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Connecting the Dots: Examining Transgender Women's Utilization of Transition-Related Medical Care and Associations with Mental Health, Substance Use, and HIV

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ABSTRACT *Findings on access to general healthcare for transgender people have emerged, but little is known about access to transition-related medical care for transwomen (i.e., hormones, breast augmentation, and genital surgery). Transgender women have low access to general medical care and are disproportionately at risk for substance use, mental illness, and HIV. We conducted an analysis to determine if utilization of transition-related medical care is a protective factor for health risks to transgender women and to investigate if care differs by important demographic factors and HIV status. A secondary analysis was conducted using data from a 2010 HIV surveillance study using respondent-driven sampling to recruit 314 transwomen in San Francisco. Survey-corrected logistic regression models were used to estimate odds ratios for six psychosocial health problems—binge drinking, injection drug use, anxiety, depression, suicidal ideation, and high-risk intercourse—comparing various levels of utilization of transition-related medical care. Odds ratios were also calculated to determine if utilization of transition-related medical care was related to less overlap of risk domains. We found that Latina and African American transwomen had significantly lower estimated utilization of breast augmentation and genital surgery, as did transwomen who identified as transgender rather than female. Overall, utilization of transition-related medical care was associated with significantly lower estimated odds of suicidal ideation, binge drinking, and non-injection drug use. Findings suggest that utilization of transition-related medical care may reduce risk for mental health problems, especially suicidal ideation, and substance use among transwomen. Yet, important racial/ethnic and gender identity disparities in utilization of transition-related medical care need to be addressed.*

KEYWORDS *Healthcare utilization, Transition, Transgender women, HIV, Substance use, Mental health*

INTRODUCTION

The American Medical Association states that mental healthcare, hormone therapy, and sex reassignment surgery are medically necessary forms of therapeutic treatment for people diagnosed with gender identity disorder.[1] Barriers to transition-related medical care are associated with increased risk for violence, suicide, and HIV for transgender people.[2,3] Violence is often the result of being "visibly gender non-

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conforming," which has been found to elicit anti-transgender bias.[2] Suicide and engagement in HIV-related risk behaviors have been explained as coping responses to extreme forms of discrimination and resultant loss in family, employment, and educational opportunities.[4] For transgender women (transwomen), utilization of transition-related medical care, including hormone therapy, breast augmentation, and genital surgery, may be a protective factor for health disparities in mental health, substance use, and HIV, which are all known to disproportionately impact transwomen.[5–8]

Compared with cis-gender females, transwomen report lower overall mental health and quality of life.[9] In a study comparing quality of life between transwomen on and off hormones, hormonal therapy was associated with higher scores in general and mental health.[10] A study by Rotundi found that transgender people ready but not able to medically transition are more likely to have depressive symptoms than peers who have begun the process.[11] The ensuing combination of hopelessness and depression results in participation in high-risk sexual behaviors.[12] Nuttbrock et al. recently found that gender-related abuse also caused depressive symptoms that predicted HIV and STIs for young transwomen.[13]

Hopelessness and depression related to gender identity may also lead to suicidal ideation. A study of 229 transwomen in Virginia found that 58 % had lifetime suicidal ideation, and 62 % of those who had considered suicide attributed it to transition-related issues.[14] In 2006, Clements-Nolle et al. found that almost one third of a sample of more than 500 transgender respondents reported a lifetime suicide attempt.[15] Other studies report lifetime suicide attempt prevalence in the transgender population ranging from 18 to 41 %, which is 15–38 % higher than the overall US population.[2]

A study of drug use among a population-based sample of transwomen found a high prevalence of non-injection drug use.[16] Santos et al. recently study found that 41.4 % of transwomen had used any non-injection substances in the past 12 months, including methamphetamine, cocaine, and crack.[16] Similar to poor mental health outcomes for transwomen, reasons for substance use reported in the literature were coping with transition-related stigma, discrimination, and violence.[8,17,18]

National organizations and researchers have made a call for increased access to transgender-related medical care as one way to reduce poor health outcomes exhibited in this population.[4,19] Utilization of transition-related medical care may have an important positive effect on mental health for transwomen, which may in turn reduce substance use and engagement in high-risk sexual behavior. The following analysis was conducted with a resilience focus.[20] We tested the hypothesis that transwomen with more utilization of transition-related medical care would be less at risk for substance use, HIV, and mental health problems. To this end, we conducted a secondary analysis of HIV surveillance data from a population-based sample of 314 transwomen in San Francisco, CA.

