAD), heart failure (HF), hypertension (HTN), hypercholesterolemia (HC), and myocardial infarction (MI)) over age among people enrolled in private insurance. I hypothesized that, when matching on demographic and insurance characteristics, the age patterns of CVD risk among trans people would display a "weathering" pattern (Geronimus 2023), that is, an increase in CVD risk among trans people compared to cis people who share their sex assigned at birth at early- and middle- adulthood, which persists into older ages. In addition, I found that when compared to cis people who shared their sex assigned at birth, the risk of CVDs among transmasculine and nonbinary people assigned female at birth (TMN) and transfeminine and nonbinary people assigned male at birth (TFN) was elevated during early- or middle-adulthood (i.e., ages 18-49) and these differences persisted into older ages, suggestive of "weathering." Broadly, these findings held when I removed those who had never accessed hormones, suggesting that prescribed hormone use during the study period did not meaningfully modify these results. Although preliminary, these findings indicate that the "weathering" hypothesis may be a viable theoretical frame for CVDs among trans populations in the U.S.

In Chapter 3, I explored how stigma operated across levels of the Socio-Ecological Model of Transgender Stigma and Health (White Hughto et al. 2015), and was associated with medical gender affirmation, specifically non-prescribed hormones (NPHs) use among the largest ever convenience sample of trans people in the U.S. (James et al. 2016). Using structural equation modeling, I found that among trans adults using hormones, healthcare policy stigma (a cumulative measure of the severity of policy-level factors that demean, devalue, and restrict the care of trans people) was positively associated with NPHs use and operated through insurance coverage and anticipating stigma in healthcare settings. However, when assessing the model, I did not find a direct association between healthcare policy stigma and NPH use. Instead, I found chains of associations between healthcare policy stigma, insurance coverage, avoiding healthcare due to stigma, and using NPHs. This suggested that the model I tested was sufficient to explain the relationship between healthcare policy stigma and using NPHs.

In Chapter 4, I again applied White Hughto and colleagues' Socio-Ecological Model of Transgender Stigma and Health (White Hughto et al. 2015) to consider how AGAPs were adapting to stigma in response to the introduction of bills or policies that aimed to restrict access to gender-affirming care for trans adolescents. I conducted 32 semi-structured interviews with AGAPs from states that passed or introduced such bans. I found that providers were navigating stigma across all levels of the Socio-Ecological Model of Transgender Stigma and Health, such as structural or institutional policies restricting gender-affirming care for adolescents, interpersonal threats of violence and harassment from anti-trans activists, and identity management and concealment to avoid stigma or harassment at the individual level. Stigma across all levels of the social ecological model influenced AGAPs' willingness to advocate against efforts to restrict access to gender-affirming care for trans adolescents. This Chapter showed how AGAPs could buffer the effects of stigma to facilitate access to gender-affirming care for adolescents. Still, it comes at a cost to AGAPs, requiring them to make decisions about the ethical, legal, and personal tradeoffs to maintaining access to gender-affirming care for adolescents.

Implications for Research on Stigma and the Health of U.S. Trans Populations

When studying CVDs, the framing of health disparities between trans and cis populations has often centered on individual factors associated with health, often ignoring the effects stigma may have on these outcomes (Caceres, Streed, et al. 2020; Committee on Understanding the Well-Being of Sexual and Gender Diverse Populations et al. 2020; King et al. 2020). Typically, these studies have framed differences in CVD risk as attributable to exogenous hormone use or individual health behaviors such as smoking and exercise (Caceres, Jackman, et al. 2020; Cocchetti et al. 2021; Connelly and Delles 2021; Howerton and Harris 2021; Irwig 2018; Knight 2021; Malhotra et al. 2022; Martinez et al. 2018; Seal 2019). Although preliminary, findings from Chapter 2 suggest that the weathering hypothesis (Geronimus 2023) may provide an alternative theoretical framing for understanding the risk of CVD among U.S. trans populations as trans people were at a greater risk for CVDs than their cis counterparts who shared their sex assigned at birth throughout most ages and these differences were most significant during early- and middle- adulthood. Research should consider the multifaceted ways stigma may affect the risk of CVDs in trans populations by not only creating identity threats that directly affect CVD risk (Geronimus et al. 2016) but also how stigma affects other factors known to be associated with CVDs, such as substance use, physical activity, diet, and blood pressure (Caceres, Streed, et al. 2020) Additionally, researchers should assess how age modifies the relationship between gender and CVD risk in more representative samples of trans people, as Chapter 2 findings were derived using a sample of people enrolled in private insurance and using an algorithm known to undercount trans people. Further, given that trans people may face overlapping forms of stigma, such as racism, sexism, or other forms of oppression, it is important to consider how stigma across these factors may reinforce one another to produce unequal health outcomes, including

CVD risk (Beltran et al. 2019; Crenshaw 1993; Goldenberg, L. Reisner, et al. 2020; Hughes, King, Gamarel, Geronimus, O. A. Panagiotou, et al. 2022; Wesp et al. 2019).

Research on stigma and its association with the health of U.S. trans populations has often focused on interpersonal- or individual-level stigma, and few quantitative studies have considered the interplay of stigma operating at different levels of the Socio-Ecological Model of Transgender Stigma and Health (King et al. 2020; White Hughto et al. 2015). Findings from Chapter 3 highlight the importance of mapping stigma across levels of the Socio-Ecological Model of Transgender Stigma and Health (White Hughto et al. 2015) to consider how they may reinforce one another to predict health outcomes among U.S. trans populations. Further, most research on NPHs use operationalizes NPHs as a dichotomous variable: either any NPHs use or none (Clark et al. 2018; de Haan et al. 2015). Chapter 3 highlights the importance of conceptualizing NPH use as a trichotomous variable (i.e., prescribed hormones use, only using NPHs, and supplemental NPHs use). Consistent with my hypotheses in Chapter 3, the effect sizes on key predictor variables varied significantly between those who used supplemental NPHs and those who only used NPHs, suggesting the need to treat NPHs use as distinct from those who use supplemental NPHs because the drivers of each may be different. This chapter outlined how critical state-level policies are to the ability of trans people to access an essential component of healthcare: gender-affirming medical care.

The findings from Chapter 4 highlight the importance of resistance and resilience among trans populations and their allies to mitigate the effects of anti-trans stigma across all levels of the Socio-Ecological Model of Transgender Stigma and Health (White Hughto et al. 2015). While conceptualizations of resilience among queer adolescents have often focused on adolescents' ability to recover quickly from difficulties (Robinson and Schmitz 2021), researchers have pushed the field to consider the role other protective factors, such as social context and institutions, shape individuals' resilience and risk (Asakura 2017; Fergus and Zimmerman 2005; Ungar 2011). Chapter 4 echoes these calls, suggesting future research should contextualize their understanding of resilience to include the social and institutional contingencies that shape adolescents' resilience and risk. In this way, we must think about how providers, allies, and institutions resist state violence (Burns 2019; Padilla et al. 2007; Ungar 2000) and how all three can be resilience-promoting resources for trans people in the face of stigma.

Implications for Policymakers, Trans Health Advocates, and Providers of Gender-Affirming Care

Overall, these findings implore policymakers, trans health advocates, and providers of gender-affirming care to consider interventions aimed at reducing stigma across each level of the Socio-Ecological Model of Transgender Stigma and Health (White Hughto et al. 2015). At the structural level, this may involve implementing policies that protect the civil rights of trans people and their access to healthcare. Recent executive actions by the Biden-Harris administration are a step in the right direction, such as enforcing section 1557 of the Affordable Care Act's prohibition on discrimination based on sex to prohibit discrimination based on gender identity in health programs, guiding schools that accept federal funds that federal law protects trans people in educational settings, and enforcing the Fair Housing Act to prohibit discrimination based on gender identity (The White House 2022). While these executive actions are important, another administration may easily overturn them. In fact, former President Trump vowed to roll back these protections should he be reelected in 2024, saying that his administration would end programs that promote the concept of gender transition "at any age," promising to prohibit federal tax dollars from being used to pay for gender-affirming care, among other anti-trans policies (Migdon 2023). For this reason, legislation protecting trans people's civil rights and access to healthcare must be passed at the federal and state levels to ensure protections are not easily overturned by an administration hostile to trans rights. While the state extending legal protection to trans individuals is important, as Ungar (2000) noted, these protections alone are not enough, they must be enforced and not easily rescinded. Efforts to reduce trans stigma at the interpersonal level may involve increasing social contact among cis and trans people (Cao and Atinc Gurcay 2022), or short and scalable interventions, such as 10-minute conversations encouraging perspective-taking by participants (Broockman and Kalla 2016). And at the individual- and interpersonal-level, it requires access to social, psychological, legal, and medical gender affirmation to alleviate gender dysphoria and aid trans people in navigating stigma (White Hughto et al. 2015).

Several limitations to the findings in both Chapters 2 and 3 are a function of methodological limitations given the scarcity of population-level studies that adequately collect gender identity and suggest the need for collecting accurate gender identity information in public health surveillance systems, demographic surveys, and administrative and vital statistics data to better test public health theories that have implications for public health practice. While calls for better data collection of gender identity in health surveys and surveillance systems are not new (Cahill and Makadon 2017; Committee on Understanding the Well-Being of Sexual and Gender Diverse Populations et al. 2020; Streed et al. 2020), efforts by the Biden-Harris administration to collect gender identity in Federal statistical surveys is undoubtedly a good start (Orvis 2023). Capturing accurate information on gender identity in consultation with trans populations will allow policymakers to help identify and address economic, health, and social priorities among trans populations. Additionally, this will allow researchers and public health practitioners to develop interventions to improve the health and well-being of trans populations in the U.S.

Findings from Chapters 3 and 4 suggest the need for interventions and policies that support AGAPs, trans adolescents and adults, and their families when accessing or providing gender-affirming care. Maintaining access to gender-affirming care includes implementing policies that ensure gender-affirming care is covered by insurance, rescinding laws and policies at the state and federal levels that restrict this form of care and ensuring healthcare providers are adequately trained in the provision of gender-affirming care for trans adolescents and adults. Some progress has been made to ensure that insurance companies cover gender-affirming care. For example, in 2021, Colorado included gender-affirming care as an essential health benefit to their insurance benchmark plan requiring insurers to cover these services for their enrollees (The White House 2022). More states should consider including gender-affirming care as an essential health benefit, which could aid in accessing gender-affirming care for trans adolescents and adults. Additionally, as AGAPs suggested in Chapter 4, healthcare institutions should advocate access to gender-affirming care by educating or directly lobbying legislators about the importance of gender-affirming care and implementing clinic safety measures to keep AGAPs and patients safe. Lastly, individuals can support transgender adolescents and their families by donating to funds that help families afford the costs associated with gender-affirming care (Campaign for Southern Equality 2023) and connecting them to existing resources such as TransFamily Support Services (TransFamily Support Services 2023), which help families navigate barriers to accessing care.

