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Global Health Burden and Needs of Transgender Populations: A Review

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Summary

Transgender people are a diverse population affected by a variety of negative health indicators across high, middle, and low income settings. Studies consistently document high prevalence of adverse health outcomes in this population, including HIV and other sexually transmitted infections (STIs), mental health distress, and substance use and abuse. However, many other health areas remain understudied, population-based representative samples and longitudinal studies are lacking, and routine surveillance efforts for transgender population health are scarce. The absence of survey items with which to identify transgender respondents in general surveys often limits availability of data to estimate the magnitude of health inequities and characterize transgender population-level health globally. Despite limitations, there are sufficient data highlighting the unique biological, behavioral, social, and structural contextual factors surrounding health risks and resiliencies for transgender people. To mitigate these risks and foster resilience, a comprehensive approach is needed that includes gender affirmation as a public health framework, improved health systems and access to healthcare informed by high quality data, and effectively partnering with local transgender communities to ensure responsiveness of and cultural specificity in

programming. Transgender health underscores the need to explicitly consider sex and gender pathways in epidemiologic research and public health surveillance more broadly.

Keywords

transgender; disease burden; sex and gender

Introduction

Transgender people have an assigned sex at birth different from their current gender identity or expression and represent a diverse population across regions and within countries worldwide (Sidebar 1).[1,2] Although accurate data concerning the size of the transgender population globally are lacking, and population prevalence depends on transgender "case" definition, estimates suggest transgender identity prevalence of 0.3%−0.5% (see also White and colleagues Paper 1 of this issue).[3] Despite small numbers, transgender people are a population burdened by substantial adverse health indicators across high, middle, and low income settings.[4,5] Health inequities for transgender people are hypothesized to be multifactorial with risks including systematic social and economic marginalization, pathologization, stigma, discrimination, and violence, including healthcare systems and settings.[6] The purpose of this data synthesis is to characterize the global health burden facing transgender populations, including the specific contexts and multiple determinants of health affecting them. Data from the peer-reviewed scientific literature were reviewed to characterize the burden and distribution of disease in transgender populations globally. This synthesis of information describes transgender population health and leverages data from different regions of the world to highlight the unique sex- and gender-related biological, behavioral, social, legal, and structural factors surrounding health risks and resiliencies for this underserved population. The review further seeks to inform future advocacy, funding, health surveillance, public health policy, monitoring, and reporting processes, and research initiatives to not only address and improve health, but also to promote health equity, social justice, and human rights, including the right of all people to self-determination.

Review and Synthesis

A review and synthesis of peer-reviewed recent literature (2008–2014) in transgender health was conducted. "Transgender" and associated terms (e.g., hijra, waria, travesti, trans masculine, MTF) were searched alongside health terms (e.g., HIV, disease, illness, mental health), related concepts (e.g., wellbeing), social factors (e.g., discrimination, stigma). Search databases included: Pubmed, Embase, OVID, PsychInfo, Web of Science, and ProQuest.

Inclusion criteria were: (1) any study design that included quantitative data on disease burden in transgender people of any age; (2) studies published between January 1, 2008-December 20, 2014 (inclusive) to limit information to the current context for this population; (3) studies in English, French, and Spanish. Primary exclusion criteria were: (1) studies published before 2008; (2) studies appearing online ahead of print; (3) qualitative studies; (4) studies focused on intersex individuals; (5) studies focused on neuroanatomy or

neuropsychology; (6) clinical studies focused on gender reassignment outcomes including studies of sexual satisfaction and quality of life with surgical outcomes given recent reviews on these topics[7,8]; (7) studies where lesbian, gay, bisexual, transgender (LGBT) or men who have sex with men (MSM) participants were not disaggregated by gender identity (unless data were analyzed separately and meaningful inferences could be made about transgender people). Due to the overall objective of obtaining epidemiological trends among transgender people, sources were not excluded on the basis of quality provided that they met all the inclusion criteria and exclusion criteria as defined above (Sidebar 2).

First and second reviewers (RM, CH) conducted parallel screening of titles found in the search. If either one or both reviewers selected the abstract for full article review, the article was pulled for full article review. If at the full article review there was a disagreement between the first two reviewers regarding data extraction, a third reviewer (SR) resolved the disagreement.

A codebook was created and refined to guide data abstraction using a collaborative consensus-based process among members of the author team. Health-related outcome categories were identified to synthesize and further organize the literature reviewed. The team incorporated principles from grounded theory,[9] whereby codes were iteratively grouped into concepts and concepts into categories. Six health-related outcome categories emerged. Through this process in became apparent that stigma and discrimination were not only determinants of health (illness), but also critical outcomes in and of themselves for transgender populations globally.

An expert consultation with selected transgender health researchers was also conducted, and additional articles recommended that satisfied the inclusion criteria were included for data abstraction. The unique number of studies were captured, as well as the number of data points—for example, if an article reported on four health outcomes, it contributed four data points to the review. Similarly, if data were reported for specific subgroups (e.g., mental health prevalence estimates for trans feminine and trans masculine people separately), these were counted as unique data points and extracted accordingly (Sidebar 3).