METHODS

Participants

Sampling for the Transfemales Empowered to Address Community Health (TEACH) study was conducted from August to December 2010. Study participants were recruited using respondent-driven sampling (RDS) as a method to obtain a robust and diverse sample of this hard-to-reach population.[21,22] Crude and

corrected demographics and risk characteristics for the sample, as well as seed characteristics, successes, and challenges in the RDS, are provided by Rapues et al.[23] In brief, TEACH participants were eligible for the study if they (1) self-identified as male-to-female or transfemale, (2) were aged 18 years or older, and (3) reported living in San Francisco. Each study participant was screened for study eligibility before enrollment. Verbal informed consent was obtained before starting the behavioral survey. Interviewers administered the behavioral surveys using handheld computers.

Measures

Demographics. Participants reported their age, race/ethnicity, gender identity, and sexual orientation. Additional demographic factors provided were income, level of education, whether or not participants were on disability programs or social welfare, including general assistance, unemployment, or social security income (i.e., social assistance), and HIV status. Rapid HIV testing was offered to all participants regardless of self-reported HIV status.*Transition-related Medical Care*. Utilization of transition-related medical care was defined for those participants who reported use of hormones, breast augmentation, and/or genital surgery. Participants were classified in the surgery group if they reported genital surgery, were classified in the breast augmentation if they reported breast augmentation but not genital surgery, and were classified in the hormones category if they reported hormones but not genital surgery or breast augmentation.*Hormones*. Utilization of hormones was categorized as yes for those who responded affirmatively to "Have you ever taken hormones or other drugs to enhance your gender presentation?"*Breast Augmentation and Genital Surgery (i.e., Sexual Re-Assignment Surgery)*. For these two items, participants were given a list to choose from for the question "What types of gender confirmation surgery have you had?"

Health Outcomes

Mental Health. Mental health problems were identified by determining if participants reported being diagnosed with depression, anxiety, or reported suicidal ideation. Depression and anxiety were coded as positive if they were checked yes as part of the question "Have you been diagnosed with any of the following mental health issues?" Suicidal ideation was coded as positive for yes responses to the question "Have you ever had thoughts or ideations of committing suicide?"*Substance Use*. Binge drinking was coded positive for responses of five or more to the question "On a typical day when you drank alcohol in the past 6 months, about how many drinks did you have?" Non-injection drug use was coded positive if respondents answered yes to using any of the following drugs in the past 12 months: methamphetamine, crack, cocaine, downers, hallucinogens, ecstasy, GHB, ketamine, heroin, or poppers. Injection drug use was coded positive if respondents answered yes to having injected any substance in the last 12 months.*High-risk Intercourse*. High-risk intercourse was defined as unprotected receptive intercourse (URI) in the past 6 months to capture both the specific and highest risk for acquiring HIV (HIV-negatives) and risk for transmitting (HIV-positives). In the case of missing HIV status for the participant, the variable was not defined. [24]

This study received human participants review and approval from the University of California, San Francisco's Committee on Human Research. All participants provided informed consent to participate in this research.

Statistical Analysis

Data analysis for this study was conducted in 2013. The primary hypothesis we tested in this secondary analysis was whether access to transition-related medical care was associated with lower risk for HIV, substance use, and mental health issues. Secondarily, we assessed differences in utilization of transition-related medical care at various levels—none, hormones, breast augmentation, and genital surgery—by key demographic and risk characteristics to determine if there were disparities in access to transition-related medical care. We defined a hierarchical variable for transition-related care, which classifies individuals into groups by prioritizing genital surgery, then breast augmentation, and finally, hormones. We also used non-hierarchical definitions of medical care in our analyses (see below).