Closing Remarks

Ultimately, improving the health and well-being of trans populations in the U.S. is contingent on our ability to address fundamental causes, such as stigma derived from the *gender/sex fallacy* (Hatzenbuehler et al. 2013; King et al. 2020; Link and Phelan 1995; Padilla et al. 2007; Ungar 2000; West and Zimmerman 1987; White Hughto et al. 2015). This will require efforts across levels of the Socio-Ecological Model of Transgender Stigma and Health (White Hughto et al. 2015) to support identity-safe environments (Geronimus et al. 2016), and maintain access to gender-affirming care for U.S. trans populations (Reisner et al. 2016).

Appendix

Appendix Table 1: List of CVD ICD codes

Description	Code	ICD 9/10	CVD	Description	Code	ICD 9/10	CVD
Cardiovascular disease, unspecified	429.2	9	CAD	Angina pectoris with documented spasm	I20.1	10	CAD
Cor ath unsp vsl ntv/gft	414.00	9	CAD	Other forms of angina pectoris	I20.8	10	CAD
Crnry athrscl natve vssl	414.01	9	CAD	Angina pectoris, unspecified	I20.9	10	CAD
Crn ath atlg vn bps grft	414.02	9	CAD	Acute coronary thrombosis not resulting in myocardial infrc	I24.0	10	CAD
Crn ath nonatlg blg grft	414.03	9	CAD	Other forms of acute ischemic heart disease	I24.8	10	CAD
Cor ath artry bypas grft	414.04	9	CAD	Acute ischemic heart disease, unspecified	I24.9	10	CAD
Cor ath bypass graft NOS	414.05	9	CAD	Athscl heart disease of native coronary artery w/o ang pctrs	I25.10	10	CAD
Cor ath natv art tp hrt	414.06	9	CAD	Athscl heart disease of native cor art w unstable ang pctrs	I25.110	10	CAD
Cor ath bps graft tp hrt	414.07	9	CAD	Athscl heart disease of native cor art w ang pctrs w spasm	I25.111	10	CAD
Chr tot occlus cor artry	414.2	9	CAD	Athscl heart disease of native cor art w oth ang pctrs	I25.118	10	CAD
Cor ath d/t lpd rch plaq	414.3	9	CAD	Athscl heart disease of native cor art w unsp ang pctrs	I25.119	10	CAD
Cor ath d/t calc cor lsn	414.4	9	CAD	Old myocardial infarction	I25.2	10	CAD
Chr ischemic hrt dis NEC	414.8	9	CAD	Ischemic cardiomyopathy	I25.5	10	CAD
Chr ischemic hrt dis NOS	414.9	9	CAD	Silent myocardial ischemia	I25.6	10	CAD
AMI anterolateral,unspec	410.00	9	CAD	Atherosclerosis of CABG, unsp, w unstable angina pectoris	I25.700	10	CAD
AMI anterolateral, init	410.01	9	CAD	Athscl CABG, unsp, w angina pectoris w documented spasm	I25.701	10	CAD
AMI anterolateral,subseq	410.02	9	CAD	Atherosclerosis of CABG, unsp, w oth angina pectoris	I25.708	10	CAD
AMI inferolateral,unspec	410.20	9	CAD	Atherosclerosis of CABG, unsp, w unsp angina pectoris	I25.709	10	CAD
AMI inferolateral, init	410.21	9	CAD	Athscl autologous vein CABG w unstable angina pectoris	I25.710	10	CAD
AMI inferolateral,subseq	410.22	9	CAD	Athscl autologous vein CABG w ang pctrs w documented spasm	I25.711	10	CAD

Description	Code	ICD 9/10	CVD	Description	Code	ICD 9/10	CVD
AMI inferopost, unspec	410.30	9	CAD	Athscl autologous vein CABG w oth angina pectoris	I25.718	10	CAD
AMI inferopost, initial	410.31	9	CAD	Athscl autologous vein CABG w unsp angina pectoris	I25.719	10	CAD
AMI inferopost, subseq	410.32	9	CAD	Athscl autologous artery CABG w unstable angina pectoris	I25.720	10	CAD
AMI inferior wall,unspec	410.40	9	CAD	Athscl autologous artery CABG w ang pctrs w documented spasm	I25.721	10	CAD
AMI inferior wall, init	410.41	9	CAD	Athscl autologous artery CABG w oth angina pectoris	I25.728	10	CAD
AMI inferior wall,subseq	410.42	9	CAD	Athscl autologous artery CABG w unsp angina pectoris	I25.729	10	CAD
AMI anterior wall,unspec	410.10	9	CAD	Athscl nonautologous biological CABG w unstable ang pctrs	I25.730	10	CAD
AMI anterior wall, init	410.11	9	CAD	Athscl nonaut biological CABG w ang pctrs w documented spasm	I25.731	10	CAD
AMI anterior wall,subseq	410.12	9	CAD	Athscl nonautologous biological CABG w oth angina pectoris	I25.738	10	CAD
AMI lateral NEC, unspec	410.50	9	CAD	Athscl nonautologous biological CABG w unsp angina pectoris	I25.739	10	CAD
AMI lateral NEC, initial	410.51	9	CAD	Athscl native cor art of txplt heart w unstable angina	I25.750	10	CAD
AMI lateral NEC, subseq	410.52	9	CAD	Athscl native cor art of txplt heart w ang pctrs w spasm	I25.751	10	CAD
True post infarct,unspec	410.60	9	CAD	Athscl native cor art of transplanted heart w oth ang pctrs	I25.758	10	CAD
True post infarct, init	410.61	9	CAD	Athscl native cor art of transplanted heart w unsp ang pctrs	I25.759	10	CAD
True post infarct,subseq	410.62	9	CAD	Athscl bypass of cor art of txplt heart w unstable angina	I25.760	10	CAD
Subendo infarct, unspec	410.70	9	CAD	Athscl bypass of cor art of txplt heart w ang pctrs w spasm	I25.761	10	CAD
Subendo infarct, initial	410.71	9	CAD	Athscl bypass of cor art of txplt heart w oth ang pctrs	I25.768	10	CAD
Subendo infarct, subseq	410.72	9	CAD	Athscl bypass of cor art of txplt heart w unsp ang pctrs	I25.769	10	CAD
AMI NEC, unspecified	410.80	9	CAD	Atherosclerosis of CABG w unstable angina pectoris	I25.790	10	CAD
AMI NEC, initial	410.81	9	CAD	Atherosclerosis of CABG w angina pectoris w documented spasm	I25.791	10	CAD
AMI NEC, subsequent	410.82	9	CAD	Atherosclerosis of CABG w oth angina pectoris	I25.798	10	CAD
AMI NOS, unspecified	410.90	9	CAD	Atherosclerosis of CABG w unsp angina pectoris	I25.799	10	CAD
AMI NOS, initial	410.91	9	CAD	Chronic total occlusion of coronary artery	I25.82	10	CAD
AMI NOS, subsequent	410.92	9	CAD	Coronary atherosclerosis due to lipid rich plaque	I25.83	10	CAD
Unstable angina	I20.0	10	CAD	Coronary atherosclerosis due to calcified coronary lesion	I25.84	10	CAD
Other forms of chronic ischemic heart disease	I25.89	10	CAD	Acute on chronic right heart failure	I50.813	10	HF

Description	Code	ICD 9/10	CVD
Chronic ischemic heart disease, unspecified	I25.9	10	CAD
STEMI involving left main coronary artery	I21.01	10	CAD
STEMI involving left anterior descending coronary artery	I21.02	10	CAD
STEMI involving oth coronary artery of anterior wall	I21.09	10	CAD
STEMI involving right coronary artery	I21.11	10	CAD
STEMI involving oth coronary artery of inferior wall	I21.19	10	CAD
STEMI involving left circumflex coronary artery	I21.21	10	CAD
STEMI involving oth sites	I21.29	10	CAD
ST elevation (STEMI) myocardial infarction of unsp site	I21.3	10	CAD
Non-ST elevation (NSTEMI) myocardial infarction	I21.4	10	CAD
Acute myocardial infarction, unspecified	I21.9	10	CAD
Myocardial infarction type 2	I21.A1	10	CAD
Other myocardial infarction type	I21.A9	10	CAD
Systolic hrt failure NOS	428.20	9	HF
Ac systolic hrt failure	428.21	9	HF
Chr systolic hrt failure	428.22	9	HF
Ac on chr syst hrt fail	428.23	9	HF
Diastolc hrt failure NOS	428.30	9	HF
Ac diastolic hrt failure	428.31	9	HF
Chr diastolic hrt fail	428.32	9	HF
Ac on chr diast hrt fail	428.33	9	HF
Syst/diast hrt fail NOS	428.40	9	HF
Ac syst/diastol hrt fail	428.41	9	HF
Chr syst/diastl hrt fail	428.42	9	HF
Ac/chr syst/dia hrt fail	428.43	9	HF
CHF NOS	428.0	9	HF
Right heart failure due to left heart failure	I50.814	10	HF
Biventricular heart failure	I50.82	10	HF
High output heart failure	I50.83	10	HF
End stage heart failure	I50.84	10	HF
Other heart failure	I50.89	10	HF
Heart failure, unspecified	I50.9	10	HF
Malignant hypertension	401	9	HTN
Benign hypertension	401.1	9	HTN
Hypertension NOS	401.9	9	HTN
Mal hyp ht dis w/o hf	402	9	HTN
Mal hypert hrt dis w hf	402.01	9	HTN
Benign hyp ht dis w/o hf	402.1	9	HTN
Benign hyp ht dis w hf	402.11	9	HTN
Hyp hrt dis NOS w/o hf	402.9	9	HTN
Hyp ht dis NOS w ht fail	402.91	9	HTN
Mal hy kid w cr kid I-IV	403	9	HTN
Mal hyp kid w cr kid V	403.01	9	HTN
Ben hy kid w cr kid I-IV	403.1	9	HTN
Ben hyp kid w cr kid V	403.11	9	HTN
Hy kid NOS w cr kid I-IV	403.9	9	HTN
Hyp kid NOS w cr kid V	403.91	9	HTN
Mal hy ht/kd I-IV w/o hf	404	9	HTN
Mal hyp ht/kd I-IV w hf	404.01	9	HTN
Mal hy ht/kd st V w/o hf	404.02	9	HTN
Mal hyp ht/kd stg V w hf	404.03	9	HTN
Ben hy ht/kd I-IV w/o hf	404.1	9	HTN

