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Education Attainment And Health: Outside The Gender Binary

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EDUCATION ATTAINMENT AND HEALTH: OUTSIDE THE GENDER BINARY

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ABSTRACT

Transgender and gender nonbinary individuals, hereafter referred to as trans, report worse health outcomes than trans individuals whose gender identity matches their sex assigned at birth, hereafter referred to as cisgender (Bauer, Hammond, Travers et al. 2009, Cicero, Reisner, Merwin et al. 2020). Past research has indicated that social determinants of health, such as education attainment, may be responsible for these inequities (Low 2006, The Lancet Public 2020). Education's influence on health is well known from previous research, but the association is not distributed equally. In the United States (US) educational system, state and local governments have control, not the federal government. Even at the federal level, no law applies protections to students to ensure that they are free from any form of harassment or violence based on their gender identity. This decentralized form of governance creates differences in funding, curriculum, and many other policies and procedures that are associated with how education is delivered to the masses. Using the Behavioral Risk Factor Surveillance Survey (BRFSS) 2014-2020, a nationally representative probability sample of adults in the U.S., I will examine how education impacts and influences the disparities between trans and cisgender individuals on self-rated general health and self-assessed mental health. Results of the logistic regression analyses demonstrated that trans individuals had lower odds of reporting only good mental health days and lower odds of reporting good self-rated health than cisgender individuals. Results of the interaction effects between gender identity and

education demonstrated reduced impact of educational attainment on self-rated health, but the impact of education on good mental health days did not vary by gender identity. Lastly, increasing education is significantly associated with better health for both trans and cisgender people, but the influence was significantly diminished for gender minorities. The current study underlines the important role of educations influence of the health of trans individuals. This finding supports the theory of learned effectiveness (Mirowsky and Ross 2017) through the significant health improvement when an individual completes a high school degree compared to those with less than a high school degree on self-rated health. However, findings also support the diminishing returns theory, where members of marginalized statuses receive fewer health benefits from increasing resources, including education (Assari and Bazargan 2019b, Sutter, Perrin).
Keywords: Transgender, Education, Health, Self-rated Health, Nonbinary

DEDICATION

This project is dedicated to the transgender, gender nonbinary, and anyone who does not subscribe to traditional societal norms surrounding a binary gender role construct.

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Introduction

Education has consistently been an essential social determinant of health and can significantly improve health outcomes at the individual, interpersonal, community, and societal levels (Center on Society and Health, 2014). At the personal level, education impacts our lives, including health, in numerous ways, including elevating social status, self-image, and other forms of human capital (Baker, Leon, Smith Greenaway et al. 2011). However, these education opportunities have been distributed inequitably across different populations. For example, trans individuals, on average, are less likely to have at least a high school degree than cisgender people (Downing and Przedworski 2018). Barriers to education and the resources provided by education may represent one of the mechanisms resulting in inequities in health for trans individuals. However, there is a dearth of studies that examine the health outcomes of trans individuals using a nationally representative dataset or examined factors that influence differences in health outcomes between trans and cisgender individuals (for an exception, see (Meerwijk and Sevelius 2017).

The lack of research on trans individuals can be attributed to many factors, including not collecting this information on surveys (Deutsch 2016, Goodman, Adams, Corneil et al. 2019, Meerwijk and Sevelius 2017). Fortunately, researchers and survey designers are beginning to form questions, allowing those who fall outside the gender norms to be represented. Starting in 2014, BRFSS began to ask if an individual identifies as “gender” and, if so, whether they are “gender male, gender female, or gender

nonbinary." Before including a gender identity question, it had been determined by the binary sex of the individual, resulting in the erasure of an entire population. This project uses the combined years of 2014-2020 of the Behavioral Risk Factor Surveillance Survey (BRFSS) to address three research questions: (1) Do trans people have lower levels of education than cisgender people? (2) Do trans people have poorer health outcomes than cisgender people? And (3) Does education's influence on health vary between trans and the cisgender population?

BACKGROUND

Education and Health

Education is an "upstream" social determinant of health, meaning it is a factor outside healthcare that impacts overall health. The Indirect and direct pathways that education provides influence on health is complex. Education impacts health indirectly through increased financial stability and occupational choice. The association of income and employment increases the likelihood of having better health and wellness, providing more access to quality care, insurance, medications, and other areas where money can increase health benefits (Zimmerman, Woolf, Blackburn et al. 2018). By increasing an individual's education, the indirect effect surrounding occupational choice may allow trans individuals to pick a career or profession they are enthusiastic about, leading to less chronic work stress. Additionally, it is possible to begin a job at a higher salary than someone with less education.

From a sociological perspective, education is directly associated with health by increasing individual agency to improve health outcomes through learned effectiveness. It intentionally engages active learning for individuals, exposing them to knowledge, reasoning skills, values, socio-emotional awareness and control, and social interaction (Cockerham 2017, Cockerham and Scambler 2021, Noy 2019, Zajacova and Lawrence 2018). In Beck (1964), he describes how education is associated with physical and human resources. He suggests that these associations invest in an individual's human capital (Beck, 1964). For example, research looking at changes in education laws surrounding increased

years of mandatory education found that those subject to more extended education had better health and lived on average, 1.7 years longer than those who were not. Additionally, they found this better health was due to the increased agency provided by the longer educational requirement imposed. However, a growing body of research has suggested that resource substitution from learned effectiveness has less impact on minoritized groups.

Empirically, several studies have provided evidence of a gradient in health benefits over previous decades. The decreased influence of education on health provides a diminishing return for the minoritized individuals. They provided evidence that increasing education is associated with more significant improvements in health. For example, Zajacova and Lawerance (2018) used the National Health Interview Study (NHIS), 2002-2016, to examine the gradient surrounding health outcomes and how this varied by race/ethnicity and found that while this gradient was present across all races and ethnicities the impact of education was diminished for minoritized groups.

Gender Identity

Transgender is the term used to describe individuals who fall under gender nonconformity and includes those whose identity differs from their sex assigned at birth (Davidson 2007, James, Herman, Rankin et al. 2016). The group comprises individuals assigned male at birth (AMAB) who currently identify as a woman and those assigned females at birth (AFAB) who currently identify as a man. It can also include others who do not conform to society's binary gender roles (non-binary and genderfluid). Intersex individuals are also included under the gender umbrella. Intersex individuals are people who are born with differences in sex development and may have both male and female

reproductive organs, any different combination, or no secondary sexual characteristics (Cools, Nordenström, Robeva et al. 2018).