In RDSAT,[25] we derived individual-level weights by age group. We then merged these weights into the survey dataset in R.[26] Using the survey package for R,[27] we estimated the percent of individuals in each individual-level demographic group of interest in each category of the hierarchical variable for utilization of transition-related medical care (Table 1). We conducted survey-corrected chi-squared tests to check for associations between the demographic variables and the hierarchical variable for utilization of transition-related medical care (Table 1). We also conducted pairwise tests to compare access to transition-related medical care between demographic groups. This analysis does not use hierarchical definitions of care and is reported in the results text. Using R and the survey package for R (R Core Team, 2012), we also fit survey-corrected logistic regression models to estimate odds ratios for six psychosocial health problems—binge drinking, injection drug use, anxiety, depression, suicidal ideation, and high-risk intercourse—comparing various levels of utilization of transition-related medical care to a reference group of no access (Table 2). These models adjust for age group and race/ethnicity, which are possible confounders for the associations of interest.

RESULTS

Of the 314 transwomen in the sample, 22 had not utilized transition-related medical care as defined for this analysis, 292 had accessed hormones, 49 had breast augmentation, and 28 had genital surgery. Of the 28 transwomen who has genital surgery, 14 also utilized breast augmentation and all utilized hormones. Of the 35 transwomen who accessed breast augmentation, 34 accessed hormones. The four groups differed in age, race, gender identity, health insurance, and HIV status (Table 1). In all age groups, we estimated that hormone therapy was the most utilized component of transition-related care. We estimated that transwomen ages 50+ and 20–29 had the highest utilization of breast augmentation (24.8 and 19.5 %, respectively). Similar findings resulted in the pairwise analysis (21.6 % for transwomen 50+ and 18.4 %). We also estimated that older transwomen in the two age groups between ages 40 and 50+ were the largest proportion of people who had utilized genital surgery (5.2 % for 40–49 and 10.9 % for 50+), and that those in the 50+ age range had the biggest proportion of individuals who did not utilize *any* transition-related medical care (10.1 %). For race, African Americans and Latinas were estimated to have the highest proportions for those who did not utilize *any* transition-related medical care, though these numbers are still relatively small (10 and 9.5 %, respectively). African Americans and whites were estimated to have the biggest proportion utilizing hormones (86.6 and 87.8 %, respectively), but the results were different in the pairwise analysis in which all racial groups reported high

TABLE 1 Demographic factors and HIV status by hormones, breast augmentation, and genital surgery utilization

	None (%)	Hormones (%)	Breast (%)	SRS (%)	*F*	*P* value
Age						
20–29	6.7	73.9	17.5	2.0	4.4 (2,20.2)	0.03*
30–39	4.1	87.6	7.3	1.1		
40–49	4.0	87.6	3.2	5.2		
50+	10.1	65.1	13.9	10.9		
Race						
Asian	0.0	51.5	43.1	5.4	5.2 (2.5,24.7)	0.01*
Black	10.0	86.6	1.3	2.1		
Latino	9.5	73.7	13.3	3.5		
White	0.0	87.8	3.8	8.3		
Other	2.3	77.0	12.8	7.9		
Gender identity						
Female	1.8	78.6	12.9	6.7	4.6 (1.7,16.7)	0.03*
Transgender female	9.9	79.9	6.9	3.3		
Health insurance						
Insurance	6.3	84.1	4.8	4.8	43.8 (2,19.6)	0.00*
No	4.4	52.8	38.5	4.4		
Monthly income						
0–417	4.1	76.8	16.1	3.0	2.2 (1.5,14.8)	0.16
418–833	7.2	86.7	2.2	3.9		
834–1250	8.9	79.2	8.4	3.6		
1251+	1.5	74.6	14.0	9.9		
Education						
Never completed high school	4.7	82.4	9.4	3.4	1.7 (2.3,22.9)	0.21
Completed high school only	10.3	76.2	11.8	1.8		
Some college	2.7	81.1	8.9	7.3		
College degree	9.5	70.9	6.2	13.4		
HIV status						
Negative	2.0	79.9	10.1	8.0	8.7 (1.1,11.3)	0.01*
Positive	12.3	80.9	5.5	1.3		
Social assistance						
Assistance	6.4	81.3	7.8	4.5	1 (1.8,18.2)	0.38
No	5.3	75.4	13.6	5.7		

