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# Transgender Health Disparities: Comparing Full Cohort and Nested Matched-Pair Study Designs in a Community Health Center

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## Abstract

**Purpose—**U.S. health surveillance systems infrequently include measures to identify transgender respondents or monitor the health of this underserved and marginalized population.

**Methods—**From 2001–2002, transgender and non-transgender adults were sampled at a Massachusetts clinic. Health differences were formatively examined by transgender identity using a cross-sectional, clinic-based sample (n=2,653); and a nested matched-pair subsample (n=155).

**Results—**Both designs produced virtually identical findings: (1) the prevalence of HIV, substance abuse, and smoking did not differ significantly for transgender and non-transgender patients; (2) transgender patients were more likely to endorse a lifetime suicide attempt and ideation compared to non-transgender patients ($p<0.05$); (3) transgender patients disproportionately reported social stressors (violence, discrimination, childhood abuse) relative to non-transgender patients ($p<0.05$).

**Conclusion—**Findings suggest that a nested design may provide an effective methodology for using clinical data to study transgender health, and underscore the need for routine collection of gender identity in clinical settings.

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**DISCLAIMER**
None to report.

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None to report.

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Health disparity; transgender; gender identity; methods; study design

## INTRODUCTION

Transgender is an umbrella term used to describe people whose assigned sex at birth is not fully aligned or congruent with their current gender identity or expression.[1] Prior research has documented a high prevalence of adverse health outcomes in some transgender communities, including mental health distress and suicidality,[2–4] substance use,[5] cigarette smoking,[6] and HIV and other sexually transmitted infections (STIs).[2, 7–16] Social stressors have also been shown to burden transgender subpopulations throughout development including experiences of verbal, physical, and/or sexual violence and victimization,[4, 17–19] and discrimination in employment and healthcare.[20, 21]

In the U.S., health surveillance systems do not routinely include standardized measures with which to identify transgender respondents to monitor the health of the transgender population.[1, 22] As a consequence, a common methodological weakness of many studies in transgender health, especially those seeking to examine health disparities, is the lack of a cisgender (i.e., non-transgender) comparison group. Therefore, clinic settings such as community-based health centers that offer services to transgender people, represent important locales and potentially rich sources of data with which to study transgender health, particularly in urban areas.[23] Although not representative samples, clinic samples offer the novel opportunity to not only understand more about transgender people engaged in healthcare, but also to compare transgender and cisgender patients in order to document and understand health differences in specific special patient populations. These data can inform delivery of healthcare services at clinic sites, including funding and resource allocation, cultural competency training efforts, and contextualize transgender patient care.[24] Data can also be linked to electronic medical record data to obtain provider-documented diagnoses, biomarker information, and health insurance claims documenting healthcare utilization to increase the rigor of information obtained via self-reported surveys.

Despite the recognized potential of clinic-based data systems for transgender health,[25, 26] there has been little methodological attention explicitly paid to study design issues and sampling of transgender patients in clinic settings for health research. The current study aims to fill this gap. Two research objectives are the focus of this analysis: (1) Feasibility: can a cross-sectional clinic-based sample of patients be used to document health disparities by transgender identity within an urban health clinic? (2) Efficiency: can the same study be designed more efficiently, using substantially less time and resources, and produce the same results? We formatively compare transgender and cisgender patients presenting for care at an urban community health center on key health and social stress indicators using two methods to investigate these research questions. First, we use a cross-sectional clinic-based sample (n=2653 - n=31 transgender; n=2,622 cisgender). Second, we use a nested matched-pair subsample (n=155 - n=31 transgender patients matched 4:1 to n=124 cisgender controls on age (+/−3 years), race/ethnicity, educational attainment, and income).

# METHODS

## Study population

The present study used de-identified data from The Community Health Center Core Data Project. The Core Data Project was a survey of patients engaged in medical care from 2001–2002 at Fenway Community Health Center (FCHC) in Boston, Massachusetts.[27] This project was initially conceived as a quality improvement initiative to inform FCHC's practice and improve patient care. During a 12-month period, all medical patients were invited at intake to voluntarily complete a one-time self-report, paper-pencil one-page anonymous questionnaire to help FCHC improve programming and clinical care. The survey was designed with input from FCHC providers to collect information about experiences and health concerns believed to be important for sexual and gender minorities who make up a large proportion of FCHC patients. The objective of the project was to improve clinical care and not to contribute to generalizable knowledge; thus the project was determined to be a quality improvement activity and not research.[28, 29] The de-identified data set, as defined by the Privacy Rule,[30] did not directly or indirectly contain identifiable information. As such, it was determined to be research not involving human subjects and therefore not requiring Institutional Review Board approval.