Description	Code	ICD 9/10	CVD	Description	Code	ICD 9/10	CVD
Left heart failure	428.1	9	HF	Ben hyp ht/kd I-IV w hf	404.11	9	HTN
Heart failure NOS	428.9	9	HF	Ben hy ht/kd st V w/o hf	404.12	9	HTN
Left ventricular failure, unspecified	I50.1	10	HF	Ben hyp ht/kd stg V w hf	404.13	9	HTN
Unspecified systolic (congestive) heart failure	I50.20	10	HF	Hy ht/kd NOS I-IV w/o hf	404.9	9	HTN
Acute systolic (congestive) heart failure	I50.21	10	HF	Hyp ht/kd NOS I-IV w hf	404.91	9	HTN
Chronic systolic (congestive) heart failure	I50.22	10	HF	Hy ht/kd NOS st V w/o hf	404.92	9	HTN
Acute on chronic systolic (congestive) heart failure	I50.23	10	HF	Hyp ht/kd NOS st V w hf	404.93	9	HTN
Unspecified diastolic (congestive) heart failure	I50.30	10	HF	Mal renovasc hypertens	405.01	9	HTN
Acute diastolic (congestive) heart failure	I50.31	10	HF	Mal second hyperten NEC	405.09	9	HTN
Chronic diastolic (congestive) heart failure	I50.32	10	HF	Benign renovasc hyperten	405.11	9	HTN
Acute on chronic diastolic (congestive) heart failure	I50.33	10	HF	Benign second hypert NEC	405.19	9	HTN
Unsp combined systolic and diastolic (congestive) hrt fail	I50.40	10	HF	Renovasc hypertension	405.91	9	HTN
Acute combined systolic and diastolic (congestive) hrt fail	I50.41	10	HF	Second hypertension NEC	405.99	9	HTN
Chronic combined systolic and diastolic hrt fail	I50.42	10	HF	Prim pulm hypertension	416	9	HTN
Acute on chronic combined systolic and diastolic hrt fail	I50.43	10	HF	Essential (primary) hypertension	I10	10	HTN
Right heart failure, unspecified	I50.810	10	HF	Hypertensive heart disease with heart failure	I11.0	10	HTN
Acute right heart failure	I50.811	10	HF	Hypertensive heart disease without heart failure	I11.9	10	HTN
Chronic right heart failure	I50.812	10	HF	Hyp chr kidney disease w stage 5 chr kidney disease or ESRD	I12.0	10	HTN
Hypertensive chronic kidney disease w stg 1-4/unsp chr kdny	I12.9	10	HTN	Pre-existing hypertension w pre-eclampsia, third trimester	O11.3	10	HTN
Hyp hrt & chr kdny dis w hrt fail and stg 1-4/unsp chr kdny	I13.0	10	HTN	Pre-existing htn with pre-eclampsia, comp childbirth	O11.4	10	HTN
Hyp hrt & chr kdny dis w/o hrt fail, w stg 1-4/unsp chr kdny	I13.10	10	HTN	Pre-existing htn with pre-eclampsia, comp the puerperium	O11.5	10	HTN
Hyp hrt and chr kdny dis w/o hrt fail, w stg 5 chr kdny/ESRD	I13.11	10	HTN	Pre-existing hypertension with pre-eclampsia, unsp trimester	O11.9	10	HTN
Hyp hrt & chr kdny dis w hrt fail and w stg 5 chr kdny/ESRD	I13.2	10	HTN	Pure hypercholesterolem	272	9	HC
Renovascular hypertension	I15.0	10	HTN	Mixed hyperlipidemia	272.2	9	HC
Hypertension secondary to other renal disorders	I15.1	10	HTN	Other and unspecified hyperlipidemia	272.4	9	HC
Hypertension secondary to endocrine disorders	I15.2	10	HTN	Pure hypercholesterolemia	E78.0	10	HC

Description	Code	ICD 9/10	CVD	Description	Code	ICD 9/10	CVD
Other secondary hypertension	I15.8	10	HTN	Mixed hyperlipidemia	E78.2	10	HC
Secondary hypertension, unspecified	I15.9	10	HTN	Pure hypercholesterolemia, unspecified	E78.00	10	HC
Hypertensive urgency	I16.0	10	HTN	Hyperlipidemia, unspecified	E78.5	10	HC
Hypertensive emergency	I16.1	10	HTN	AMI anterolateral,unspec	410.00	9	MI
Hypertensive crisis, unspecified	I16.9	10	HTN	AMI anterolateral, init	410.01	9	MI
Postprocedural hypertension	I97.3	10	HTN	AMI anterolateral,subseq	410.02	9	MI
Pre-existing essential htn comp pregnancy, first trimester	O10.011	10	HTN	AMI inferolateral,unspec	410.20	9	MI
Pre-existing essential htn comp pregnancy, second trimester	O10.012	10	HTN	AMI inferolateral, init	410.21	9	MI
Pre-existing essential htn comp pregnancy, third trimester	O10.013	10	HTN	AMI inferolateral,subseq	410.22	9	MI
Pre-existing essential htn comp pregnancy, unsp trimester	O10.019	10	HTN	AMI inferopost, unspec	410.30	9	MI
Pre-existing essential hypertension complicating childbirth	O10.02	10	HTN	AMI inferopost, initial	410.31	9	MI
Pre-existing essential hypertension comp the puerperium	O10.03	10	HTN	AMI inferopost, subseq	410.32	9	MI
Pre-exist hyp heart disease comp pregnancy, first trimester	O10.111	10	HTN	AMI inferior wall,unspec	410.40	9	MI
Hypertensive chronic kidney disease w stg 1-4/unsp chr kdny	I12.9	10	HTN	Pre-existing hypertension w pre-eclampsia, third trimester	O11.3	10	HTN
Hyp hrt & chr kdny dis w hrt fail and stg 1-4/unsp chr kdny	I13.0	10	HTN	Pre-existing htn with pre-eclampsia, comp childbirth	O11.4	10	HTN
Hyp hrt & chr kdny dis w/o hrt fail, w stg 1-4/unsp chr kdny	I13.10	10	HTN	Pre-existing htn with pre-eclampsia, comp the puerperium	O11.5	10	HTN
Hyp hrt and chr kdny dis w/o hrt fail, w stg 5 chr kdny/ESRD	I13.11	10	HTN	Pre-existing hypertension with pre-eclampsia, unsp trimester	O11.9	10	HTN
Hyp hrt & chr kdny dis w hrt fail and w stg 5 chr kdny/ESRD	I13.2	10	HTN	Pure hypercholesterolem	272	9	HC
Renovascular hypertension	I15.0	10	HTN	Mixed hyperlipidemia	272.2	9	HC
Hypertension secondary to other renal disorders	I15.1	10	HTN	Other and unspecified hyperlipidemia	272.4	9	HC
Hypertension secondary to endocrine disorders	I15.2	10	HTN	Pure hypercholesterolemia	E78.0	10	HC
Other secondary hypertension	I15.8	10	HTN	Mixed hyperlipidemia	E78.2	10	HC
Secondary hypertension, unspecified	I15.9	10	HTN	Pure hypercholesterolemia, unspecified	E78.00	10	HC
Hypertensive urgency	I16.0	10	HTN	Hyperlipidemia, unspecified	E78.5	10	HC
Hypertensive emergency	I16.1	10	HTN	AMI anterolateral,unspec	410.00	9	MI
Hypertensive crisis, unspecified	I16.9	10	HTN	AMI anterolateral, init	410.01	9	MI

Description	Code	ICD 9/10	CVD	Description	Code	ICD 9/10	CVD
Postprocedural hypertension	I97.3	10	HTN	AMI anterolateral,subseq	410.02	9	MI
Pre-existing essential htn comp pregnancy, first trimester	O10.011	10	HTN	AMI inferolateral,unspec	410.20	9	MI
Pre-existing essential htn comp pregnancy, second trimester	O10.012	10	HTN	AMI inferolateral, init	410.21	9	MI
Pre-existing essential htn comp pregnancy, third trimester	O10.013	10	HTN	AMI inferolateral,subseq	410.22	9	MI
Pre-existing essential htn comp pregnancy, unsp trimester	O10.019	10	HTN	AMI inferopost, unspec	410.30	9	MI
Pre-existing essential hypertension complicating childbirth	O10.02	10	HTN	AMI inferopost, initial	410.31	9	MI
Pre-existing essential hypertension comp the puerperium	O10.03	10	HTN	AMI inferopost, subseq	410.32	9	MI
Pre-exist hyp heart disease comp pregnancy, first trimester	O10.111	10	HTN	AMI inferior wall,unspec	410.40	9	MI
Pre-exist hyp heart disease comp pregnancy, second trimester	O10.112	10	HTN	AMI inferior wall, init	410.41	9	MI
Pre-exist hyp heart disease comp pregnancy, third trimester	O10.113	10	HTN	AMI inferior wall,subseq	410.42	9	MI
Pre-exist hyp heart disease comp pregnancy, unsp trimester	O10.119	10	HTN	AMI anterior wall,unspec	410.10	9	MI
Pre-existing hypertensive heart disease comp childbirth	O10.12	10	HTN	AMI anterior wall, init	410.11	9	MI
Pre-existing hypertensive heart disease comp the puerperium	O10.13	10	HTN	AMI anterior wall,subseq	410.12	9	MI
Pre-exist hyp chronic kidney disease comp preg, first tri	O10.211	10	HTN	AMI lateral NEC, unspec	410.50	9	MI
Pre-exist hyp chronic kidney disease comp preg, second tri	O10.212	10	HTN	AMI lateral NEC, initial	410.51	9	MI
Pre-exist hyp chronic kidney disease comp preg, third tri	O10.213	10	HTN	AMI lateral NEC, subseq	410.52	9	MI
Pre-exist hyp chronic kidney disease comp preg, unsp tri	O10.219	10	HTN	True post infarct,unspec	410.60	9	MI
Pre-existing hyp chronic kidney disease comp childbirth	O10.22	10	HTN	True post infarct, init	410.61	9	MI
Pre-existing hyp chronic kidney disease comp the puerperium	O10.23	10	HTN	True post infarct,subseq	410.62	9	MI
Pre-exist hyp heart and chr kidney dis comp preg, first tri	O10.311	10	HTN	Subendo infarct, unspec	410.70	9	MI
Pre-exist hyp heart and chr kidney dis comp preg, second tri	O10.312	10	HTN	Subendo infarct, initial	410.71	9	MI
Pre-exist hyp heart and chr kidney dis comp preg, third tri	O10.313	10	HTN	Subendo infarct, subseq	410.72	9	MI
Pre-exist hyp heart and chr kidney dis comp preg, unsp tri	O10.319	10	HTN	AMI NEC, unspecified	410.80	9	MI
Pre-exist hyp heart and chronic kidney disease comp chldbrth	O10.32	10	HTN	AMI NEC, initial	410.81	9	MI
Pre-exist hyp heart and chr kidney disease comp the puerp	O10.33	10	HTN	AMI NEC, subsequent	410.82	9	MI
Pre-existing secondary htn comp pregnancy, first trimester	O10.411	10	HTN	AMI NOS, unspecified	410.90	9	MI