Trans individuals report disproportionate poorer health outcomes at the individual and structural levels when compared to cisgender individuals (Carone, Rothblum, Bos et al. 2021, Feldman, Luhur, Herman et al. 2021, Ross, Law and Bell 2016). Trans individuals report being more distressed, less satisfied with their lives, and less happy than cisgender individuals (Dubin, Nolan, Streed Jr et al. 2018, Eyssel, Koehler, Dekker et al. 2017, Goodman and Nash 2018). Furthermore, trans individuals use drugs more frequently, have poorer physical health, and have worse mental health than cisgender individuals (Feldman et al. 2021, Grant, Mottet, Tanis et al. 2010, James et al. 2016). For example, trans individuals report a 41%+ lifetime suicide rate, nine times higher than the general population (Feldman, Brown, Deutsch et al. 2016, Feldman et al. 2021). Additionally, trans individuals face structural constraints to good health. Trans individuals face fears of harassment, discrimination, and violence in the health care setting, resulting in less access to and use of treatment and preventative services. This delay in care is likely responsible for the higher rates of certain types of cancers and premature death found among trans individuals compared to cisgender individuals. (James et al. 2016, Korpaisarn and Safer 2018).

Trans individuals, education, and health

Trans individuals report multiple negative experiences, creating mistrust of the current healthcare and educational system (Cicero, Reisner, Merwin et al. 2020, King, Hughto and Operario 2020). For example, social exclusion leading to greater discrimination and social stigma results in delaying medical care until it is an emergency

(Grant et al. 2010, James et al. 2016, Ross et al. 2016). Additionally, the over-focus on the binary of gender creates a hostile and unsupportive educational environment by preventing access to areas that match the individual's gender identity and lack of support among their peers and teachers. For example, lack of access to gender-neutral facilities and the refusal of teachers to use preferred pronouns can cause vulnerable individuals to leave school altogether (Jones 2017, Schneider 2010, Stolzenberg and Hughes 2017). Studies dating from 2009 to 2015 show trans adults (18-40) have lower than average educational attainment (Beemyn 2003, Cech and Waidzunas 2021, Goldberg 2018, Jones 2017, Schneider 2010, Wilkinson, Pearson and Liu 2018). Data shows that 48% of trans and 35% of gender non-binary adults have attended some college compared to 61% of cis adults (Philips 2017, Powell 2016, Wilkinson et al. 2018). Additionally, past research has found that gender-diverse youth are more likely than their cisgender peers to fail a high proportion of high school courses and are less likely to take an advanced math course in high school (Wilkinson et al. 2018). These lower levels of education likely late into the documented lower income levels, higher unemployment, and lack of access to health insurance found among trans individuals compared to cisgender (Bockting, Barucco, LeBlanc et al. 2020, Correro and Nielson 2020, Feldman et al. 2021, Grant et al. 2010). Trans individuals have difficulty accessing education because of discrimination and violence within the academic environment. For example, approximately 80% of trans youth report some form of harassment while attending school (Jones 2017, Kosciw, Greytak and Diaz 2009, Philips 2017, Terada, Matsumoto, Sato et al. 2012). In addition to direct harassment, general feelings of exclusion are also reported, and this is exceptionally high among trans individuals, even compared to other socially excluded

groups such as lesbian, gay, and bisexual (LGB) individuals. Approximately 42% of trans individuals reported feeling like they "didn't belong at school" compared to 24% of their LGBQ cisgender peers (Bochenek and Brown 2001, Jones 2017, Pinel 1998, Schneider 2010). In currently available data, trans youth and adults report higher psychological costs to education (Cohen, Nussbaum, Weintraub et al. 2020, Vable, Duarte, Cohen et al. 2020). These experiences contribute to the lower educational attainment documented for this population (Bochenek and Brown 2001, Cohen, Karrington, Trachtman and Salas-Humara 2021).

Education provides individuals with self-accountable and self-directed knowledge, increases access to resources, and may provide healthier norms (Link and Phelan 1995, Link and Phelan 2006, Ross 1995). However, theories including minority diminished returns suggest that this benefit will be diminished for trans individuals. This project aims to provide a descriptive view of how education is associated with the overall health of the trans and nonbinary community and whether education results in the same gains in health for trans individuals as it does for cisgender individuals.

THEORY

Though it is well documented that education improves health, the exact mechanisms that result in this relationship still need to be clarified. First is Durkheim's theory of agency and structure, which states that a social system, such as the institution of education, has a more significant association with the individual social position than the individual's agency. The second is learned effectiveness theory, which focuses more on the aspect of the agency. Theories of learned effectiveness describe ways education improves health outcomes by focusing on creative work, a sense of personal control, and a healthy lifestyle, resulting in better health for the more educated. However, diminished return theory suggests that the positive benefits of social and economic resources, such as educational attainment, do not translate into improved health for socially vulnerable populations.

Structural

Emile Durkheim provided a basis to examine how social structure impacts the individual and can contribute to adverse health outcomes, such as suicide. In Durkheim's (1897, 1985) Le Suicide, he defined social structure as the intersection of two independent parameters: social integration and regulation (Fenton, Reiner and Hamnett 1984). Social integration can be described as an internal commitment to an act, habit, or ritual performed by others. Social regulation, Durkheim defines as control over an action designed to limit, restrict, or determine individual actions and choices (Durkheim 1915,

Ottaway 1955). The gender binary is a notable example of this social regulation, with most of the information collected continuing to only ask for the male or female sex. In addition to regulation and integration that exist primarily outside of the individual, agency influences the social world.

Human agency can be described as the capacity of the individual's thoughts and actions to express their power in social interactions. He argued that structure, not agency, had a more profound effect on the individual, and structural policies, such as education, could and must be used to maintain the homogeneity of society (Barnes 1977, Dill 2007, Pickering and Walford 2002). Durkheim also provided his interpretation of education in his later works. He posited that when children are taught to respect the rules important from the social majority, they adapt to preferred socially approved behavior and general limitations found in "polite society." In this instance, Durkheim uses education as a structural institution that seeks to reproduce these preferred norms to create community solidarity (Ottaway 1955). Durkheim suggests that learning restraint is the first crucial step toward the seriousness of life. One could argue that Durkheim's conceptual thoughts could also be applied to the ability of individuals with education to make informed decisions that can improve their overall health. Durkheim viewed this more structurally, meaning overarching policies had more to do with this than the agency or individual's preferences on their health outcome (Dill 2007, Pickering and Walford 2002).

Durkheim suggested that the structure is essential to provide the preferred education to maintain social solidarity. Thus, our educational curriculum often reflects the majority's concept of appropriate societal norms concerning what is reasonable, suitable, or valuable. Examples of this concept can be seen currently happening in state

governments across the United States (U.S.). Some governments dictate the curriculum distributed through K-12 schools, public colleges, and universities (Klepper, Clark, Bosse et al. 2022, Whitfield, Westgate, Gartner et al. 2023, Wiggan, Smith and Watson-Vandiver 2021). There continues to be an attack on trans individuals and their allies due to their increased visibility in society. Most of these states are seeking to remove material considered too "progressive" or "woke" while providing indoctrination for more segregation and theology (Anderson and Duclos 2023, Cicero 2023, Lombardi and Sahni 2023).