## Study design

Gender identity was assessed using a single item. Participants were asked to describe their gender with response options "male", "female", and "transgender". The inclusion of this question made this analysis possible. The full cohort sample (design 1) was comprised of 2,653 patients who participated in the Core Data Project and fully completed the survey. The nested matched-pair subsample (design 2) consisted of 155 patients drawn from the full cohort. In a nested case-control study, cases of a disease or condition that occur in a defined cohort are identified and, for each, a specified number of matched controls are selected from among those in the cohort who have not developed the disease.[31] For the purposes of this study, we used a hybrid approach with a matched-pair design and defined "cases" as transgender patients (n=31). Controls matched 4:1 were selected from cisgender patients to control for confounding and improve statistical efficiency. For each transgender case, two cisgender female controls (n=62) and two cisgender male controls (n=62) were selected, matched on age (+/−3 years), race/ethnicity, educational attainment, and income. Matching was implemented to control for confounding and improve statistical efficiency.

## Measures

The brief one-page survey was designed to minimize patient burden as much as possible given the survey was administered in the patient waiting area. Brief single-item screening questions were used for all measures. No psychometric information is available for the items, although many of the items were similar to other screening instruments commonly used in clinical settings (for example, other violence screening instruments).[32–34]

**Demographic matching—**Demographics matched on were age, race/ethnicity, educational attainment, and income. Age was a continuous measure and calculated from year of birth to date of survey completion. Race was operationalized as white (non-

Hispanic) and any racial/ethnic minority (Black (non-Hispanic), Latino/Hispanic, other race/ethnicity). Education was coded as lower (high school diploma/GED or less), moderate (some college/Associate's degree), or higher (college degree or post-graduate/professional degree). Anticipating a non-linear association of income and health,[35] we first categorized income into quintiles to examine the socioeconomic gradient in health and used generalized additive models[36–38] to determine the most parsimonious coding specification of income. Based on this analysis, income was operationalized less than $20,000 versus greater than $20,000.

**Health—**Five binary (yes/no) health indicators were operationalized: (1) Lifetime suicidal ideation ("ever thought seriously about killing yourself"); (2) Suicide attempt ("ever made a suicide attempt"); (3) Substance abuse history ("ever felt you had a problem with substance use"); (4) Lifetime smoking ("ever smoked cigarettes"); (5) HIV serostatus (self-reported as "HIV-positive").

**Social stressors—**Four dichotomous (yes/no) stressors were asked and parameterized. (1) Childhood abuse age<15 was queried ("ever abused as a child under 15 years-old"), which included any experience of sexual, verbal and/or physical abuse). (2) Intimate partner violence was assessed including victimization ("ever *been* slapped, punched, kicked, beaten up, or otherwise physically or sexually hurt by your spouse (or former spouse), a boyfriend/girlfriend, or some other intimate partner"), and perpetration ("ever slapped, punched, kicked, beaten up, or otherwise physically or sexually hurt your spouse (or former spouse), a boyfriend/girlfriend, or some other intimate partner"). (3) Violence in adulthood (age≥18) was assessed using three items for verbal attack, physical attack, and sexual harm. A binary variable of any verbal, physical, and/or sexual violence in adulthood was operationalized. (4) Employment discrimination ("ever discriminated against at work/lost job") and healthcare discrimination ("ever discriminated against getting healthcare") were assessed. A dichotomous variable of any discrimination was coded.

## Statistical analyses

SAS® 9.2 was used to analyze data, where statistical significance was determined at the alpha 0.05 level. The general analytic strategy was to compare transgender patients to cisgender female and male patients (gender-stratified). Transgender patients were also compared to all cisgender patients (not gender-stratified). For the full cohort analysis (design 1), bivariate statistics (t-tests for continuous variables and $\chi^2$ for categorical indicators) were conducted to identify differences in demographics, health, and social stressors by gender identity. Multivariable logistic regression models were then fit regressing health and social stressors on transgender identity and controlled for demographic characteristics (age, race/ethnicity, educational attainment, and income).