Description	Code	ICD 9/10	CVD	Description	Code	ICD 9/10	CVD
Pre-existing secondary htn comp pregnancy, second trimester	O10.412	10	HTN	AMI NOS, initial	410.91	9	MI
Pre-existing secondary htn comp pregnancy, third trimester	O10.413	10	HTN	AMI NOS, subsequent	410.92	9	MI
Pre-existing secondary htn comp pregnancy, unsp trimester	O10.419	10	HTN	STEMI involving left main coronary artery	I21.01	10	MI
Pre-existing secondary hypertension complicating childbirth	O10.42	10	HTN	STEMI involving left anterior descending coronary artery	I21.02	10	MI
Pre-existing secondary hypertension comp the puerperium	O10.43	10	HTN	STEMI involving oth coronary artery of anterior wall	I21.09	10	MI
Pre-existing hypertension w pre-eclampsia, second trimester	O11.2	10	HTN	STEMI involving right coronary artery	I21.11	10	MI
STEMI involving oth coronary artery of inferior wall	I21.19	10	MI	Non-ST elevation (NSTEMI) myocardial infarction	I21.4	10	MI
STEMI involving left circumflex coronary artery	I21.21	10	MI	Acute myocardial infarction, unspecified	I21.9	10	MI
STEMI involving oth sites	I21.29	10	MI	Myocardial infarction type 2	I21.A1	10	MI
ST elevation (STEMI) myocardial infarction of unsp site	I21.3	10	MI	Other myocardial infarction type	I21.A9	10	MI

Notes: CAD = coronary artery disease HF= heart failure, HTN= hypertension, HC= hypercholesterolemia, MI= myocardial infarction,

Appendix Table 2: Descriptive Statistics on Matched Sample

Matched Variables	TMN n= 17929	Cis Women n= 4185106	t/chi2 stat	p-val	TFN n= 9769	Cis Men n= 3628334	t/chi2 stat	p-val test
Age at enrollment, mean(SE)	34.920 (0.106)	34.920 (0.009)	0.000	0.999	40.759 (0.178)	40.759 (0.012)	0.000	0.999
Observed Years, mean(SE)	6.289 (0.024)	6.242 (0.003)	-1.350	0.176	5.256 (0.041)	5.256 (0.003)	-0.840	0.399
Race/Ethnicity, %			0.000	0.999			0.000	0.999
NH Asian	2.64	2.64			2.67	2.67		
NH Black	8.19	8.19			7.87	7.87		
Hispanic	8.76	8.76			7.80	7.80		
NH White	64.42	64.42			62.49	62.49		
Unknown	16.00	16.00			19.16	19.16		
Education, %			0.000	0.999			0.000	0.999
Less than 12th Grade	0.23	0.23			0.36	0.36		
High School Diploma	17.93	17.93			17.61	17.61		
Less than Bachelor Degree, More than HS	45.86	45.86			44.13	44.13		
Greater than Bachelor Degree	19.93	19.93			18.59	18.59		
Unknown	16.05	16.05			19.32	19.32		
Census Region at Enrollment, %			0.000	0.999			0.000	0.999
South	44.02	44.02			37.07	37.07		
Midwest	22.21	22.21			24.04	24.04		
West	24.33	24.33			27.99	27.99		
Northeast	9.33	9.33			10.8	10.8		
Unknown	0.11	0.11			0.11	0.11		

*Note all analyses matched by sex assigned at birth (i.e., TFN to Cis Women and TMN to Cis Men) on age, age at enrollment, region, edu, and race. SE were clustered within each individual and data were weighted so each individual is equally represented regardless of the number of observed years. Chi square tests (for categorical variables) and t-tests (for linear variables) testing significant differences between the matched groups. TFN = transfeminine and nonbinary people assigned male at birth, TMN = transmasculine and nonbinary people assigned female at birth.

Appendix Table 3: Overview of studies

Studies	Brown and Jones (2016)	Downing and Przedworski (2018)	Alzahrani et al. 2019	Poteat et al. 2021
Outcomes	MI, HF, HC, HTN, CAD	combined: CAD or MI	myocardial infarction diagnosis	combined: heart condition or heart disease, angina, heart attack, hypertension, or stroke
Ns	**Trans**: 5,135 **Cis**: 15,405	**TM**: 699 **TW**: 1,073 **CM**: 218,021 **CW**: 297,810	**TM**: 1,267 **TW**: 1,788 **CM**: 306,046 **CW**: 410,828	**TM**: 25 **TW**: 70 **CM**: 447 **CW**: 517
Methods for data collection	administrative data	self-report	self-report	self-report
Gender collection	algorithm	self-report	self-report	self-report
Underlying pop	Veterans accessing care through VA	BRFFS 2014-2016 (31 states)	BRFFS 2014-2017	TransPop (aged =>40)

TM = Trans Men, TW = Trans Women, CM = Cis Men, CW = Cis Women, SAAB=sex assigned at birth, CAD = coronary artery disease, HF= heart failure, HTN= hypertension, HC= hypercholesterolemia, MI= myocardial infarction.

Appendix Table 4: Brown and Jones (2016) CVD prevalence estimates compared to Optum

Study	Brown and Jones (2016)					
	Unadjusted Study Estimates			**Optum, Adjusted Estimates**		
Measure	**Cis**	**Trans**	**Risk Ratio**	**Cis**	**Trans**	**Risk Ratio**
CAD	15.94%	22.75%	1.427	13.27%	18.57%	1.399 (1.336, 1.462)
HF	5.44%	8.65%	1.590	5.18%	8.42%	1.626 (1.519, 1.734)
HTN	48.61%	57.72%	1.187	42.93%	53.90%	1.255 (1.232, 1.278)
HC	49.83%	58.19%	1.168	40.45%	55.37%	1.369 (1.346, 1.392)
MI	1.77%	2.92%	1.650	2.04%	3.38%	1.651 (1.463, 1.840)

CAD = coronary artery disease, HF= heart failure, HTN= hypertension, HC= hypercholesterolemia, MI= myocardial infarction.

Appendix Table 5: Cis Men vs. TFN, CVD prevalence estimates compared to Optum

Study	**Downing and Przedworski (2018)**	**Alzahrani et al. 2019**	**Poteat et al. 2021**
Outcome	**CAD or MI**	**MI**	**All CVDs**
Unadjusted Study Estimates, Cis Men	9.00%	5.60%	54.50%
Unadjusted Study Estimates, TFN	8.00%	7.80%	42.30%
Unadjusted Study Risk Ratio	**0.889**	**1.393**	**0.776**
Optum, Adjusted Estimates, Cis Men	10.65%	2.30%	62.87%
Optum, Adjusted Estimates, TFN	13.87%	4.51%	72.95%
Optum, Adjusted Risk Ratio	**1.302 (1.224, 1.380)**	**1.962 (1.697, 2.223)**	**1.160 (1.142, 1.179)**

CAD = coronary artery disease, MI= myocardial infarction, TFN = trans feminine and nonbinary assigned male at birth

Appendix Table 6: Cis Women vs. TMN, CVD prevalence estimates compared to Optum

Study	**Downing and Przedworski (2018)**	**Alzahrani et al. 2019**	**Poteat et al. 2021**
Outcome	**CAD or MI**	**MI**	**All CVDs**
Unadjusted Study Estimates, Cis Women	4.80%	3.10%	48.40%
Unadjusted Study Estimates, TMN	6.60%	7.20%	29.30%
Unadjusted Study Risk Ratio	**1.375**	**2.323**	**0.605**
Optum, Adjusted Estimates, Cis Women	7.54%	1.42%	61.03%
Optum, Adjusted Estimates, TMN	9.37%	2.15%	59.66%
Optum, Adjusted Risk Ratio	**1.242 (1.160, 1.325)**	**1.520 (1.245, 1.793)**	**0.978 (0.959, 0.996)**

CAD = coronary artery disease, MI= myocardial infarction, TMN = trans masculine and nonbinary assigned female at birth

Purpose: To compare the CVD risk ratios in the Optum data with other studies that have compared the risk of CVDs among trans and cis samples.

Procedure: I reweighted the Optum data to match the specific age distributions stratified by gender in other studies of CVD risk among trans populations and compared these rates to the crude rates and rate ratios for each study. When making comparisons to the Brown and Jones (2016) study, I also reweighted the data to match the distribution of sex assigned at birth in addition to age.

Analyses/Discussion

When comparing the risk ratios between the Optum data, weighted to match the age and sex distribution of Brown and Jones (2016), I found that the risk ratios between these two studies were similar across all five CVDs. While generally, the Brown and Jones sample had elevated rates of each condition, the differences in CVD risk between the trans and cis samples were similar across studies. This finding was unexpected as the Brown and Jones study included only those engaging with care through the Veterans Health Administration, while Optum included those in private insurance. It should be noted that although the crude rates of CVDs were fairly similar across both studies, the Optum data includes a much longer observational period, meaning that we would expect the rates to be even higher among the Brown and Jones (2016) study if the observational period was longer and it is uncertain how this would affect the risk ratios between the trans and cis samples. Future research comparing samples and studies could account for these differences through matching, weighting, or limiting the observed periods wherever possible to better account for differences in observational time.

When comparing the risk ratios of having either CAD or MI between the Optum data, weighted to match the age distribution of Downing and Przedworski (2018) stratifying by gender, I found that the risk ratio using Optum data was higher than that of Downing and Przedworski when comparing cis men to TFN people (1.3 compared to 0.9, respectively) and similar when comparing cis women to TMN (1.2 to 1.4, respectively). These findings are puzzling because gender seems to modify how these data compare to each other. However, one explanation might be that CAD is imprecisely estimated in self-reported data, especially among younger populations, as seen in (Bergmann et al. 1998) and the preceding appendix. Given that the Downing and Przedworski data are derived from a fairly young sample, we would expect these rates to be imprecise, especially because it appears self-reported CAD is a less precise measurement when comparing cis men to TFN people. Although, given the underlying sample and measures are so different, these findings are difficult to interpret and highlight the need for including large numbers of trans people in studies considered the gold standard for assessing CVD risk.