Learned Effectiveness Theory

While Durkheim focused on how education structures our environment and choices to influence health, learned effectiveness focuses on how education impacts health through better skills and knowledge. Learned effectiveness can be considered a state of mind of individuals who feel they can control their successes or failures. As Ross &Wu (1995) described, education has repeatedly been shown to positively influence one's health. Learned effectiveness focuses on human capital. Human capital implies that education improves health because it allows trans individuals to gain and continue to develop habits, skills, resources, and abilities to garner better health (Mirowsky and Ross 2005, Mirowsky and Ross 2015, Mirowsky and Ross 2017, Ross and Mirowsky 2010). In learned effectiveness, education improves health by creating the importance of personal control and providing knowledge and skills to make informed decisions about your life and health behaviors. In the simplest form, education teaches people how to learn. By developing the skill to learn, the individual develops vital skills related to communication and creates logic to analyze problems to locate the best solution. Learning can lead to

increased confidence and more interpersonal interaction skills. Conversely, reduced education or a toxic learning environment can prevent the development of these vital skills for individual growth and benefit society.

Education is a resource that provides the individual with the tools and confidence to be persistent, communicate successfully, search out and use information, or figure out the cause of a problem and solve it. Education is a resource that, once acquired, no one can take away.

Theories connecting education and health for trans individuals.

Durkheim argued that education resulted in better health by prescribing preferred societal norms, which are health-promoting. These norms persist over the individual's life course as Durkheim discussed how schools instill the preferred societal norms into the child, leading to the expected behavior and reducing or eliminating those actions that society deems inappropriate. However, among children who fall outside the perceived "normal," structures that prioritize instilling societal norms may cause more harm than good. This can result in poorer health outcomes among minority populations.

The current diversity of gender categories can be ambiguous and perceived as threatening to the perception of heteronormative gender roles in society. This perception can cause extreme discomfort in others. Throughout history, trans people have challenged the traditional assumption of gender identity being determined simply by an individual’s sex assigned at birth (Bauer, Hammond, Travers et al. 2009, Burdge 2007). At the same time, some do not seem bothered by the deviation from the conventional concepts surrounding gender identity. However, others react to the divergence with discomfort, fear, and even hostility, including violence. The view surrounding structural phobia is similar to the

argument around structural and systemic racism. Similar to structural racism, structural phobia is based on the theory of structural stigma or stigma at the institutional level. Structural stigma is described as societal-level conditions, norms, and those institutional policies that can prevent opportunities, resources, and well-being of those targeted (Bockting et al. 2020, King et al. 2020). Stigma is the othering of groups that may be considered different than the majority. For example, racial minorities, gender minorities, and sexual minorities continued to be excluded from the more prominent groups by othering, exacerbating stigmatization.

Learned effectiveness can be considered a mindset gained from increased education that gives individuals greater control over their daily lives. Conversely, the absence of education can lead to learned helplessness (Mirowsky & Ross, 2005). All education can work to create learned effectiveness through increased cognitive abilities, self-control, and ability for effective problem-solving. In addition, learning can develop and improve confidence and motivation to investigate problems and concerns (O'Shea, Langer, Woods et al. 2018). Individuals with more education have reported a better understanding of their health and the risks to their health. Improving health literacy prepares individuals to address critical or complex issues around their health status. Learned effectiveness from education benefits the trans population by increasing agency over their internal sense of self and the development of resilience. However, the existence of structural anti- bias does have a significant impact on the overall health of this marginalized population (Kattari, Bakko, Langenderfer-Magruder and Holloway 2021a, Kattari, Call, Holloway et al. 2021b, Romanelli and Lindsey 2020). If the healthcare system does not allow for identities outside of societal binary gender norms, increased

education and learned effectiveness can become a moot point.

Social and economic resources that improve health for much of the population do not result in the same significant health gains across diverse groups. Thus, rather than seeing health disparities diminish with increasing resources, these disparities often widen. This is because the health of the more privileged group improves with increasing resources as the health of the less privileged group has significantly less improvement or remains the same with increases in resources (Assari and Bazargan 2019a, Assari and Bazargan 2019c, Zimmerman et al. 2018). Data surrounding the theory of minority diminished returns suggests that structural concerns play a significant part in the role of reduced returns on education for health among marginalized populations (Assari 2019, Assari and Bazargan 2019c, Assari and Bazargan 2019d). When examining Black Americans, institutional policies and Jim Crow-era beliefs associated with people of color persist and reduce the benefits of resources such as education compared to white Americans (Assari and Bazargan 2019b, Islekel 2022). Like structural racism, structural phobia continues to reify binary gender norms using social sanctions, and these structural constraints may result in reduced returns between education and health among trans individuals compared to cisgender individuals.

Previous research examining minority diminished returns (MDR) focused on racial and ethnic minorities, and only two studies were found that provide data on lesbian, gay, and bisexual (LGB) individuals (Assari and Bazargan 2019a). Assari and Bazargan (2019) found poorer self-reported health in highly educated LGB individuals compared to their heterosexual peers. Additionally, they found that other measures of socioeconomic status, including education, income, employment, and marital status, had a smaller

beneficial impact on depression and obesity for lesbian, gay, and bisexual individuals (Assari and Bazargan 2019d). Their results support further research on educational attainment's more negligible health effects among other marginalized groups, including gender identity minorities.

METHODS

Data

This project uses combined data from 2014-2020 of the Behavioral Risk Factor Surveillance Survey (BRFSS) to examine the association between education and reported health outcomes by self-reported gender identity. The BRFSS is a survey conducted yearly by the Centers for Disease Control and Prevention (CDC) and is considered the nation's best health-related telephone survey. Established in 1984, the BRFSS began by surveying fifteen states but now collects data from all 50 states, the District of Columbia, and several U.S. territories. Each year, telephone and cell phone adult interviews surpass 400,000, making the BRFSS the world's largest continuously conducted health survey (CDC 2014-2020). This ongoing systematic collection of state-specific data is designed to present chronic health conditions and the use of preventive services. US states, the District of Columbia, and most US territories complete the mandatory or core section of the BRFSS (CDC 2014-2020). This section includes questions on self-reported health outcomes, including general health status and physical and mental health (Centers for Disease Control and Prevention 2014-2020). Over the years, the BRFSS has added optional models that states can volunteer to fit with the core section. One of these optional sections concerns sexual orientation and gender identity (SOGI) (Centers for Disease Control and Prevention 2014-2020). BRFSS survey is one of the only population-based surveys that collect information on gender identity. However, the SOGI module is optional; only nineteen states included the SOGI module in 2014, though 33

included it in 2020.