*$P<0.05$, significant findings compared to no utilization of transition-related services

utilization of hormones (African Americans 90 %, Latinas 90.2 %, others 97.7 %, and whites and Asians reporting 100 % utilization). Asians were estimated to have the biggest proportion that utilized breast augmentation, followed by Latinas and those who identified as "other" (43.1, 13.3, and 12.8 %). Findings were similar for those groups in the pairwise analysis (46.2 % Asians, 19.1 % Latinas, and 15.3 % other). Whites and others were estimated to be the most likely to have utilized genital surgery (8.3 and 7.9 %, respectively). Our data suggests that transwomen who identified as transgender were significantly less likely to have utilized transition-related medical care than transwomen who identified as female (9.9 vs 1.8 % who did not access care ($P=0.03$; $F_{1,10}=27.7$, $P<0.01$). Those who identified as female were estimated to be almost twice as likely to have had breast augmentation (12.9 % compared to 6.9 %) and genital surgery (6.7 % compared to 3.3 %); similar, but

TABLE 2 Survey-corrected logistic regression models to estimate odds ratios for six psychosocial health problems by hormones, breast augmentation, and genital surgery utilization

	Percent	OR (95 % CI)
Depression		
None	53.1	–
Hormones	46.2	0.6 (0.4, 1.0)
Breast	49.2	0.6 (0.2, 2.1)
Genital surgery	44.9	0.5 (0.2, 1.4)
Anxiety		
None	35.1	–
Hormones	28.3	0.7 (0.3, 1.5)
Breast	41.2	1.4 (0.2, 11.5)
Genital surgery	29	0.7 (0.2, 3.1)
Suicidal ideation		
None	75.2	–
Hormones	51.3	0.2 (0.1, 0.5)*
Breast	51.5	0.3 (0.1, 0.6)*
Genital surgery	73.5	0.6 (0.2, 2.4)
Non-injection drug use, 12 months		
None	59.9	–
Hormones	33.1	0.2 (0.1, 0.4)*
Breast	29.2	0.1 (0.0, 1.4)
Genital surgery	12.5	0.1 (0.0, 1.0)
Injection drug use, 12 months		
None	0.2	–
Hormones	12.4	44.7 (2.4, 826.2)*
Breast	9.2	27.9 (1.3, 608)*
Genital surgery	0	0 (0, 0)
Binge drinking		
None	23.6	–
Hormones	13.2	0.4 (0.3, 0.7)*
Breast	7.6	0.2 (0.2, 0.3)*
Genital surgery	0.8	0 (0, 0.2)*
High-risk intercourse		
None	26.6	–
Hormones	23.1	0.7 (0.1, 5.5)
Breast	47.0	3.8 (0.3, 51.5)
Genital surgery	20.7	1.4 (0.1, 22.1)

Percentages are weighted

*$P<0.05$, significance level for utilization levels compared to reference group of no utilization of transition-related medical services

insignificant findings emerged for the pairwise comparisons (16.4 % compared to 9.5 %; $F_{1,10}=1.9$, $P=0.20$) and genital surgery (6.7 % compared to 3.3 %; $F_{1,10}=2.7$, $P=0.13$).

Although most transwomen in San Francisco were estimated to have health insurance (85.2 %), we observed uneven utilization of various types of transition-related medical care. In chi-squared analysis, we estimated that more than 80 % of transwomen with insurance utilized hormones, compared to just over 50 % who accessed hormones without health insurance ($P<0.001$) but for the pairwise