When comparing the risk ratios of having been diagnosed with MI between the Optum data, weighted to match the age distribution of Alzahrani et al. (2019) stratifying by gender, I found that the risk ratio using Optum data was higher than that of Alzahrani et al. when comparing cis men to TFN people (2.0 compared to 1.4, respectively) and smaller when comparing cis women to TMN (1.5 to 2.3, respectively). The findings of Alzahrani et al. should be interpreted with caution, as it is known, especially when estimating MI, that self-reported rates of MI are inaccurately estimated and often conflated with other cardiovascular conditions (Muggah et al. 2013; Robinson et al. 1997). For these reasons, it is difficult to interpret the differences between the Optum data and the findings of Alzahrani et al.

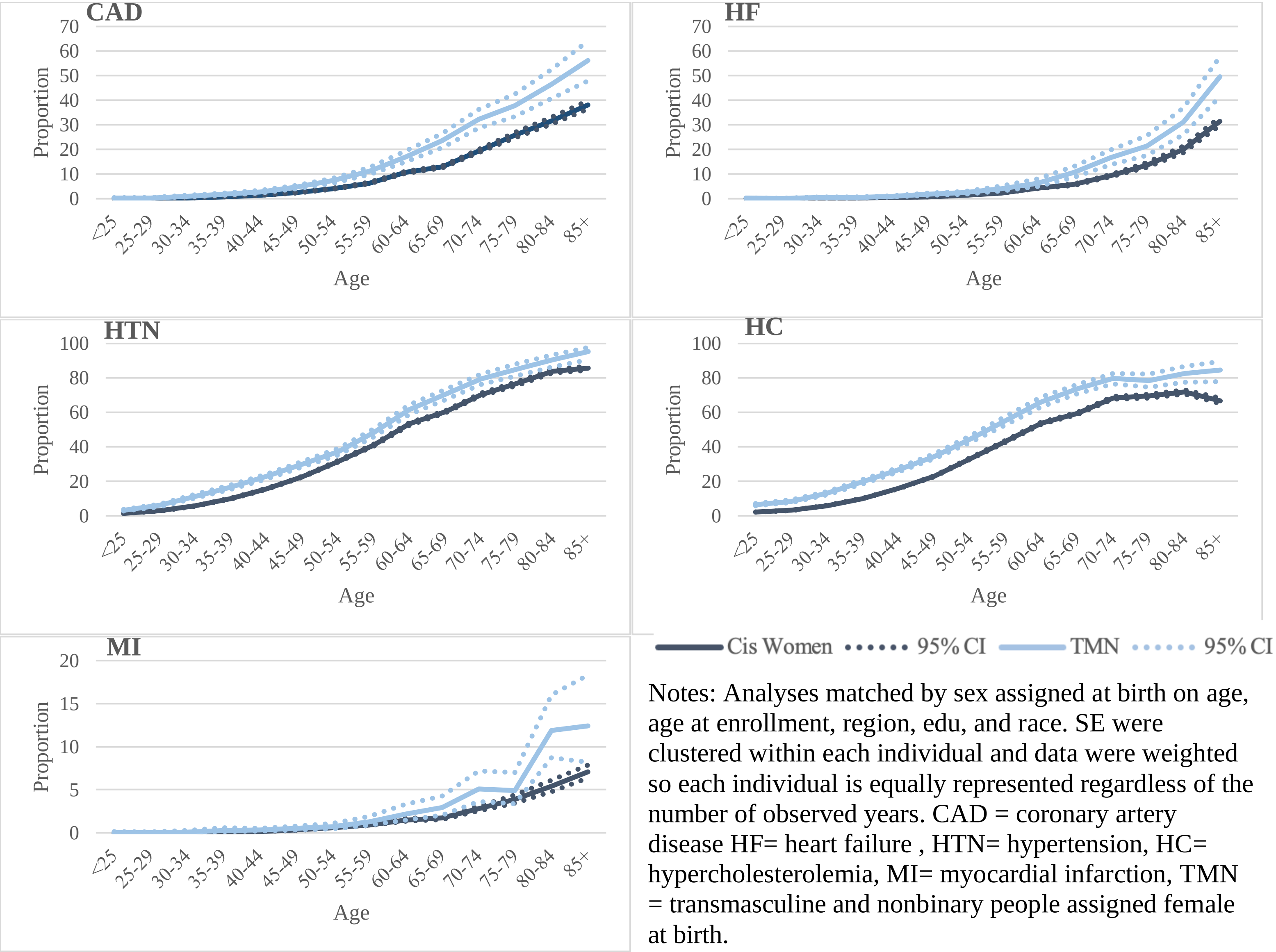
When comparing the risk ratios of having been diagnosed with any CVDs between the Optum data, weighted to match the age distribution of Poteat et al. (2021) stratifying by gender, I found that the risk ratio using Optum data was higher than that of Poteat et al. when comparing cis men to TFN people (1.2 compared to 0.8, respectively) and when comparing cis women to TMN (1.0 to 0.6, respectively). These differences may be due to several factors; most importantly, the underlying CVDs which comprise the outcome being studied is not the same. Further, Poteat et al. relied on a very small sample of trans people in their study and limited the sample to those who were 40 and older. Additionally, gender was collected differently in each study and the populations underlying the trans sample in each study were different. Differences in how information on gender was collected between these two studies make it challenging to interpret differences between the Optum data and the findings of Poteat et al.

Appendix Table 7: Full Multinomial Model

Outcome	Uninsured		Skipped Care: Cost		Skipped Care: Stigma		PHs Only		Supplemental NPHs		NPHs Only (Ref)
	Log-odds	**P-Val**	**Log-odds**	**P-Val**	**Log-odds**	**P-Val**	**Log-odds**	**P-Val**	**Log-odds**	**P-Val**	
Age	-0.004	0.111	-0.020	<0.001	-0.040	<0.001	-0.011	0.031	-0.011	0.062	
Sex Work	0.484	<0.001	0.490	<0.001	0.353	0.001	-0.578	<0.001	0.095	0.603	
Physical or Verbal Abuse	0.040	0.597	0.872	<0.001	1.640	<0.001	0.162	0.282	0.344	0.042	
Trans Engagement	-0.142	0.224	-0.028	0.756	-0.192	0.128	0.052	0.811	0.236	0.351	
Experiencing Homelessness	0.762	<0.001	0.989	<0.001	0.737	<0.001	-0.342	0.054	-0.077	0.699	
Unemployed	0.854	<0.001	0.260	0.003	0.080	0.503	0.172	0.411	0.203	0.388	
Person of Color (ref=White)	0.134	0.144	0.096	0.153	0.177	0.063	-0.347	0.037	-0.090	0.630	
Census Region (ref = Midwest)											
Northeast	0.103	0.418	-0.234	0.006	-0.134	0.263	0.432	0.099	0.385	0.178	
South	0.201	0.071	0.038	0.631	0.294	0.008	-0.385	0.046	-0.344	0.120	
West	0.266	0.037	0.123	0.160	-0.056	0.658	-0.106	0.665	-0.161	0.554	
Gender Identity (ref= Trans Women/Women)											
Trans Man/Man	0.184	0.021	-0.518	<0.001	-1.040	<0.001	-2.186	<0.001	-0.992	<0.001	
Gender Non-Binary/Genderqueer	-0.047	0.751	-0.017	0.859	-0.212	0.104	-2.125	<0.001	-1.189	0.001	
Family Support (ref = Don't Have , Supportive, or Neither Supportive nor Unsupportive)											
Not Out	0.149	0.432	0.141	0.324	0.365	0.090	-1.471	<0.001	-1.406	<0.001	
Unsupportive	0.172	0.058	0.484	<0.001	0.931	<0.001	-0.406	0.012	-0.326	0.075	
Education (ref = College Grad)											
Less Than High School	0.706	0.002	-0.033	0.866	0.049	0.859	-0.537	0.134	-0.881	0.047	
High School Grad	0.642	<0.001	-0.037	0.704	-0.370	0.008	-0.049	0.835	-0.054	0.840	
Some College	0.397	<0.001	0.150	0.008	-0.313	<0.001	-0.043	0.776	-0.151	0.370	
Uninsured	-	-	1.770	<0.001	-	-	-1.647	<0.001	-1.161	<0.001	
Medicaid Expansion	-0.590	<0.001	-	-	-	-	-	-	-	-	
Skipped Care due to Cost	-	-	-	-	-	-	-0.172	0.261	0.303	0.079	
Skipped Care due to Stigma	-	-	-	-	-	-	-0.740	<0.001	-0.060	0.739	
Health Care Policy Stigma	0.209	<0.001	0.183	<0.001	0.116	0.004	-0.173	0.034	-0.251	0.006	

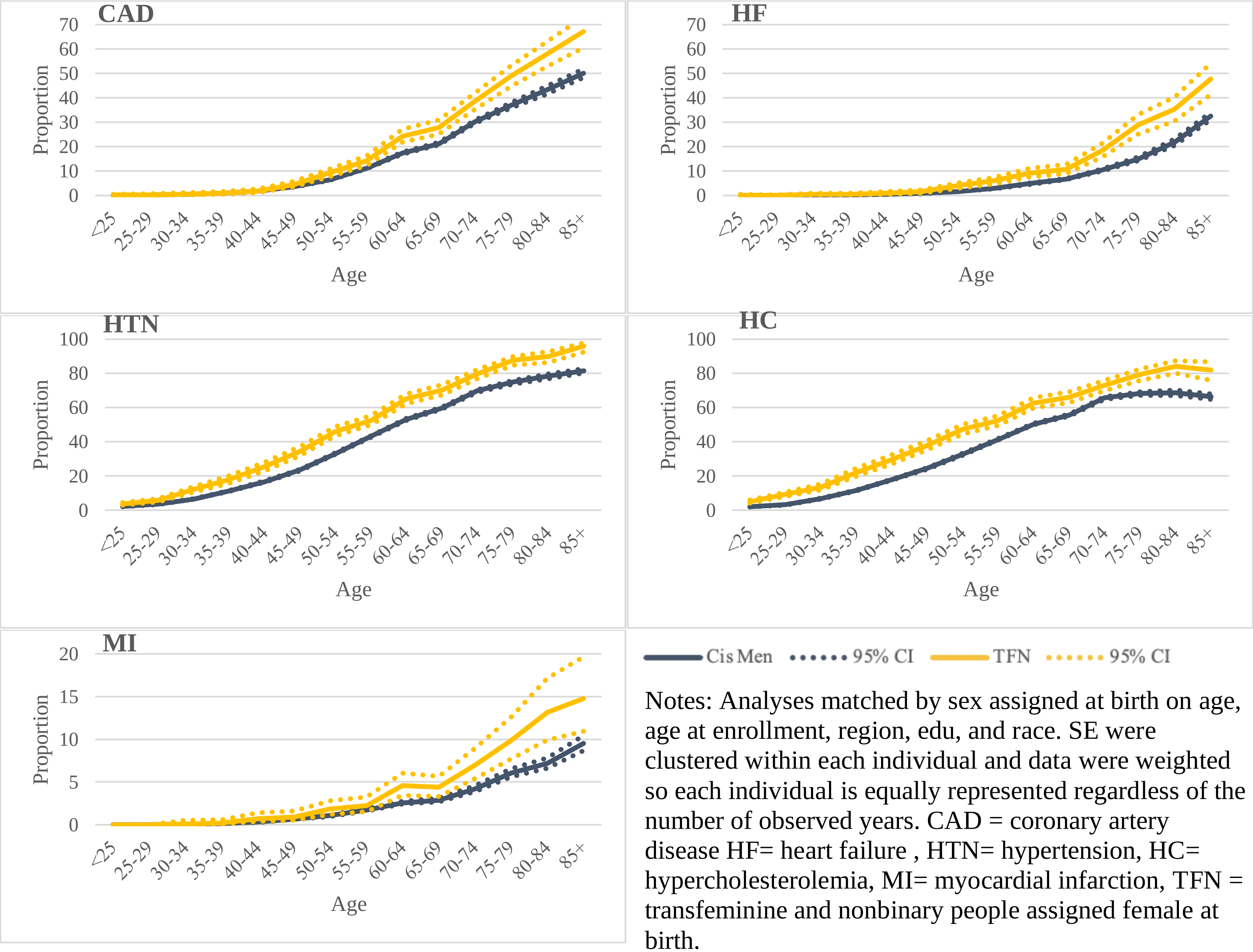
Note: PHs = Prescribed Hormones, NPHs = Non-Prescribed Hormones