BRFSS data from 2014-2020 were combined for a sufficient sample size of trans individuals. The BRFSS survey average respondent response rate is 63.7%, indicating that close to 64% of those contacted answered and agreed to answer the survey questions with the interviewer (Health and Services 2014- 2020). The survey used probability sampling techniques meaning the data is representative and generalizable to the US states where the module information is collected. Every person in the sampling frame has a non-zero chance of being included in the study (Centers for Disease Control and Prevention 2014-2020, Du Bois, Guy, Legate and Kendall 2020). After combining the datasets from each year and reviewing missingness, there were 3,100,101 observations for the potential sample size. However, 1,680,108 (54.2%) of individuals were missing responses for the primary independent variable of gender identity of cisgender or trans. This high missingness rate can be related to individual's refusing to answer or answering, "I don't know." However, the module used to collect the SOGI data is an optional module, and many states did not opt in, leading to entire states that were not asked. In addition, Self-reported health had a total of 3,651 (0.26%) missing valid information and a total of 24,683 (1.24%) missing information on reported number of days in the last month where mental health was an issue. This gave a potential sample size for individuals with valid answers on the health measures and gender identity questions of 1,419,993. An additional 3,702(0.27%) are missing on education and 2.40% of the potential sample are missing on additional covariates, creating the final sample size of 1,358,795.

Measures

Dependent Variable(s)

The study design included two distinct reported health outcomes from the BRFSS. First, self-rated health was used to show an individual's overall perceived general health status. This was ascertained by asking, "Would you say that, in general, your health is:" with the choices of excellent, very good, good, fair, poor, do not know/not sure, and refused. The variable was then recorded into excellent, very good, and good into one group (=1) and fair and poor into another group (=0). In addition, a variable representing the individual's mental health status was selected and is accessed by asking the respondent, "During the past 30 days, how many days of mental health kept you from doing your usual activities such as self-care, work, or recreation?" Respondents answered between 0 and 30. These measures are then recorded to represent only good mental health days in the last 30 days (0=1) or any bad mental health days during the previous 30 days (1 to 30=0) to account for the lack of variability in the responses. For example, 64.1% of my sample answered, they had 0 days associated with poor mental health and by dichotomizing the number of days, I reduce the skewness in the dependent variable.

Independent variables

The primary independent variable relates to the respondent's gender identity. To determine the gender identity, the question "Do you consider yourself to be transgender? If yes, ask whether you consider yourself male-to-female, female-to-male, or gender non-conforming?" These are recoded into a dichotomous variable with (0) Not trans and (1) trans. Do not know/Not Sure, Refused, and Not asked or missing are recorded into the (.) missing group.

Education also serves as an independent variable and is coded into categories distinguishing the various levels of educational attainment and measures diploma and

degree obtainment. These are then coded into did not graduate high school and graduated high school or more. These categories are chosen because it ensures that the youngest individuals in my sample have had the opportunity to obtain the level of education examined. For example, many of those 18 to 24 years old have not had a chance to complete college.

Covariates

Covariates include sex, marital status, race/ethnicity, age, and veteran status. Sex is used as a covariate because sex as a binary plays an important role in social interactions surrounding trans people (Breslow, Brewster, Velez et al. 2015, Davidson 2007, Westbrook and Schilt 2014). Race/ethnicity is measured as non-Hispanic White only, non-Hispanic Black only, non-Hispanic another race only, non-Hispanic Multiracial and Hispanic. Race is included as a covariate because it is important to control race because previous research has found gradients across education and health (Arcaya, Arcaya and Subramanian 2015, Kaplan, Fang and Kirby 2017). Marital status is measured as never married, formerly married (divorced, separated, or widowed), married, and unmarried couples. I control for marital status because individuals who are married may be better suited to continue education or to return to the educational setting (Montez and Barnes 2016). Veteran status is included because military veterans have access to educational resources that the civilian population does not have (Petri, Jenson, Gotto and Day 2016), and trans individuals are over-represented in the military (Gates and Herman 2014). Veteran status is measured as yes, they served, or no, they have not served. Age is estimated continuously as age in years and is included because it is a significant predictor of health, as the number of years lived can predict disease onset. (McCrory, Fiorito,

Hernandez et al. 2021).

Analytic Plan

Statistical Analysis

All statistical analyses will be performed using Stata version 18. First, I examine the descriptive statistics of means and percentages for the full sample, and by gender status. Chi square and t-tests are conducted to examine whether significant differences between trans and cis gender individuals exist for the study variables examined here. These associations are then examined in multivariate logistic regression and presented as odds ratios (ORs) and 95% confidence intervals (CIs). Model 1 examines health outcomes for trans individuals compared to cisgender individuals, controlling for the covariates, marital status, race/ethnicity, age, and veteran status. Model 1 will address hypothesis 2 and examine whether trans individuals have worse health than cisgender individuals net of covariates. Furthermore, I examine whether education increases the odds of good self-rated and mental health. Lastly, Model 2 will include the interaction between education and trans to examine whether the influence of education on health varies for compared to cisgender individuals. All analyses adjust for the complex survey design using the svy command in Stata.

RESULTS

Descriptive Statistics

Table 1 presents the weighted descriptive statistics for the sample and by gender identity. Table 1 also reports the bivariate analysis, with significance represented by asterisks (* [p=<0.05], ** [p=<0.01], and ***[p=<0.001]) and indicates a statistically significant difference between trans and cisgender individuals for that variable. In the sample 99.6% report being cis-gender and 0.4% report being trans identified (n=5,654). Table 1 answers the first research question, do trans people have lower levels of education that cisgender people? as anticipated, trans individuals reported twice the prevalence of not having a high school diploma or GED compared to the cisgender individuals (23% compared to 12.9%, p<0.001). Additionally, a significantly higher percentage of cisgender respondents report good health compared to trans individuals (82.6% compared to 76.5%, p<0.001).