For the nested sample analysis, bivariate analyses were not estimated given the sample was demographically controlled by the matched design. Two different approaches were used to analyze matched data. First, conditional logistic regression models were estimated using the PROC PHREG procedure in SAS. This procedure is appropriate for analyzing matched data as well as sparse data. The 4:1 matched cases and controls were treated as strata. The match

ID was used as the strata variable.[39–41] Second, generalized estimating equation (GEE) models were computed using the PROC GENMOD procedure in SAS with a repeated statement by match ID.

## RESULTS

Findings from the full cohort sample (design 1; n=2,653) are presented in Table 1, including demographics, health, and social stressors by gender identity. Participants ranged in age from18 to 70 years, mean age 32.0 years. Overall, 78.6% were White (non-Hispanic); 1.2% identified as transgender. Table 2 shows data from the nested matched-pairs subsample for transgender cases and cisgender controls (design 2; n=155). Participants ranged in age from 19 to 70 years, mean age 39.7 years. Overall, 86.5% were White (non-Hispanic); 20% were transgender by design due to the matching algorithm.

Table 3 presents health indicators and social stressors comparing models estimated for the full cohort to those estimated for the nested matched-pairs subsample using two different analytic techniques. Analyses from both study designs produced virtually identical results (Table 3). First, the prevalence of HIV, substance abuse, and smoking did not significantly differ for transgender and non-transgender patients in either study design 1 (models adjusted for age, race/ethnicity, educational attainment, and income) or study 2 (nested cohort matched on these same sociodemographic variables). For example, 54.8% of transgender respondents reported ever smoking cigarettes compared to 49.6% of cisgender patients in study 1, and 59.7% of cisgender matched controls in study 2.

Second, transgender patients were significantly more likely to endorse a lifetime suicide attempt and suicidal ideation compared to cisgender patients in both study designs. Overall, 29.0% of transgender patients sampled had ever attempted suicide, compared to 8.5% of cisgender patients in study 1 and 12.9% of cisgender patients in study 2.

Third, transgender patients disproportionately reported social stressors (childhood abuse age<15, perpetration of intimate partner violence, victimization in adulthood age≥18, and lifetime employment and healthcare discrimination) relative to cisgender patients in both study designs. By way of example, 54.8% of transgender patients reported childhood abuse age < 15 compared to 19.5% of cisgender patients in the full cohort and 25.0% of cisgender matched patients in the nested design.

## DISCUSSION

The current study found that data from a cross-sectional, clinic-based sample of transgender and cisgender patients can be used to document health disparities by gender identity. A *health disparity* is a “particular type of difference in health…in which disadvantaged social groups—such as the poor, racial/ethnic minorities, women, or other groups who have persistently experienced social disadvantage or discrimination—systematically experience worse health or greater health risks than more advantaged social groups”.[42] Reducing health disparities is a core aim of Healthy People 2020.[43] Differences in health and social stressors in this study were found by transgender identity in patients engaged in care at an urban health clinic, particularly on mental health, victimization in childhood and adulthood, and

discrimination. These results replicate findings from prior research in clinic and non-clinic based samples.[2–9, 17–21, 44] We also found that a nested matched-pairs design that utilized <10% of the full cohort sample performed equally as efficiently and, for a fraction of the time and resources, produced virtually identical findings as the full cohort sample with regard to comparing transgender and cisgender adult health. Specifically, even after matching the demographic variables for which a statistically significant difference existed in the entire cohort (age, education level, and income), overall, findings of health indicators did not change in the nested study. Findings suggest that a nested design offers a potentially effective method of using patient data to study transgender health with relatively minor loss in statistical efficiency compared to the full cohort study.