Appendix Figure 1: Proportion of CVD, TMN and Cis Women



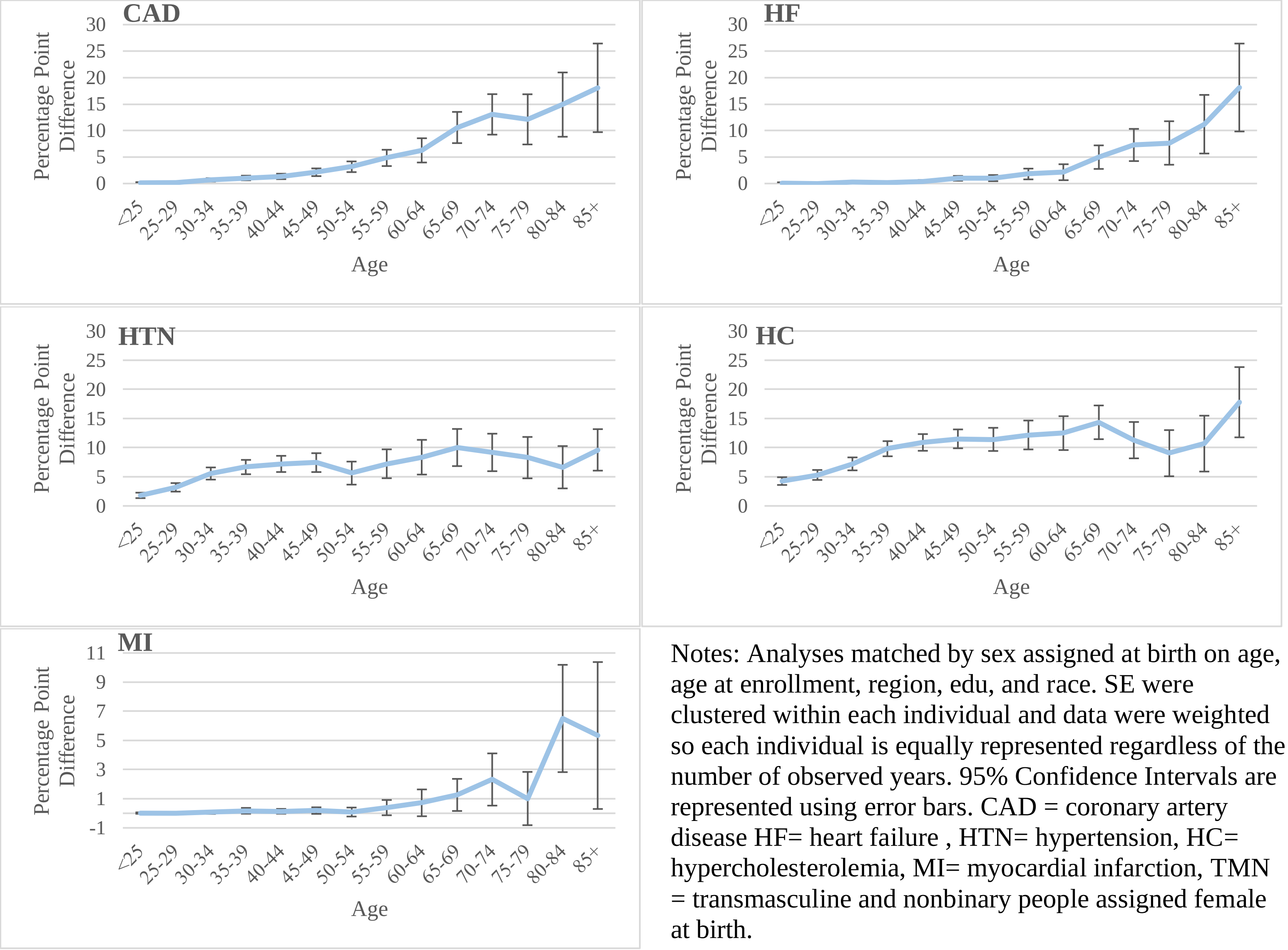
Notes: Analyses matched by sex assigned at birth on age, age at enrollment, region, edu, and race. SE were clustered within each individual and data were weighted so each individual is equally represented regardless of the number of observed years. CAD = coronary artery disease HF= heart failure , HTN= hypertension, HC= hypercholesterolemia, MI= myocardial infarction, TMN = transmasculine and nonbinary people assigned female at birth.

Appendix Figure 2: Proportion of CVD, TFN and Cis Men



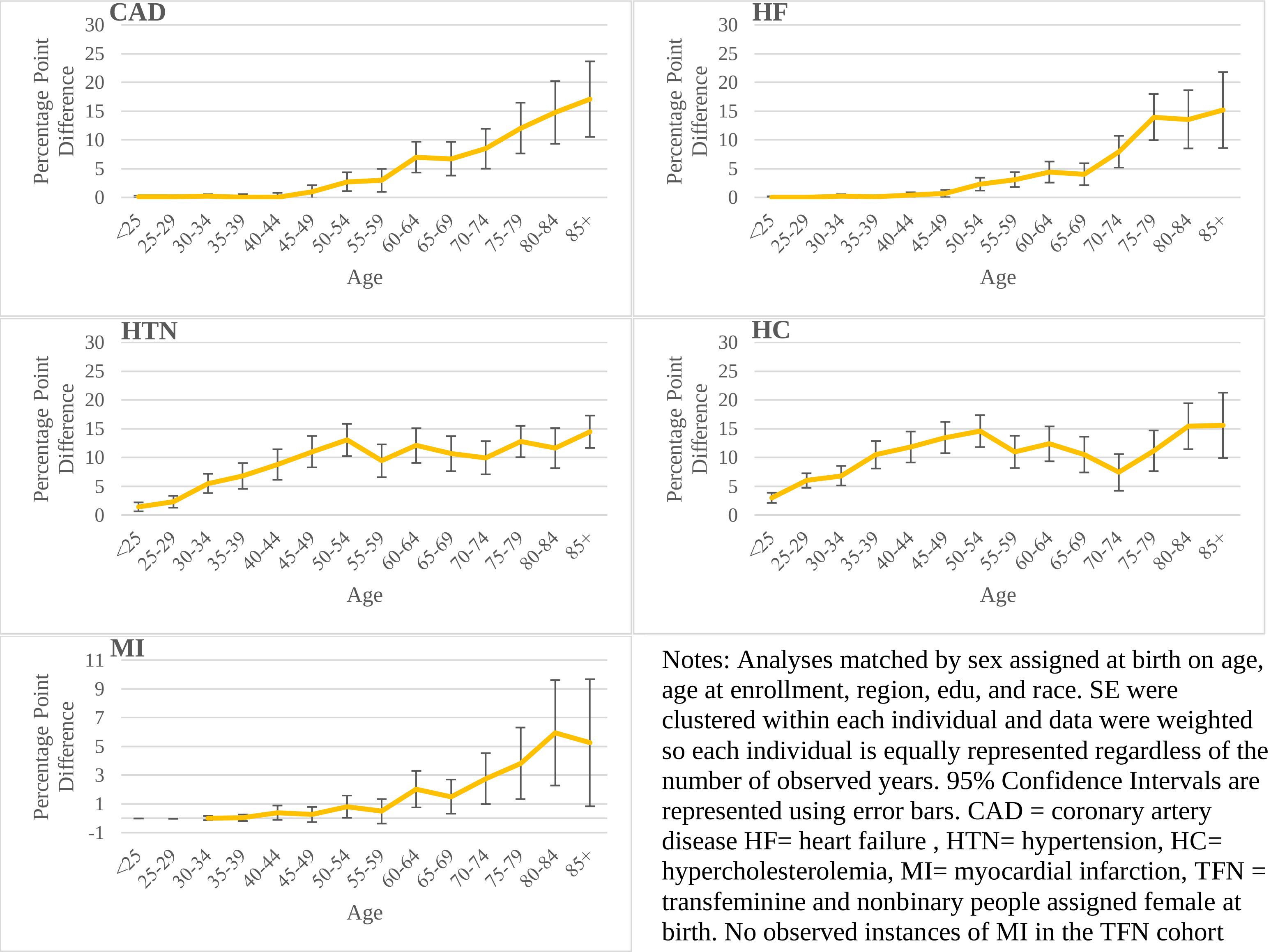
Notes: Analyses matched by sex assigned at birth on age, age at enrollment, region, edu, and race. SE were clustered within each individual and data were weighted so each individual is equally represented regardless of the number of observed years. CAD = coronary artery disease HF= heart failure , HTN= hypertension, HC= hypercholesterolemia, MI= myocardial infarction, TFN = transfeminine and nonbinary people assigned female at birth.