Table 1. Means and Bivariate by Gender Identity (Weighted)

	Sample Size n= 1,358,794`(100%)			Cisgender n= 1,353,140 (99.6%)				Transgender n= 5,654 (0.41%)		
	means	std. err.	95% CI	means	std. err.	95% CI		means	std. err.	95% CI
Self-Rated Health										
Not Good	0.174	<0.001	0.172-0.175	0.174	<0.001	0.172-0.175		0.235	0.011	0.213-0.257
Good	0.825	<0.001	0.824-0.827	0.826	<0.001	0.825-0.828	***	0.765	0.011	0.743-0.787
Good Mental Health Days										
Days Not Good	0.359	0.001	0.357-0.361	0.358	<0.001	0.356-0.360		0.512	0.015	0.482-0.542
Only Good Days	0.641	0.001	0.639-0.643	0.642	<0.001	0.640-0.644	***	0.488	0.015	0.458-0.518
Veteran										
No	0.900	0.000	0.899-0.901	0.900	0.000	0.899-0.901		0.900	0.007	0.885-0.914
yes	0.100	0.000	0.099-0.101	0.100	0.000	0.099-0.101		0.100	0.007	0.086-0.115
Marital Status										
Never Married	0.237	<0.001	0.235-0.238	0.236	<0.001	0.234-0.238		0.369	0.014	0.342-0.397
Married	0.515	<0.001	0.513-0.517	0.516	<0.001	0.514-0.518	***	0.373	0.016	0.342-0.405
Formally Married	0.201	<0.001	0.200-0.203	0.202	<0.001	0.200-0.203	***	0.178	0.009	0.161-0.196

Unmarried Couple	0.047	0.000	0.046-0.047	0.046	0.000	0.046-0.047		0.079	0.008	0.064-0.094
Sex2										
Male	0.479	<0.001	0.477-0.481	0.479	<0.001	0.477-0.480		0.530	0.015	0.499-0.560
Female	0.521	<0.001	0.519-0.523	0.521	<0.001	0.520-0.523	***	0.470	0.015	0.440-0.501
Age	48.200	0.033	48.1-48.3	48.26	0.033	48.18-48.32	***	42.038	0.546	40.9-43.1
Race										
White	0.644	<0.001	0.642-0.646	0.645	<0.001	0.643-0.647		0.545	0.016	0.514-0.576
Black	0.119	<0.001	0.118-0.120	0.119	<0.001	0.118-0.120	***	0.132	0.009	0.114-0.150
Hispanic	0.066	<0.001	0.064-0.067	0.066	<0.001	0.064-0.067	**	0.090	0.016	0.058-0.121
other	0.014	0.000	0.013-0.014	0.014	0.000	0.013-0.014	***	0.024	0.003	0.018-0.030
Multiracial	0.157	<0.001	0.156-0.159	0.157	<0.001	0.155-0.159	***	0.210	0.013	0.184-0.236
Hsplus										
Less than HS	0.13	<0.001	0.128-0.131	0.129	<0.001	0.128-0.131		0.230	0.017	0.197-0.263
HS or more	0.87	<0.001	0.869-0.872	0.871	<0.001	0.869-0.872	***	0.770	0.017	0.737-0.803

Source: 2014-2020 BRFSS Data, n=1,358,794 (Total),

Cisgender individuals also reported that they were more likely to only have good mental health than trans individuals. 64.2% of cisgender respondents reported only good mental health days compared to 48.8% of the trans respondents (*p<0.001).* Lastly, trans individuals were less likely to be married or formerly married, more likely to be female and younger, and less likely to be non- Hispanic white compared to cisgender individuals.

Logistic Regression Results

Self-Rated Health

Results from the logistic regression models predicting good self-reported health are presented as odds ratios (OR) in Table 2. Model 1 includes all covariates. This model

Table 2. Self-Rated Health Logistic Regression (Weighted) n=1,358,794

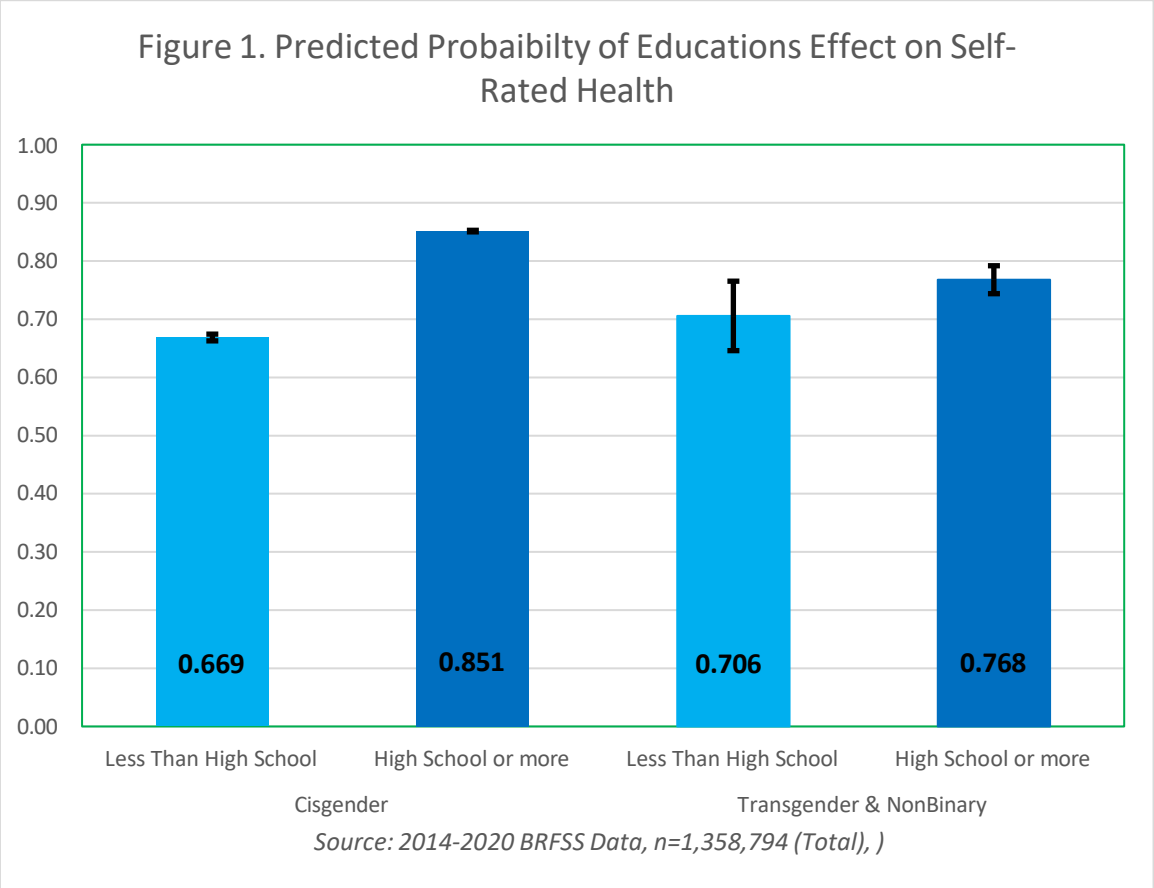
	Model 1			**Model 2**		
Self-Rated Health *(Not Good & Good)*	**Odds ratio**	**P**	**95% CI**	**Odds ratio**	**P**	**95% CI**
Transgender *(Cisgender)*						
yes	0.707	**<0.001**	0.607-0.822	1.200	0.240	0.885-1.627
Veteran *(No)*						
yes	0.857	**<0.001**	0.830-0.885	0.857	**0.000**	0.830-0.884
Marital Status *(Never Married)*						
Married	1.542	**0.000**	1.494-1.590	1.541	**0.000**	1.494-1.589
Formally Married	0.888	**0.000**	0.859-0.919	0.888	**0.000**	0.858-0.919
Unmarried Couple	1.017	0.560	0.960-1.078	1.018	0.544	0.961-1.078
Sex2 *(Male)*						
female	0.926	**0.000**	0.905-0.947	0.926	**0.000**	0.905-0.947
Age	0.975	**0.000**	0.975-0.976	0.975	**0.000**	0.975-0.976
Race *(White)*						