Some transgender health disparities shown to be present in the peer-review literature,[5, 6, 11, 14] were not evidenced in our sample, likely given the specific composition of the patient population utilized for this analysis. For example, the prevalence of HIV, substance abuse, and smoking did not significantly differ for transgender and cisgender patients. The lack of health disparities in Fenway's patient population by gender identity can likely be attributed to several factors. First, the organization was the largest primary care provider for HIV-infected people in New England during the time of the initial data capture. Additionally, the organization is a LGBT health clinic and it is well-documented that other sexual minority groups have higher rates of HIV, substance use, and smoking compared to the general, non-sexual minority population[45–47] thus, differences in these conditions may not be seen between transgender and other sexual minority patients sampled. Second, we did not have information on assigned sex at birth or gender identity vector (i.e., transgender men and transgender women). Given the differential distribution of HIV among transgender women relative to transgender men, not stratifying by natal sex/gender status may obfuscate differences that may be present when, for example, comparing transgender women and cisgender women. Third, measures were dichotomously assessed to minimize patient burden. The dichotomous smoking variable is particularly problematic. A lack of disparity in ever smoking may not reflect the nuances of patients' smoking histories (i.e., having smoked a few cigarettes in high school versus being a current daily smoker). Nonetheless, disparities between transgender and cisgender patients were seen with regard to lifetime suicide attempt, suicidal ideation, childhood abuse, intimate partner violence, victimization, and employment and healthcare discrimination, highlighting the need for targeted individual, interpersonal and structural-level interventions that aim to eliminate social stressors and improve the mental health of transgender individuals in clinical settings.

Several limitations warrant consideration. The sample was taken from one of the world's largest LGBT-focused health centers. While generalizability to transgender and non-transgender patients of other health centers is unknown, our findings are consistent with those documented in prior studies using clinic and non-clinic based samples.[2–9, 17–21, 44] Nested matched-pair data cannot make up for the limitations of the original design which was a cross-sectional sampling of patients who presented for care and who were willing to fill out a survey. No information on the response rate of participation represents a significant limitation and an area for future improvement of rigor in this line of research. An additional limitation is that no data were available on assigned sex at birth or specific gender identity (e.g., male-to-female, female-to-male, genderqueer). The distribution of health concerns

differs within different subsets of the transgender community; therefore, not being able to stratify by natal sex/gender status may conceal some health differences. Also, the childhood abuse screener did not distinguish between emotional, physical, or sexual abuse experiences in childhood. Lastly, data used for this analysis were more than ten years old; however, the focus of this report is on methods and analytic techniques.

Clinic-based samples and patient-related data are under-utilized sources of information about transgender health, particularly in community-based, urban health centers that typically serve a large pool of transgender patients, many of whom come from marginalized communities. Well-designed studies that sample transgender patients, and a subset of matched cisgender patients, can provide rich information on transgender health disparities. Matching can be conceptualized as stratification in the design phase to form strata that are balanced and that provide for an efficient statistical analysis.[40, 48] It is especially useful with small sample sizes and when a random sample is difficult to obtain, as well as to control for confounding factors that are difficult to measure. A limitation of matching worth consideration is the inability to examine the risk factors associated with the matching variable.[49]

Just as retrospective and prospective chart review studies of clinic populations contribute to science in transgender health by reporting on provider-reported patient medical record data (e.g., biomarkers such as blood work or laboratory-confirmed HIV serostatus or STI diagnoses),[10, 15, 50, 51] cross-sectional point-of-care convenience samples are also advantageous as they offer the opportunity for clinic patients to self-report on ancillary information that may not be collected in a routine medical encounter (e.g., symptoms of depression, suicidality, history of abuse).[52, 53] Certainly there are disadvantages to utilizing clinic-based samples, the most obvious being selection bias (i.e., people engaged in clinic care may not be representative of patients who are not in care or patients who are willing to complete a survey in the clinic waiting room may not be representative of those patients who are unwilling to participate).[23] Additionally, self-reported data are also subject to bias, particularly questions that are sensitive or subjective in nature (e.g., ever experienced workplace discrimination). Ultimately, however, clinic based samples, and in particular data gathered outside of a patient-provider encounter (via waiting room/point-of-care surveys), provide clinicians and researchers with the opportunity to supplement patient medical records with additional social and behavioral sciences data which can serve to advance the body of knowledge regarding specific marginalized patient populations as well as improve the quality of patient care.[52, 53]

Clinic-based settings offer the unique opportunity to investigate health disparities by gender identity by comparing the health and wellbeing of transgender and cisgender patients.[26] This study assists in filling a gap identified by The Institute of Medicine's 2011 groundbreaking report in LGBT health which stated: "All aspects of the evidence base for transgender-specific healthcare need to be expanded. *Research methods* that will yield the data needed to inform decisions about transgender-specific health should be developed" (page 298, italics added).[1] Gender identity should be routinely collected as part of patient demographic characteristics in clinical settings and will allow unique opportunities to conduct research in transgender health and build the knowledge-base for transgender clinical care. Multi-site

studies of community-based health centers that pool transgender patient records are needed to replicate findings from this formative study.