assessment, more than 93.7 % of transwomen with insurance and 95 % without utilized hormones; however, this finding was not significant ($F_{1,10}=0.71$, $P=0.42$). There was much less utilization of breast augmentation for those *with* health insurance. We estimated that 38.5 % of transwomen without health insurance had breast augmentation compared to only 4.8 % of transwomen with health insurance ($P<0.001$), with similar pairwise findings (40.3 % of transwomen without health insurance had breast augmentation compared to only 7.8 % of transwomen *with* health insurance; $F_{1,10}=30.9$, $P<0.01$). HIV status was also significantly related to transition-related medical care. We estimated that almost 98 % of transwomen who were HIV-negative had utilized some form of transition-related medical care, while 87.7 % of transwomen living with HIV were estimated to have utilized transition-related medical care ($P=0.01$; $F_{1,10}=9.24$, $P=0.01$). Utilization of breast augmentation among transwomen living with HIV was estimated to be almost half that of transwomen who were HIV-negative (5.5 vs 10.1 %, respectively, $P=0.01$); this finding was similar in the pairwise estimation (5.8 % among transwomen living with HIV vs 15.4 % among those who were HIV-negative; $F_{1,10}=6.26$, $P=0.03$). Findings for those who utilized genital surgery was estimated to be highest for transwomen who were HIV-negative versus positive (8 vs 1.3 %, $P=0.01$; $F_{1,10}=25.5$, $P<0.01$).

We identified significant differences in suicidal ideation and substance use for transwomen who did not utilize transition-related medical care (Table 2). The estimated odds of suicidal ideation were lower for those who utilized hormones (odds ratio (OR) 0.2, 95 % CI 0.1–0.5) and breast augmentation (OR 0.3, 95 % CI 0.1–0.6) compared to transwomen who had not utilized transition-related medical care. The estimated odds of non-injection drug use were significantly lower for those who had accessed hormones than for those who did not (OR 0.2, 95 % CI 0.1–0.4), but there were no significant differences for non-injection drug use with breast augmentation or genital surgery. The estimated odds of binge drinking were significantly lower for those who utilized hormones (OR 0.4, 95 % CI 0.3–0.7), breast augmentation (OR 0.2, 95 % CI 0.2–0.3), or genital surgery (OR 0.0, 95 % CI 0, 0.2). There were no significant findings related to high risk sex.

DISCUSSION

For transwomen in this study, there may be a protective effect of utilizing transition-related medical care on mental health status and substance use. Though little research has investigated this question, a study of utilization of sexual reassignment surgery has shown that the physical and mental health of transwomen after surgery is comparable to general samples of non-transgender Dutch and American women.[28] In this study, utilization of hormones, breast augmentation, and genital surgery were all associated with lower odds of suicidal ideation, binge drinking, and non-injection drug use.

In the study of Testa et al., suicide attempts were significantly related to experiencing physical violence, often because of the respondent's gender identity or presentation.[29] The link between stigma and depression may be strong in the trans community because transgender people face an inordinate amount of stigma due to the perception that they transgress sexuality and gender norms.[30] For transwomen, having an appearance that does not transgress typical conceptions of gender may be protective from violence and discrimination, and subsequently to depression and suicide. Utilization of transition-related medical services may also alleviate mental health concerns due to internal struggles. There is research

demonstrating improved quality of life for transwomen who have undergone facial feminization surgery (FFS) and/or gender reassignment surgery (GRS).[9] In that study, transwomen without surgical intervention in the overall study had statistically significant lower mental health scores compared to the general female population.[9]

The benefits of transition-related medical care for mental health outcomes may also extend to substance. We found significantly lower odds of binge drinking and non-injection substance use for those who utilized transition-related medical care. Though little literature exists to date, a recent study of the use of non-prescribed drugs among transgender adults was related to low self-esteem, discrimination, and poor mental health outcomes.[17] Drug abuse is a known coping mechanism for transphobia, discrimination, and stressful life events.[8,31,32] Utilization of transition-related care may ameliorate some of these internal and external sources of stress that put transwomen at risk for substance abuse.