Black	0.720	**0.000**	0.698-0.742	0.720	**0.000**	0.698-0.742
Hispanic	0.985	0.610	0.931-1.043	0.983	0.565	0.929-1.041
other	0.614	**0.000**	0.579-0.652	0.615	**0.000**	0.579-0.652
Multiracial	0.631	**0.000**	0.609-0.654	0.631	**0.000**	0.609-0.654
Hsplus *(Less than High School)*						
HS or more	2.970	0.000	2.882-3.062	2.989	**0.000**	2.899-3.081
Transgender# Hsplus *(Cisgender & Less than High School)*						
yes#HS or more				0.470	**0.000**	0.336-0.657
_cons	6.841	0.000	6.527-7.169	6.812	0.000	6.500-7.139

Source: 2014-2020 BRFSS Data, n=1,358,794 (Total)

will address hypothesis 2, that trans individuals report worse self-rated health than cisgender individuals. As expected, compared to cisgender individuals, trans individuals show significantly reduced odds of having good self-rated health (OR 0.707, $p < 0.001$) net of covariates. Examining the covariates, I find that individuals who are veterans, have a lower education, female, and racialized minorities or have been formerly married report worse health.

Model 2 includes the interaction between being trans and education and tests hypothesis 3, the positive impact of education on health is diminished for trans compared to cisgender individuals. The effect of education on self-rated health significantly varies by gender identity as indicated by the statistically significant interaction (OR: 0.470, $p<0.001$). Predicted probability of good health is calculated for each of the education and gender minority groups and is displayed in Figure 1. Figure 1 suggests that education results in better self-rated health for both cisgender and trans individuals. However, education's beneficial impact on self-rated health is noticeably diminished for trans individuals compared to cisgender individuals. Comparing less than a high school



education to those with a high school degree/GED or more is associated with an increase in the predicted probability of good health by a factor of 0.182 (predicted probability for cisgender without a high school degree is 0.669 and with a high school degree is 0.851). For trans individuals, comparing less than a high school education to those with a high school degree/GED or more is associated with an increase in the predicted probability of good health by a factor of 0.062 (predicted probability for trans individuals without a high school degree is 0.706 and with a high school degree is 0.768). Though both trans and cisgender individuals benefit from education, cisgender receives more benefit than trans. Additionally, I find that among those with less than a high school degree, there are not statistically significant differences between trans and cisgender individuals on reporting good health (predicted probability for cis individuals 0.668, 95% CI: 0.662 –

0.674 and the expected probability for trans individuals 0.706 95% CI: 0.649 – 0.765). The differences between trans individuals and cisgender individuals are only observed among those with a high school degree or more (predicted probability for cis individuals 0.851, 95% CI: 0.850 – 0.852 and the predicted probability for trans individuals 0.767, 95% CI: 0.743 – 0.791).

Good Mental health

Results from the logistic regression models predicting those that report only good mental health days are presented as odds ratios (OR) in Table 3. Model 1 includes all covariates and will address research question 2, trans individuals were less likely to report only good mental health days than cisgender individuals. As expected, compared to cisgender individuals, trans individuals show significantly reduced odds of only good mental health days (OR 0.592, $p < 0.001$) net of covariates. Examining the covariates, I find that individuals who are veterans are less likely to report only good mental health days.

Table 2. Self-Rated Health Logistic Regression (Weighted) n=1,358,794

	Model 1			**Model 2**		
Good Mental Health *(Only good days& days not good)*	**Odds ratio**	**P**	**95% CI**	**Odds ratio**	**P**	**95% CI**
Transgender *(Cisgender)*						
yes	0.597	**<0.001**	0.532-0.671	0.726	**0.049**	0.528-0.999
Veteran *(No)*						
yes	1.019	0.175	0.992-1.048	1.019	0.179	0.991-1.048
Marital Status *(Never Married)*						
Married	1.487	**<0.001**	1.453-1.521	1.487	**<0.001**	1.453-1.521
Formally Married	0.937	**<0.001**	0.912-0.963	0.937	**<0.001**	0.912-0.963