Appendix Figure 3: Percentage Point Difference of CVD, TMN minus Cis Women



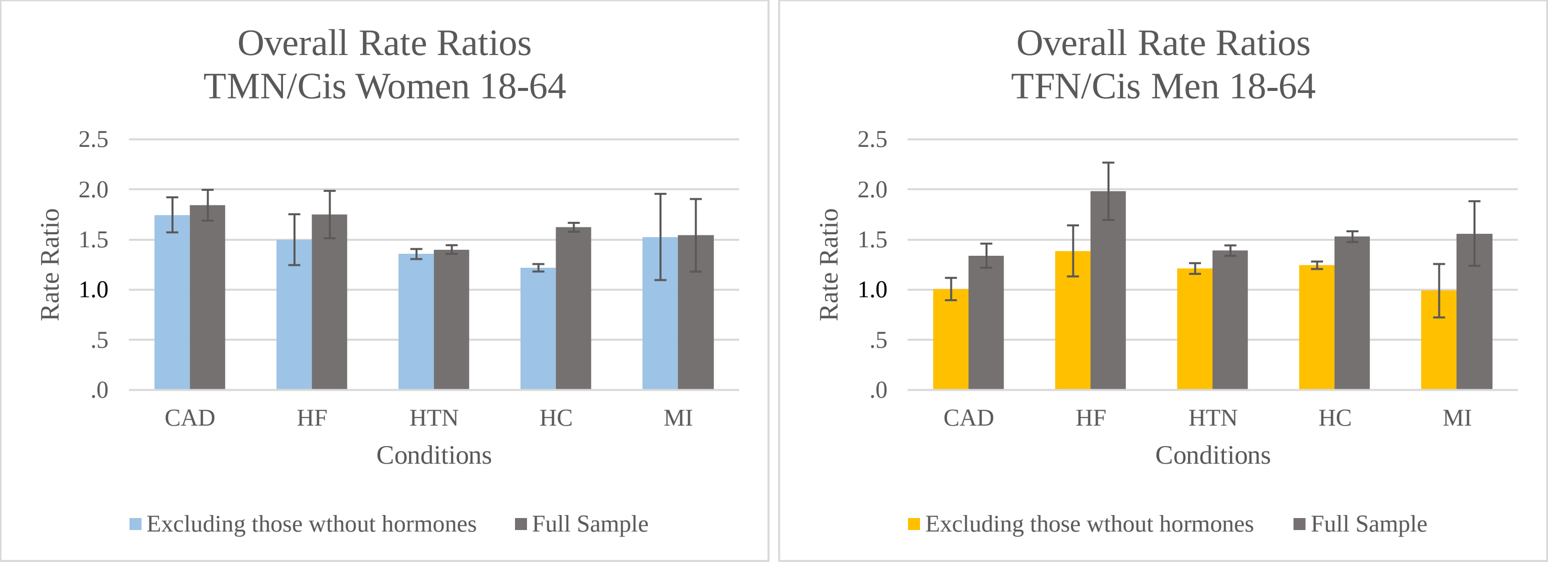
Notes: Analyses matched by sex assigned at birth on age, age at enrollment, region, edu, and race. SE were clustered within each individual and data were weighted so each individual is equally represented regardless of the number of observed years. 95% Confidence Intervals are represented using error bars. CAD = coronary artery disease HF= heart failure , HTN= hypertension, HC= hypercholesterolemia, MI= myocardial infarction, TMN = transmasculine and nonbinary people assigned female at birth.

Appendix Figure 4: Percentage Point Difference of CVD, TFN minus Cis Men



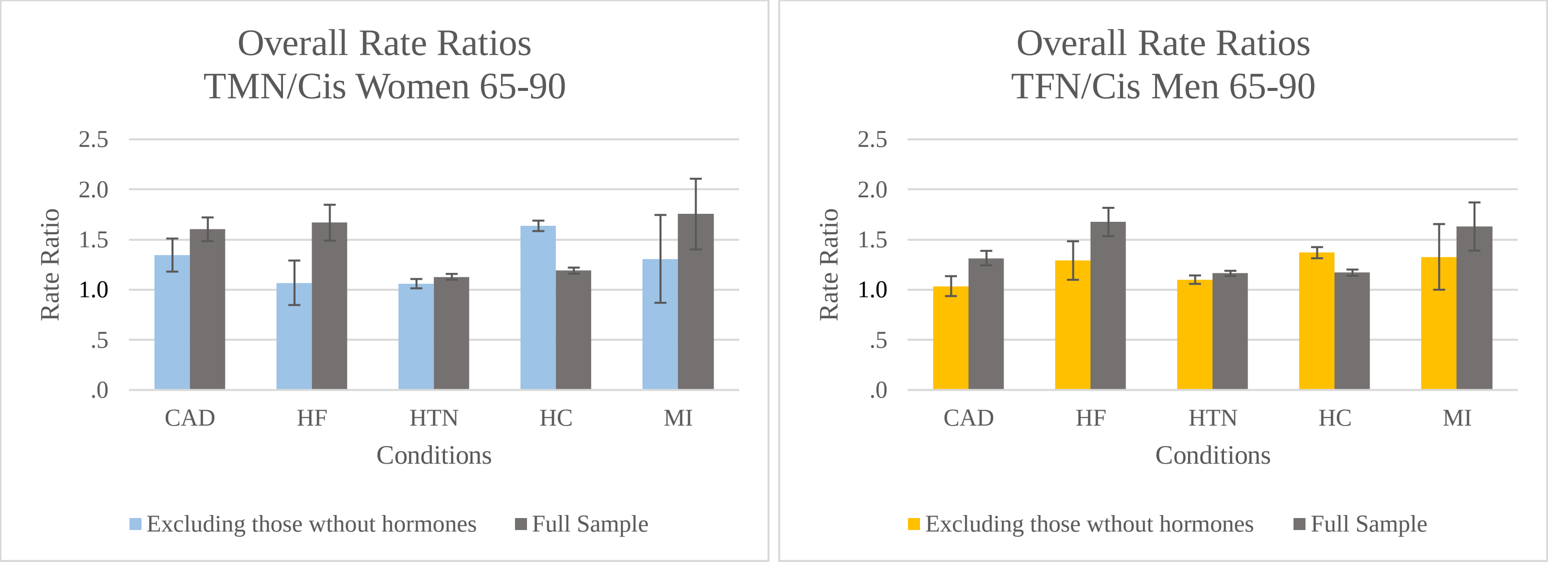
Notes: Analyses matched by sex assigned at birth on age, age at enrollment, region, edu, and race. SE were clustered within each individual and data were weighted so each individual is equally represented regardless of the number of observed years. 95% Confidence Intervals are represented using error bars. CAD = coronary artery disease HF= heart failure , HTN= hypertension, HC= hypercholesterolemia, MI= myocardial infarction, TFN = transfeminine and nonbinary people assigned female at birth. No observed instances of MI in the TFN cohort between ages 18 and 29, thus these data are not shown.

Appendix Figure 5: Sensitivity Analyses: Matched Overall Differences in Cardiovascular Conditions, Rate Ratios, Ages 18-64 Full Sample vs excluding those without any hormone use



Notes: Analyses matched by sex assigned at birth on age, age at enrollment, region, edu, and race. 95% Confidence Intervals are represented using error bars. SE were clustered within each individual and data were weighted so each individual is equally represented regardless of the number of observed years. n for full TMN sample = 17,006, n for TMN sample with hormones =11,892 , n for full TFN sample =8,464, n for TFN sample with hormones =7,099. CAD = coronary artery disease HF= heart failure , HTN= hypertension, HC= hypercholesterolemia, MI= myocardial infarction, TFN = transfeminine and nonbinary people assigned male at birth, TMN = transmasculine and nonbinary people assigned female at birth.

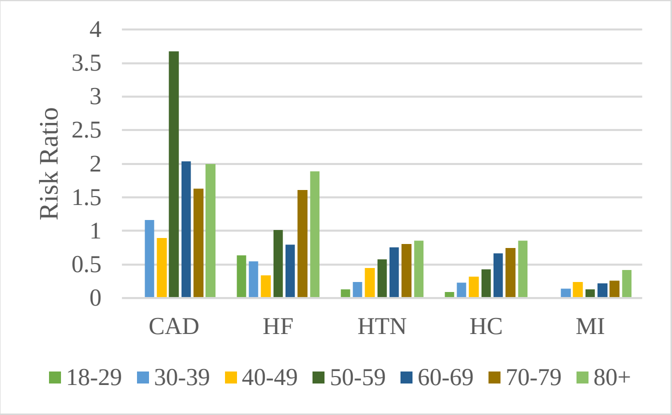
Appendix Figure 6: Sensitivity Analyses: Matched Overall Differences in Cardiovascular Conditions, Rate Ratios, Ages 65-90 Full Sample vs excluding those without any hormone use



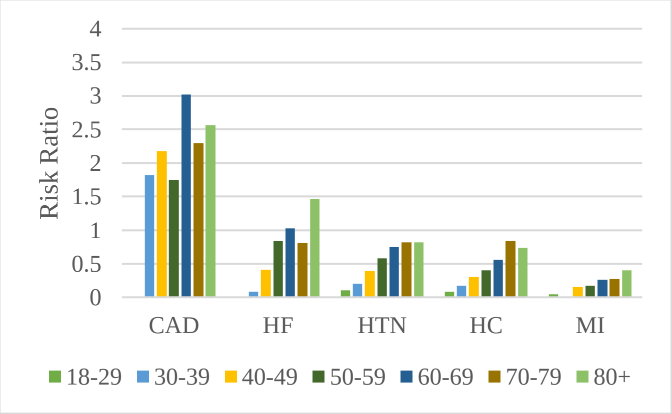
Notes: Analyses matched by sex assigned at birth on age, age at enrollment, region, edu, and race. 95% Confidence Intervals are represented using error bars. SE were clustered within each individual and data were weighted so each individual is equally represented regardless of the number of observed years. n for full TMN sample = 1,483 , n for TMN sample with hormones = 700, n for full TFN sample = 1,789, n for TFN sample with hormones = 823. CAD = coronary artery disease HF= heart failure , HTN= hypertension, HC= hypercholesterolemia, MI= myocardial infarction, TFN = transfeminine and nonbinary people assigned male at birth, TMN = transmasculine and nonbinary people assigned female at birth.