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**Table 1**

Demographics, Health Indicators, and Social Stressors in the Full Cohort Sample (Design 1) by Gender Identity (n=2,653).

| | **Transgender n=31** | | **Cisgender n=2,622** | | **Bivariate Comparisons[+]** | | **Total Sample n=2,653** | |
|---|---|---|---|---|---|---|---|---|
| **Demographics** | | | | | *t-test* | *p-value* | | |
| Age in Years - Mean (SD) | 37.3 (12.6) | | 31.9 (10.3) | | 8.16 | **0.004** | 32.0 (10.3) | |
| Range | 19–70 | | 18–70 | | | | 18–70 | |
| | *%* | *n* | *%* | *n* | $\chi^2$ | *p-value* | *%* | *n* |
| Race/Ethnicity | | | | | | | | |
| White/Caucasian | 87.1 | 27 | 78.5 | 2057 | 1.36 | 0.244 | 78.6 | 2084 |
| Racial/Ethnic Minority | 12.9 | 4 | 21.5 | 565 | | | 21.4 | 569 |
| Educational Attainment | | | | | | | | |
| High School Diploma or Less | 38.7 | 12 | 11.8 | 309 | 20.97 | **<0.0001** | 12.1 | 321 |
| Some College/Associate's Degree | 19.4 | 6 | 31.2 | 818 | | | 31.1 | 824 |
| College Degree or Higher | 41.9 | 13 | 57.0 | 1495 | | | 56.8 | 1508 |
| Family Income | | | | | | | | |
| Income <$20,000 | 67.7 | 21 | 20.5 | 538 | 41.08 | **<0.0001** | 21.1 | 559 |
| Income >$20,000 | 32.3 | 10 | 79.5 | 2084 | | | 78.9 | 2094 |
| **Health Indicators** | | | | | | | | |
| Suicidal Ideation Ever | 58.1 | 18 | 20.6 | 541 | 28.81 | **<0.0001** | 21.1 | 559 |
| Attempted Suicide Ever | 29.0 | 9 | 8.5 | 222 | 16.30 | **<0.0001** | 8.7 | 231 |
| Substance Abuse History | 32.3 | 10 | 16.9 | 443 | 5.11 | **0.024** | 17.1 | 453 |
| Smoking | 54.8 | 17 | 49.6 | 1301 | 0.33 | 0.563 | 49.7 | 1318 |
| HIV Positive | 12.9 | 4 | 11.0 | 288 | 0.12 | 0.734 | 11.2 | 292 |
| **Social Stressors** | | | | | | | | |
| Childhood Abuse Age <15 | 54.8 | 17 | 19.5 | 511 | 24.02 | **<0.0001** | 19.9 | 528 |
| Experienced Intimate Partner Violence | 25.8 | 8 | 12.7 | 334 | 4.66 | **0.031** | 12.9 | 342 |
| Perpetrated Intimate Partner Violence | 25.8 | 8 | 5.5 | 143 | 23.64 | **<0.0001** | 5.7 | 151 |
| Any Victimization as Adult Age ≥18 | 74.2 | 23 | 38.9 | 1021 | 23.64 | **<0.0001** | 39.4 | 1044 |
| Verbally Attacked | 74.2 | 23 | 32.7 | 856 | 23.87 | **<0.0001** | 33.1 | 879 |
| Physically Attacked | 22.6 | 7 | 9.7 | 255 | 12.74 | **0.0004** | 10.0 | 264 |
| Sexually Harmed | 22.6 | 7 | 12.9 | 339 | 2.52 | 0.113 | 13.0 | 346 |

| | Transgender n=31 | | Cisgender n=2,622 | | Bivariate Comparisons[+] | | Total Sample n=2,653 | |
|---|---|---|---|---|---|---|---|---|
| Any Discrimination Ever | 51.6 | 16 | 9.8 | 257 | 58.02 | **<0.0001** | 10.3 | 273 |
| Employment Discrimination | 41.9 | 13 | 8.5 | 224 | 41.99 | **<0.0001** | 8.9 | 237 |
| Healthcare Discrimination | 19.4 | 6 | 2.6 | 67 | 32.31 | **<0.0001** | 2.8 | 73 |

[+]Transgender vs cisgender (i.e., non-transgender) patients were compared in bivariate analyses.