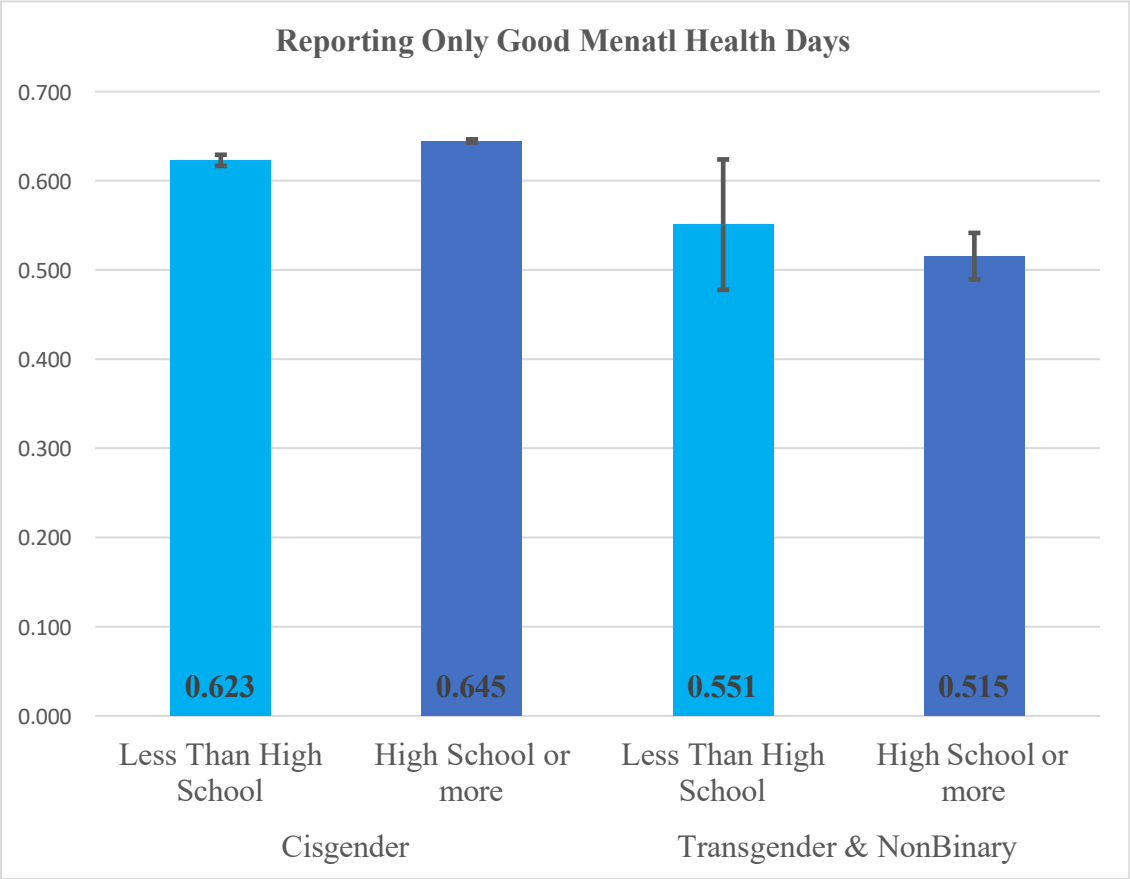
Unmarried Couple	1.022	0.306	0.980-1.066	1.022	0.301	0.980-1.066
Sex2 *(Male)*						
female	0.600	**<0.001**	0.590-0.610	0.600	**<0.001**	0.590-0.610
Age	1.025	**<0.001**	1.024-1.025	1.025	**<0.001**	1.024-1.025
Race *(White)*						
Black	1.280	**<0.001**	1.247-1.314	1.280	**<0.001**	1.247-1.314
Hispanic	1.445	**<0.001**	1.384-1.508	1.445	**<0.001**	1.384-1.508
other	0.806	**<0.001**	0.767-0.848	0.807	**<0.001**	0.767-0.848
Multiracial	1.476	**<0.001**	1.431-1.522	1.476	**<0.001**	1.431-1.522
Hsplus *(Less than High School)*						
HS or more	1.103	**<0.001**	1.070-1.138	1.106	**<0.001**	1.073-1.140
Transgender# Hsplus *(Cisgender & Less than High School)*						
yes#HS or more				0.776	0.141	0.5531.088
_cons	0.507	0.000	0.487-0.528	0.506	0.00	0.486-0.527

Source: 2014-2020 BRFSS Data, n=1,358,794 (Total)

Females are less likely to report only good mental health days compared to males (OR:0.602 *p<0.001).* Examining race/ethnicity, I find that Black, Hispanic, and multiracial report only good mental health days with higher frequency compared to white individuals. For marital status, I found that when compared to those who have never been married, those married and unmarried couples had better health, but individuals who were formally married reported more days that their mental health was not good. Finally, compared to those with less than a high school degree, those with high school degree or more have increased odds of reporting only good mental health days.

Lastly, Model 2 includes the interaction between being trans and education and tests hypothesis three: whether the positive impact of education on health is diminished

for trans compared to cisgender individuals. Hypothesis 3 is not supported as the



interaction fails to reach significance (0.776, *p=0.141)*. The predicted probabilities are displayed in figure 2 and demonstrate that while the impact of education is significant the effect size is relatively small.

DISCUSSION

The findings in this work provide some of the first views on how education attainment influences health among trans people. The study population presented here mirrors the national population estimates of the trans adult population. Here the trans sample size is 0.41% which is on par with current estimates of between 0.4% and 0.5% or about 1.6 million US adults (Herman, Flores and O'Neill 2022). The results presented above indicate that trans and cis individuals with less education report worse self-rated health and mental health. However, the results also indicate that education's influence on self-rated health is diminished for trans people compared to cisgender people. Additionally, trans and cisgender individuals with less than a high school degree had similarly ratings of self-rated health when compared to those with at least a high school degree.

I found that education had a profound impact on self-rated health, but had a very muted, though still significant association with mental health. This could be because individuals with more education may view mental health and wellness as less stigmatized, driving them to be mindful of their mental wellness. Mindfulness could also lead to more treatment or access to resources, which means individuals make more critical assessments concerning their mental health (Pachankis and Safren 2019). However, when comparing reported only good mental health days between trans and cisgender individuals I found that trans individuals have worse mental health, but the impact of education is the same for trans individuals and cisgender individuals. This

finding implies two ideas (1) the importance of having a high school degree or more is key to unlocking the health benefits of education for self-rated health and (2) that mental health continues to be a growing concern affecting both trans and cisgender individuals (Bockting, Miner, Swinburne Romine et al. 2013, Coombs, Meriwether, Caringi and Newcomer 2021, Crissman, Stroumsa, Kobernik and Berger 2019). These findings are consistent with previous work that found physical and mental health were indeed influenced by levels of education (Bjelland, Krokstad, Mykletun et al. 2008, Cohen et al. 2020, Ross and Mirowsky 2006).

With model 1, I found that receiving a high school degree or equivalent increases the odds of reporting only good mental health days by a significantly amount, but the effect size is much smaller in magnitude (OR: 1.103, $p<0.001$ for only good mental health days compared to OR: 2.970, $p<0.001$ for self-rated good health). This may be because education is more impactful on self-rated health. Education, a resource in and of itself and through the mechanism of learned effectiveness provides individuals with the skills needed to develop more resources (wealth, social status, etc.). However, it does not explain the mechanisms that create this relationship. Further research is needed to locate and isolate this unknown factor(s) to better understand how there is a paradox surrounding gender identity and mental health. It is only among those with a high school degree or more do I find differences in good SRH comparing trans individuals to cisgender individuals.

Trans and cisgender individuals both benefit from increased education, but cisgender individuals benefit more than trans individuals when examining good self-rated health. This finding is in line with previous work that found more minor associations

between education and health for racial and ethnic minorities and lesbians, gays, and bisexuals (Assari 2019, Assari and Bazargan 2019d, Chhabra, Ryan and Dimick 2020, Färe 1980, Sutter, Perrin and Trujillo 2018). I find that trans individuals who gain a high school degree or more do not receive the same return on their investments when examining their self-rated overall health. This could suggest that even highly educated trans individuals will remain marginalized and experience poorer health than their cis-gender peers. However, more research is needed to examine this association as I focused on lower levels of education.