We also found disparities in utilization of transition-related medical care by important demographic factors. Perhaps not surprisingly, transwomen with health insurance, those in the high-income bracket measured, those with the highest educational attainment, those not on social assistance, and those who identified as female reported the highest utilization of genital surgery. Having health insurance and being able to pay for genital surgery may be a marker for having a higher income. Conversely, access to genital surgery, in addition to other feminizing procedures, may confer the benefit of less transgender-related discrimination, thus allowing transwomen to attain a higher education and better employment. Moreover, those who had genital surgery may be more likely to identify as female after utilizing this procedure. It is important to note that not all transwomen desire to access the range of transition-related medical care we discuss in this study. However, this particular population-based sample speaks to the desire that many transwomen have to do so. The fact that those who did not have health insurance comprised the larger segment of the population who utilized breast augmentation may speak to the desire for such services in spite of insurance restrictions that typically do not consider this procedure medically necessary. Most important, insurance programs that cover breast augmentation and genital surgery due to their medical necessity would decrease this disparity in utilization.

Utilization also significantly differed by age and race. African Americans and Latinas made up the largest number of individuals with no utilization of transition-related medical care. Some research suggests that the interpersonal stigma encountered with physicians and the need to educate providers is an important barrier to care for all transwomen.[33,34] Where trans-specific services exist, other barriers may be the perceived cost of care or past negative care experiences with other providers that may make transwomen reluctant to seek services.[34] Transwomen who are in a racial/minority group may be even more reluctant to attempt to access to care because of racial discrimination on top of that related to transgender identity.[35]

Interesting findings arose between transwomen who were living with HIV and those who were not. Both has high utilization of hormones, but transwomen living with HIV had less utilization of genital surgery and breast augmentation. One hypothesis to explain the low utilization of surgical procedures is that transwomen who are HIV-positive had concerns about health complications that could result from surgery that could add an additional burden on top of their HIV care. Alternatively, being HIV-positive may be a marker for larger structural challenges. Transwomen who are living with HIV may be of low income and uninsured; thus,

breast augmentation and genital surgery may not be an option for them despite having the desire.

The primary limitation to this study is the measures used for this analysis. The original HIV surveillance study from which these data were taken was not to assess the relationship between transition-related medical care utilization and mental health, substance use, or HIV risk. Mental health measures were self-reported diagnoses, not symptoms, so it is possible that mental health problems were underreported in these data. The fact that depression was not related to lack of utilization of care but suicidal ideation was correlated may be an indication of this problem. However, given these significant findings, future research is needed to examine transition-related medical care utilization and access among transwomen. Temporality is also an issue inherent in cross-sectional studies. One related limitation is that it is difficult to tell whether access to transition-related medical care occurred in whole or in part before participants acquired HIV or the opposite. Nonetheless, the relationship between utilization of transition-related medical care and HIV risk are demonstrated in these data and more research is needed to determine whether utilization proximally and/or indirectly mitigates risk for HIV.

Despite these limitations, this study provides important data from research using a rigorous sampling methodology allowing for information representative of the San Francisco population of transwomen. These data do point to a need for increased utilization of transition-related medical care, which could be precipitated if more medical providers had such training. To date, there is no specific training in medical schools in the USA on transgender health. A relatively small number of clinicians have experience and training working in transgender health, and health insurance companies have typically not covered services critical to the transition-related medical needs of transwomen (e.g., breast augmentation).[2] However, a number of organizations and community clinics have taken on the responsibility of providing care for this population. Additionally, training of medical professional may reduce discrimination in medical settings and the pathologizing of transwomen that may decrease mental health stress related to transphobia. Medical schools should also consider the inclusion of a transgender health course and specialty in anticipation of the increased needs within all hospital and care sites in the USA.

What is already known on this subject?

Access and utilization of transgender-related medical care is very important to the health and well-being of transwomen Though some literature exists exploring stigma and barriers to primary medical care, there is a paucity of research examining utilization of transgender-specific medical care for transwomen. This study was conducted to understand if there is a protective effect of utilization of transgender-related medical care—specifically hormone therapy, breast augmentation, and genital surgery—on mental health, substance use, and HIV-related risk behaviors.

What this study adds?