Note: Among the 2,622 cisgender patients, 33.4% were female (n=876) and 66.6% were male (n=1,746). No data were available on assigned sex at birth or specific gender identity (e.g. male-to-female or female-to-male) of transgender patients.

**Table 2**

Demographics, Health Indicators, and Social Stressors in the Nested Matched-Pairs Subsample (Design 2) by Gender Identity (n=155).

| | **Transgender Cases n=31** | | **Matched Controls n=124** | | **Bivariate Comparisons^** | | **Total Sample n=155** | |
|---|---|---|---|---|---|---|---|---|
| | | | | | *t-test* | *p-value* | | |
| **Demographics** | | | | | | | | |
| Age in Years – Mean (SD) | 37.3 (12.6) | | 40.3 (12.5) | | 1.46 | 0.227 | 39.7 (12.6) | |
| Range | 19–70 | | 19–70 | | | | 19–70 | |
| | *%* | *n* | *%* | *n* | $\chi^2$ | *p-value* | *%* | *n* |
| Race/Ethnicity | | | | | | | | |
| White/Caucasian | 87.1 | 27 | 86.3 | 107 | 0.01 | 0.91 | 86.5 | 134 |
| Racial/Ethnic Minority | 12.9 | 4 | 13.7 | 17 | | | 13.5 | 21 |
| Educational Attainment | | | | | | | | |
| High School Diploma or Less | 38.7 | 12 | 36.3 | 45 | 0.06 | 0.970 | 36.8 | 57 |
| Some College/Associate's Degree | 19.4 | 6 | 21.2 | 25 | | | 20.0 | 31 |
| College Degree or Higher | 41.9 | 13 | 43.5 | 54 | | | 43.2 | 67 |
| Income | | | | | | | | |
| Income <$20,000 | 67.7 | 21 | 66.1 | 42 | 0.03 | 0.865 | 66.5 | 103 |
| Income >$20,000 | 32.3 | 10 | 33.9 | 82 | | | 33.1 | 52 |
| **Health Indicators** | | | | | | | | |
| Suicidal Ideation Ever | 58.1 | 18 | 29.8 | 37 | 7.68 | **0.006** | 35.5 | 55 |
| Attempted Suicide Ever | 29.0 | 9 | 12.9 | 16 | 4.52 | **0.033** | 16.1 | 25 |
| Substance Abuse History | 32.3 | 10 | 33.9 | 42 | 0.03 | 0.856 | 33.6 | 52 |
| Smoker | 54.8 | 17 | 59.7 | 74 | 0.25 | 0.620 | 58.7 | 91 |
| HIV Positive | 12.9 | 4 | 18.6 | 23 | 0.50 | 0.478 | 17.4 | 27 |
| **Social Stressors** | | | | | | | | |
| Childhood Abuse Age <15 | 54.8 | 17 | 25.0 | 31 | 9.10 | **0.003** | 31.0 | 48 |
| Experienced Intimate Partner Violence | 25.8 | 8 | 25.0 | 31 | 0.09 | 0.926 | 25.2 | 39 |
| Perpetrated Intimate Partner Violence | 25.8 | 8 | 8.9 | 11 | 5.40 | **0.020** | 12.3 | 19 |
| Any Victimization as Adult Age ≥18 | 74.2 | 23 | 41.9 | 52 | 10.43 | **0.001** | 48.4 | 75 |
| Verbally Attacked | 74.2 | 23 | 29.8 | 37 | 17.54 | **<0.0001** | 38.7 | 60 |
| Physically Attacked | 29.0 | 9 | 16.9 | 21 | 2.53 | 0.112 | 19.4 | 30 |

| | Transgender Cases n=31 | | Matched Controls n=124 | | Bivariate Comparisons^ | | Total Sample n=155 | |
|---|---|---|---|---|---|---|---|---|
| Sexually Harmed | 22.6 | 7 | 22.6 | 28 | 0.00 | 1.00 | 22.6 | 35 |
| Any Discrimination Ever | 51.6 | 16 | 12.9 | 16 | 16.96 | **<0.0001** | 20.7 | 32 |
| Employment Discrimination | 41.9 | 13 | 11.3 | 14 | 12.84 | **0.0003** | 17.4 | 27 |
| Healthcare Discrimination | 19.4 | 6 | 4.0 | 5 | 6.87 | **0.009** | 7.1 | 11 |

+Transgender cases were compared to cisgender controls in bivariate analyses appropriately adjusted for matching.