The interaction between education and gender identity describes a profound difference between trans and cisgender individuals on self-rated health. In contrast, Trans individuals are less likely to report only good mental health days compared to cisgender individuals and the influence of education is the same for trans and cisgender individuals on mental health. Although there is no definitive reason for this difference, according to past research on this topic (Goodman and Nash 2018, Kattari et al. 2021a, Kattari et al. 2021b, Safer and Tangpricha 2019).

Implications

Education is an essential social determinant of health, often preceding other measures such as income or employment. Trans individuals have much lower education levels than cis-gender individuals. This lower level of education likely accounts for some of the difference between trans and cisgender individuals on SRH. However, the benefits seen in health outcomes vary based on the gender identity of the individual. Even though trans individuals have less education, those trans individuals who receive more education do not receive the same benefit to health as cisgender individuals. Increasing educational attainment would result in improved health among trans individuals, especially given

their low levels of education, but disparities between cisgender and trans individuals would likely widen even though overall health improves. Though the benefits for trans individuals are muted, they still receive a large benefit in SRH from receiving a high school degree or GED. The current state of gender diverse youth in schools is alarming because many states seek to limit the knowledge available concerning many different topics, but there seems to be a focus of gender and nonbinary youth. The lack of available bathroom facilities or the inability to use the correct or even the closest bathroom can lead to health concerns around the urinary system (kidneys, bladder, etc.) (Philips 2017).

Future Research

When looking at how trans individuals are affected by structural institutions of oppression it is also important to consider the intersecting identities of trans populations. Trans people must deal with stigmatized identity and gender binarism, but also face issues surrounding sexism, racism, and heterosexism. Individuals can be members of both majority and stigmatized groups simultaneously. For example, a trans woman can be both white and trans, and this intersecting of the majority and marginalized provides both privilege and stigma. The intersection of multiple social identities such as race, sex, gender identity, socioeconomic status, and/or marital status have a compounding association with inequality and cumulative disadvantage.

Moving forward, there is a need to help address research gaps in the knowledge base for gender minorities. First, there is a need for a nationality representative survey that collects sexual and gender minority data combined with detailed demographics and health outcomes. Second, this survey should have diverse, inclusive, and consistent questions that can be used to address the intersectionality of race, sex, gender identity, sexual orientation, education, and the structural institutions of oppression. These questions should address detailed demographics but focus on the social constructs

surrounding stress, heterosexism, gender binarism, sexism, and racism. For example, the use of a two-step question for gender identity can be combined with other demographics to visualize multiple identities. Next, using the scholarly works of experts in intersectionality, the questions should be designed to look at the multifaceted associations and interdependence of the intersecting identities.

Limitations

This research has limitations that should be a part of the interpretation of these findings. First, significant effort was made to build a diverse sample containing, and cisgender individuals; however, this study should not be considered representative of trans individuals. There continues to be a lack of reliable data collection surrounding the size of the trans population. No known federal-level data collection tools (census, etc.) use the two-step gender identity question or a better alternative. The lack of this inclusion continues to reduce the generalizability of collected data related to gender identity.

The data source, BRFSS, is simply a cross-sectional survey conducted yearly with new participants each year. Longitudinal data would allow me and other researchers to examine the influence education has on individual health over the life course. Additionally longitudinal data will allow better understandings of how trans individuals, compared to cisgender individuals, are affected over the life course. Also, the sexual orientation and gender identity (SOGI) module is considered optional, and not all states include this module. And the states that have collected this data can opt-out from year to year, leaving inconsistency within the data. The BRFSS also uses random dialing of cell and home phones, which may miss portions of the study population due to homelessness, poverty, or other concerns related to having access to a communication device, which are

issues that tend to be more prevalent in the trans community (Deutsch 2016, Goodman et al. 2019, Rosser, Oakes, Bockting and Miner 2007). Over the years, the response rate has been trending downward, like other population-level surveys. However, BRFSS is the only nationally represented probability-based sample of trans and cisgender individuals collecting health information.

An additional limitation is the use of self-rated health and self-rated mental health. Whereas use of chart audits and access to electronic health records (EHR) is considered by many to be the "gold standard" in health outcomes research when compared to self-rated health outcomes (Fihn, McDonell, Diehr et al. 2004, Ritter, Stewart, Kaymaz et al. 2001). However, I posit that it would be meaningless to focus all attention around the EHR when seeking to explain health outcomes among a population that reports extremely low healthcare utilization rates (Bradford, Reisner, Honnold and Xavier 2013, Falak and Safdar 2020, Grant et al. 2010, Kattari et al. 2021a). The additional concerns related to institutional barriers to care, abuse in the medical setting, and overall medical mistrust prevents relying on the EHR when working with the trans population (Kattari et al. 2021a). In contrast, the SRH collection is usually less expensive and likely to include all health care manners. SRH continues to be a well-established method to predict mortality and morbidity and can provide a look into the differences surrounding population health (Burns, Baker and Sheehan 2022). The use of SRH in local, national, and international surveys allows information to be gathered from diverse groups. Not just those who can go to the doctor (Burns et al. 2022, Miilunpalo, Vuori, Oja et al. 1997). All health-related responses were considered self-reported and open to biases related to recall, self-reporting, and perceived social desirability of answers.

Conclusion

In the United States, the benefits of an education free from discrimination, harassment, and abuse are becoming a polarized political talking point. The attempt to exclude trans individuals is not one of protection but hostility. Medical systems, insurers, and leaders use the phrase "community health equity collaborations," however, health equity is impossible to reach when all the members of society are treated differently. We must do better for the health of the world. There continue to be gaps in all areas of transgender and gender nonbinary research, including the erasure of intersexed individuals. Additional research is needed to gain more in-depth insight into the relationship between educational attainment and the overall health status of marginalized groups. The overarching fact remains that transgender, intersex, gender non-binary, and anyone considering themselves gender non-conforming continues to suffer from socially induced health disparities. Education in the form of high school degree completion is essential for both trans and cisgender individuals regarding overall health shown in the worse health outcomes for cisgender and 's who have less than a high school degree. It was somewhat of a surprise to see that trans individuals' health outcomes benefit considerably when completing a high school degree or more. However, the significant diminished return on educations influence, on trans and cisgender individuals were expected.

Conflicts of Interest

The author(s) whose name listed immediately below certify that they have no affiliations with or involvement in any organization or entity with any financial interest (such as honoraria, educational grants, participation in speakers' bureaus, membership,

employment, consultancies, stock ownership, or other equity interest; and expert testimony or patent-licensing arrangements), in the subject matter or materials discussed in this manuscript.

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