Appendix Figure 7: Risk ratios by gender and age among the cisgender populations in Optum and 2011-2012 NHANES data

Risk Ratios Cis Men Optum/NHANES 2011-2012

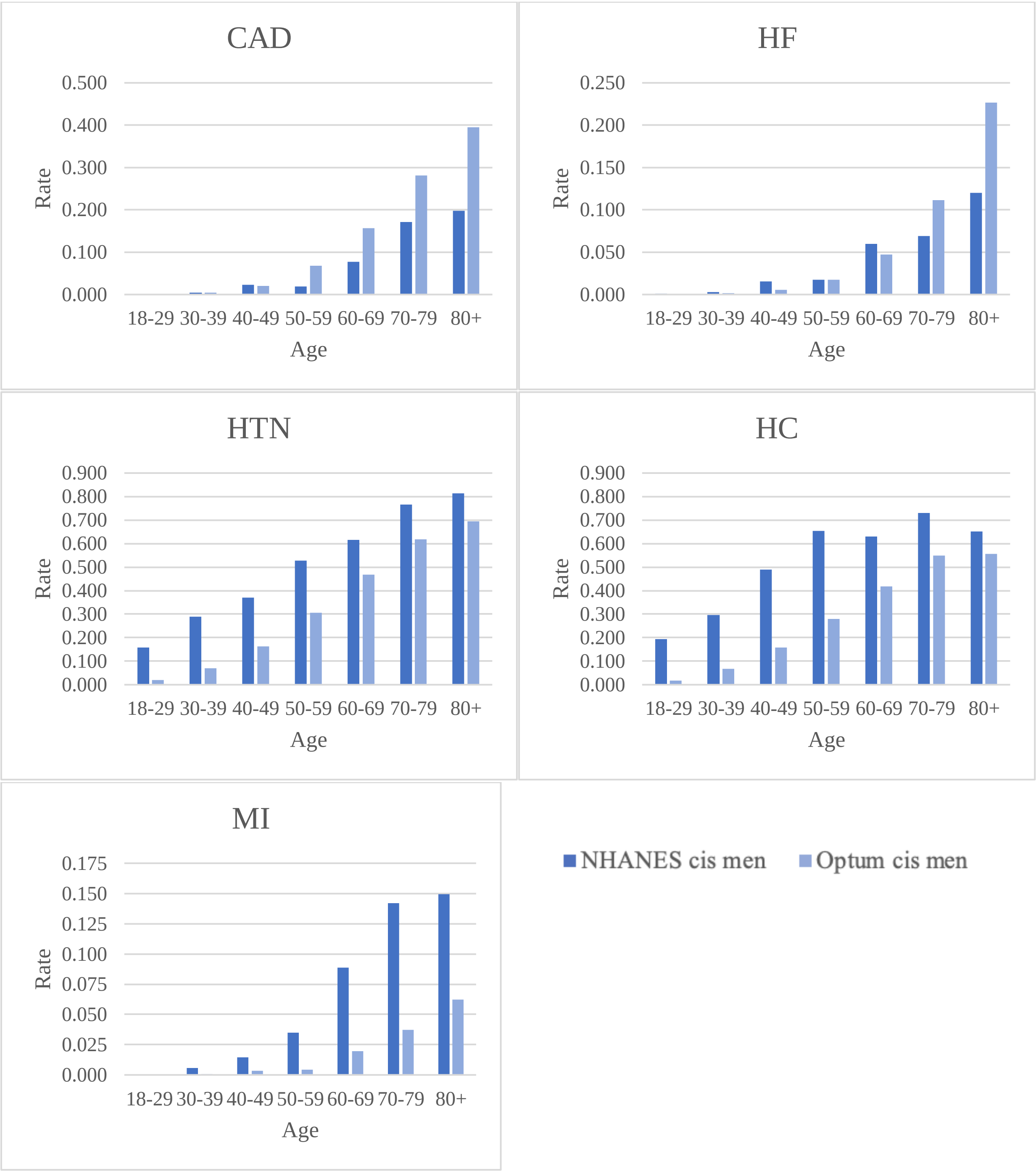


Risk Ratios Cis Women Optum/NHANES 2011-2012

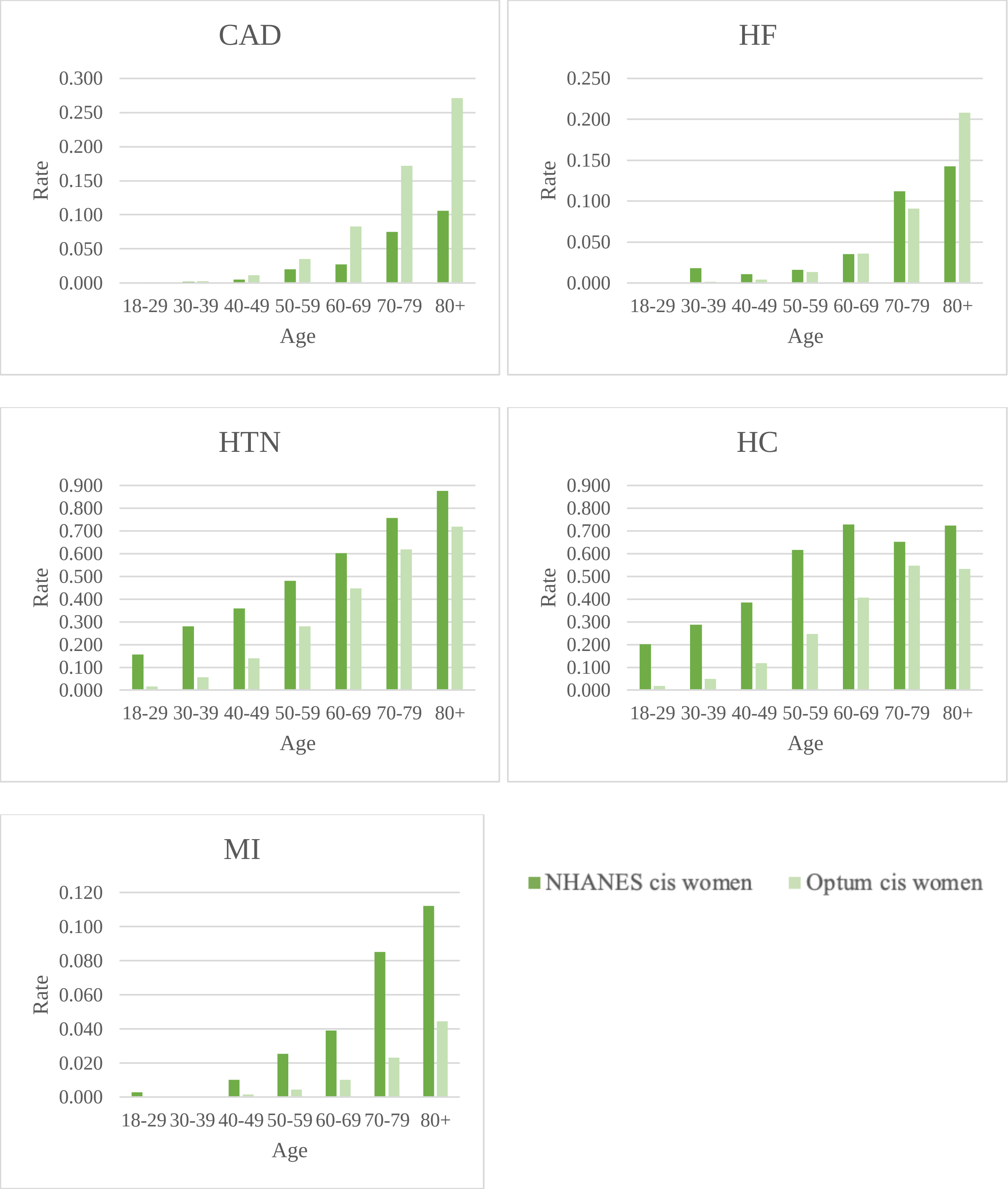


Notes: CAD = coronary artery disease, HF= heart failure, HTN= hypertension, HC= hypercholesterolemia, MI= myocardial

Appendix Figure 8: CVD rates over age Cis Men, 2011-2012 NHANES and Optum



Appendix Figure 9: CVD rates over age Cis Women, 2011-2012 NHANES and Optum



Purpose: To compare the age-specific prevalence rates of CVDs among the cisgender Optum sample and the NHANES sample by gender. 2011-2012 NHANES data were chosen as 2011 was the mean observation year in the Optum sample.

Creating NHANES measures

NHANES assessed coronary artery disease (CAD) using a self-reported measure asking respondents, “Has a doctor or other health professional ever told you that you had CAD?" NHANES assessed heart failure (HF) using a self-reported measure asking respondents, “Has a doctor or other health professional ever told you that you had HF?" NHANES assessed hypertension (HTN) using a self-reported measure asking respondents, “Has a doctor or other health professional ever told you that you had HTN?". Additionally, NHANES asked respondents if they were currently taking medication to lower their blood pressure. Those that responded “yes” were coded as having HTN. Furthermore, NHANES took blood up to three blood pressure readings from participants. Those with an average systolic blood pressure reading of equal to or greater than 140 or an average diastolic blood pressure reading of 90 were considered to have HTN. NHANES assessed hypercholesterolemia (HC) using a self-reported measure asking respondents, “Has a doctor or other health professional ever told you that you had HC?" Additionally, Additionally, NHANES asked respondents if they were currently taking medication to lower their cholesterol. Those that responded “yes” were coded as having HC. Furthermore, NHANES assessed blood serum cholesterol. Those with total cholesterol greater than or equal to 240 mg/dL were considered to have HC.

Analyses/Discussion

When comparing the rates for CAD, for both cis men and women, the population in the Optum data generally had higher rates of CAD than those found in the NHANES data. Among both cis men and women, estimates of the rate of HF were lower among the Optum data when compared to the NHANES data at most ages, however, it was greater among those 70 and older. For HTN, HC, and MI, I found that the prevalence estimates were much lower in the Optum data, especially at younger ages compared to the NHANES population.

Differences in these estimates may be due to several factors. The Optum data are reflective of only those who have access to private insurance. Thus, I would expect this group to be healthier than the NHANES population which does not limit inclusion based on insurance status and it is known that access to insurance is associated with better CVD outcomes (McClurkin et al. 2015; Wilper et al. 2009). Given that NHANES calculated HTN and HC by taking physical and lab measurements, in addition to self-report, the increased rates among the NHANES sample may be reasonably attributable, in part, to undiagnosed HTN and HC among the Optum sample. Furthermore, research has found the false positive rate for self-reported CAD and MI among those in the NHANES sample to be quite high and unreliable, especially among younger ages (Bergmann et al. 1998). Additionally, others have found that self-reported rates of MI are higher than compared to their administrative claims data, likely due to the familiarity the general public has with this term and misattribution to hospital stays for other cardiovascular conditions with MI (Muggah et al. 2013; Robinson et al. 1997). Lower instances of self-reported CAD may be in part due to misattributing CAD, or ischemic artery disease, with HC or HTN, and has been shown to be insensitive in other studies (Koller et al. 2014).

For most CVDs, as age increased, the differences between the rates of CVD in the NHANES and Optum grew smaller. This might be for several reasons. Because older individuals engage more often with the healthcare system, they have more opportunities to be diagnosed with a CVD that may have been previously undiagnosed. Because the differences between the NHANES data and Optum data grew smaller in older relative to younger ages suggests that estimates of CVDs using administrative data in young cisgender populations might be unreliable and underestimated. Given that trans people more frequently engage in healthcare, differences in risk identified in chapter 2 may be attributable to a greater opportunity to be diagnosed with CVDs compared to their cis counterparts. However, without a meaningful gold standard sample of trans people that includes information on CVD risk to compare to, these explanations remain suggestive.

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