This is the first study, to our knowledge, to use a population-based sample for an investigation of utilization of transgender-specific medical care among transwomen. This study found that utilization of transgender-related medical care may reduce risk for mental health problems, especially suicidal ideation, and substance use among transwomen. Yet, disparities were found in utilization of transition-related medical care for African American and Latina transwomen, those with health insurance, and those who identified as transgender need as opposed to female, pointing to areas of improvement for increasing access to care

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REFERENCES

1. American Medical Association. *Resolution 122—removing financial barriers to care for transgender patients*, 2008.
2. Grant JM, Mottet LA, Tanis J, Herman JL, Harrison J, Keisling M. *National Transgender Discrimination Survey Report on health and health care: National Center for Transgender Equality*, 2010; Washington, DC.
3. Stroumsa D. The state of transgender health care: policy, law, and medical frameworks. *Am J Public Health*. 2014; 104(3): e31–8. doi:10.2105/AJPH.2013.301789.
4. Anderson PL, Glidden DV, Liu A, et al. Emtricitabine-tenofovir concentrations and pre-exposure prophylaxis efficacy in men who have sex with men. *Sci Transl Med*. 2012; 4(151ra25): 151. doi:10.1126/scitranslmed.3004006.
5. Grossman AH, D'Augelli AR. Transgender youth: invisible and vulnerable. *J Homosex*. 2006; 51(1): 111–28.
6. Blosnich JR, Brown GR, Shipherd Phd JC, Kauth M, Piegari RI, Bossarte RM. Prevalence of gender identity disorder and suicide risk among transgender veterans utilizing veterans health administration care. *Am J Public Health*. 2013; 103(10): e27–e32. doi:10.2105/AJPH.2013.301507.
7. Nuttbrock L, Hwahng S, Bockting W, et al. Psychiatric impact of gender-related abuse across the life course of male-to-female transgender persons. *J Sex Res*. 2009; 47(1): 1–12.
8. Clements-Nolle K, Marx R, Guzman R, Katz M. HIV prevalence, risk behaviors, health care use, and mental health status of transgender persons: implications for public health intervention. *Am J Public Health*. 2001; 91(6): 915–21.
9. Ainsworth TA, Spiegel JH. Quality of life of individuals with and without facial feminization surgery or gender reassignment surgery. *Qual Life Res*. 2010; 19(7): 1019–24. doi:10.1007/s11136-010-9668-7.
10. Gorin-Lazard A, Baumstarck K, Boyer L, et al. Is hormonal therapy associated with better quality of life in transsexuals? A cross-sectional study. *J Sex Med*. 2012; 9(2): 531–41. doi:10.1111/j.1743-6109.2011.02564.x.
11. Rotondi NK, Bauer GR, Scanlon K, Kaay M, Travers R, Travers A. Nonprescribed hormone use and self-performed surgeries: "do-it-yourself" transitions in transgender communities in Ontario, Canada. *Am J Public Health*. 2013; 103(10): 1830–36. doi:10.2105/AJPH.2013.301348.
12. DeSantis JP, Patsdaughter CA. Which came first-the chicken or the egg? the cycle of abuse, violence, and/or neglect and HIV. *J Assoc Nurses AIDS Care: JANAC*. 2013; 24(4): 285–7. doi:10.1016/j.jana.2013.04.002.
13. Nuttbrock L, Bockting W, Rosenblum A, et al. Gender abuse, depressive symptoms, and HIV and other sexually transmitted infections among male-to-female transgender persons: a three-year prospective study. *Am J Public Health*. 2013; 103(2): 300–7. doi:10.2105/AJPH.2011.300568.
14. Xavier J, Honnold JA, Bradford J. The health, health-related needs, and lifecourse experiences of transgender Virginians. In: Policy CfP, ed. *Community Health Research Initiative: Virginia Commonwealth University*, 2007.
15. Clements-Nolle K, Marx R, Katz M. Attempted suicide among transgender persons: the influence of gender-based discrimination and victimization. *J Homosex*. 2006; 51(3): 53–69.