^Bivariate statistical comparisons were estimated using conditional logistic regression models (PROC PHREG).

## Table 3

Health Indicators and Social Stressors by Gender Identity for the Full Cohort Sample (n=2,653) and the Nested Matched-Pair Subsample (n=155).

| | Study Design 1 Full Cohort Sample n=2,653[+] | | Study Design 2 Nested Matched-Pair Subsample n=155[^] | | | |
|---|---|---|---|---|---|---|
| | | | Analysis 1 | | Analysis 2 | |
| | Odds Ratio (95% CI) | p-value | Hazard Ratio (95% CL) | p-value | Odds Ratio (95% CI) | p-value |
| **Health** | | | | | | |
| Suicidal Ideation Ever | 3.75 (1.76, 7.96) | **0.0006** | 3.19 (1.40, 7.24) | **0.006** | 3.26 (1.49, 7.10) | **0.003** |
| Attempted Suicide Ever | 2.64 (1.15, 6.08) | **0.022** | 2.92 (1.09, 7.85) | **0.033** | 2.76 (1.01, 7.54) | **0.047** |
| Substance Abuse | 1.18 (0.51, 2.70) | 0.705 | 0.92 (0.38, 2.25) | 0.856 | 0.93 (0.41, 2.10) | 0.861 |
| Smoking | 0.97 (0.47, 2.02) | 0.941 | 0.82 (0.36, 1.83) | 0.620 | 0.82 (0.38, 1.77) | 0.613 |
| HIV-Positive | 0.40 (0.13, 1.26) | 0.118 | 0.67 (0.22, 2.03) | 0.478 | 0.65 (0.20, 2.10) | 0.471 |
| **Social Stressors** | | | | | | |
| Childhood Abuse Age <15 | 3.33 (1.58, 7.04) | **0.002** | 3.70 (1.58, 8.64) | **0.003** | 3.64 (1.62, 8.19) | **0.002** |
| Experienced Intimate Partner Violence | 1.32 (0.55, 3.13) | 0.535 | 1.04 (0.43, 2.56) | 0.926 | 1.04 (0.41, 2.66) | 0.929 |
| Perpetrated Intimate Partner Violence | 4.14 (1.71, 10.01) | **0.002** | 3.03 (1.19, 7.73) | **0.020** | 3.57 (1.22, 10.47) | **0.020** |
| Any Victimization as Adult Age ≥18 | 3.90 (1.67, 9.12) | **0.002** | 4.54 (1.81, 11.39) | **0.001** | 3.98 (1.68, 9.41) | **0.002** |
| Verbally Attacked | 5.84 (2.49, 13.73) | **<0.0001** | 8.75 (3.17, 24.16) | **<0.0001** | 6.76 (2.86, 15.99) | **<0.0001** |
| Physically Attacked | 2.16 (0.90, 5.16) | 0.085 | 2.23 (0.83, 5.97) | 0.112 | 2.01 (0.83, 4.86) | 0.123 |
| Sexually Harmed | 1.15 (0.47, 2.80) | 0.754 | 1.00 (0.40, 2.50) | 0.990 | 1.00 (0.36, 2.76) | 1.000 |
| Any Discrimination Ever | 7.50 (3.45, 16.33) | **<0.0001** | 7.56 (2.89, 19.79) | **<0.0001** | 7.20 (2.59, 20.04) | **0.0002** |
| Employment Discrimination | 5.69 (2.58, 12.59) | **<0.0001** | 5.60 (2.18, 14.35) | **0.0003** | 5.67 (2.17, 14.82) | **0.0004** |
| Healthcare Discrimination | 5.78 (2.13, 15.70) | **0.0006** | 5.51 (1.54, 19.72) | **0.009** | 5.71 (1.32, 24.73) | **0.020** |

[+]Design 1: Full Cohort Sample. Logistic regression models were adjusted for age, race/ethnicity, educational attainment, and income.

[^]Design 2: Nested Matched-Pair Subsample. Transgender patients matched 4:1 with cisgender female and cisgender male controls on age, race/ethnicity, educational attainment, and income. Statistical analyses accounted for the matched case-control design. Analysis 1: Conditional logistic regression models (PROC PHREG in SAS). Analysis 2: Generalized estimating equations (GEEs) (PROC GENMOD in SAS). 95% CI=95% Confidence Interval. 95% CL=95% Confidence Limit.