16. Santos GM, Rapues J, Wilson EC, et al. Alcohol and substance use among transgender women in San Francisco: prevalence and association with human-immunoficiency virus infection. *Drug and Alcohol Review*. 2014; 33(3): 287–95. doi: 10.1111/dar.12116.
17. Benotsch EG, Zimmerman R, Cathers L, et al. Non-medical use of prescription drugs, polysubstance use, and mental health in transgender adults. *Drug Alcohol Depend*. 2013; 132(1–2): 391–4. doi:10.1016/j.drugalcdep.2013.02.027.
18. Bowers JR, Branson CM, Fletcher J, Reback CJ. Differences in substance use and sexual partnering between men who have sex with men, men who have sex with men and women and transgender women. *Cult, Health Sex*. 2011; 13(6): 629–42. doi:10.1080/13691058.2011.564301.
19. Sevelius JM. Gender affirmation: a framework for conceptualizing risk behavior among transgender women of color. *Sex Roles*. 2013; 68(11–12): 675–89. doi:10.1007/s11199-012-0216-5.
20. Herrick AL, Stall R, Goldhammer H, Egan JE, Mayer KH. Resilience as a research framework and as a cornerstone of prevention research for gay and bisexual men: theory and evidence. *AIDS Behav*. 2014; 18(1): 1–9. doi:10.1007/s10461-012-0384-x.
21. Magnani R, Sabin K, Saidel T, Heckathorn D. Review of sampling hard-to-reach and hidden populations for HIV surveillance. *AIDS*. 2005; 19(Suppl 2): S67–72.
22. Heckathorn D. Respondent-driven sampling: a new approach to the study of hidden population. *Soc Probl*. 1997; 44(2): 174–99.
23. Rapues J, Wilson EC, Packer T, Colfax GN, Raymond HF. Correlates of HIV infection among transfemales, San francisco, 2010: results from a respondent-driven sampling study. *Am J Public Health*. 2013; 103(8): 1485–92. doi:10.2105/AJPH.2012.301109.
24. Campbell MS, Gottlieb GS, Hawes SE, et al. HIV-1 superinfection in the antiretroviral therapy era: are seroconcordant sexual partners at risk? *PLoS One*. 2009; 4(5): e5690. doi:10.1371/journal.pone.0005690.
25. Volz E, Wejnert C, Cameron C, et al. *Respondent-driven sampling analysis tool (RDSAT) version 7.1*. Ithaca, NY: Cornell University; 2012.
26. Team RDC. R: A language and environment for statistical computing. Secondary R: A language and environment for statistical computing. 2012. http://www.R-project.org/. Accessed January 2013.
27. Lumley T. *Complex surveys: a guide to analysis using R*. Hoboken NJ: Wiley; 2010.
28. Weyers S, Elaut E, De Sutter P, et al. Long-term assessment of the physical, mental, and sexual health among transsexual women. *J Sex Med*. 2009; 6(3): 752–60. doi:10.1111/j.1743-6109.2008.01082.x.
29. Testa RJ, Sciacca LM, Wang F, et al. Effects of violence on transgender people. *Prof Psychol: Res Pract*. 2012; 43(5): 452–59. doi:10.1037/a0029604.
30. Mays VM, Cochran SD. Mental health correlates of perceived discrimination among lesbian, gay, and bisexual adults in the United States. *Am J Public Health*. 2001; 91(11): 1869–76.
31. Nemoto T, Operario D, Keatley J, Han L, Soma T. HIV risk behaviors among male-to-female transgender persons of color in San Francisco. *Am J Public Health*. 2004; 94(7): 1193–9.
32. Sausa LA, Keatley J, Operario D. Perceived risks and benefits of sex work among transgender women of color in San Francisco. *Arch Sex Behav*. 2007; 36(6): 768–77. doi:10.1007/s10508-007-9210-3.
33. Poteat T, German D, Kerrigan D. Managing uncertainty: a grounded theory of stigma in transgender health care encounters. *Soc Sci Med*. 2013; 84: 22–9. doi:10.1016/j.socscimed.2013.02.019.
34. Sanchez NF, Sanchez JP, Danoff A. Health care utilization, barriers to care, and hormone usage among male-to-female transgender persons in New York City. *Am J Public Health*. 2009; 99(4): 713–9. doi:10.2105/AJPH.2007.132035.
35. Wilson EC, Arayasirikul S, Johnson K. Access to HIV care and support services for African American transwomen living with HIV. *Int J Transgend*. 2014; 14(4): 182–95.