Overall Research Trends

A total of 116 studies in 30 countries were identified. Table 1 presents the health outcome studies and key data extracted from each study (the table is organized by region, country, and then author). Table 2 presents health-related data on stigma, discrimination, violence/victimization, and sex work. A map of the geographic distribution of current studies in transgender health is shown in Figure 1. The vast majority of research is in the United States. Several countries have a single study (e.g., Mexico) or between two and five studies (e.g., Canada, Australia, Iran). No other country except for the United States has six or more studies reporting data in transgender health. Indeed, for the majority of countries no data are available at all and for many including the content of Sub-Saharan Africa, only a single study exists. This gap in research is important to consider in terms of the generalizability of current health research across regions and geographic settings. We note a growing interest in transgender health research over time, particularly in most recent years in 2013 and 2014 as

shown in Figure 2. We also note a dearth of research on transgender children, adolescents and youth with only 15 studies.

Distribution of Studies by Sex and Gender

The distribution of studies by natal sex (e.g., sex assigned at birth) are depicted graphically in Figure 3. The majority of studies focus on natal males. Operationalization of "transgender" is inconsistent making generalization of scientific findings difficult by gender identity. Specifically, we found 95 distinct operationalizations of "transgender" across the 116 studies. These can be summarized into two approaches to measuring transgender populations: identity-based measures (i.e., identify as transgender, FTM, MTF, trans masculine, trans feminine, transsexual, genderqueer; n=75/95, 78.9%) or psychiatric clinical diagnostic criteria such as gender identity disorder (GID) or gender dysphoria (GD) (n=20/95, 21.1%). The predominance of identity-based research is consistent with the trend toward de-pathologization of gender diversity in transgender health research.[10]

Summary of Methodological Limitations in Current Research

The most common study design is cross-sectional (90/116, 77.6% of studies). We note the dearth of longitudinal data (7/16, 6.0% of studies), and identified only a single randomized-controlled efficacy trial of an intervention to improve the health of transgender people globally; two studies utilized a pre-/post-intervention design. Only three studies were identified that used probability-based sampling methods (3/116, 2.6%). Many studies use convenience sampling methods and deploy multiple sampling strategies simultaneously (e.g., online, venue-based, peer referral, snowball sampling). Some sampling schemes are more focused, for example clinic samples (29/116, 25.0%), exclusively Internet-based samples (17/116, 14.7%), or respondent-driven samples (8/116, 6.9%). Most studies (95/116, 81.9%) are descriptive, only presenting prevalence data (predominately unadjusted prevalences) and do not present any measures of association to examine the relationship of risk factors(s) and/or social determinant(s) with health outcomes. Few studies compare transgender and non-transgender people (e.g., offer comparative data); most are within-group focused not allowing for documentation of health inequities.

Data Points Categorized By Health Outcome Domain

Overall 981 unique health-related data points were identified from the 116 studies. Figure 4 presents these data points grouped into six health-related outcome categories by frequency: (1) mental health (e.g., depression, anxiety), (2) sexual and reproductive health (e.g., HIV, STIs), (3) substance use (e.g., alcohol, drugs), (4) violence/victimization (e.g., sexual, physical abuse), (5) stigma/ discrimination (e.g., internalized stigma, fired from employment), and (6) general health (e.g., diabetes, cancer). High burden of adverse health and disease outcomes face transgender populations globally where data are available. We briefly summarize data on each of the health areas below.

(1) Mental Health

Mental health is the most commonly studied area of transgender health (n=303 data points; 30.9%). The majority of data points focus on mood disorders (n=96, 31.6%), suicidal and non-suicidal self-injury (n=50, 16.5%), and anxiety disorders (n=44, 14.5%). Mental health outcomes are inconsistently operationalized across studies. For example, within mood disorders (n=96), there are 80 data points focused on depression. Many studies of depression use diverse clinical screening cut-points for clinical syndromes (e.g., past week depressive distress assessed via Center for Epidemiologic Studies Depression Scale (CESD) with differing cut-points), differing timeframes of assessment (e.g., lifetime depression, past week depressive distress, clinical diagnosis of current major depressive episode), and heterogeneous subpopulations of transgender people (e.g., MTF, hijra, FTM). Despite these limitations, data consistently show that transgender adults are burdened by mental health concerns. For example, depression prevalence estimates are as high as 64.2% (CESD 16+) in a sample of 573 transgender women[11] and 63.0% (operationalized as CESD 20+) in a sample of 230 MTF.[12] Studies using clinical diagnosis of depression rather than screeners show lower prevalences. For example, 31.4% in 207 MTF (% in clinical range of MMPI) in Amsterdam[13] and 36.2% experiencing a current major depressive episode in 253 transgender people (both MTF and FTM) in Australia.[14]

Understanding risk factors for mental health problems is critical to decreasing global mental health morbidity, yet remarkably few studies have done so in transgender people. The majority of mental health research (n=161/981 data points, 53.2%) report prevalence data only. Measures of association between risk factors and mental health conditions are an important area for future research efforts. Additional gaps in mental health research include few studies examining PTSD or traumatic stress (n=3 data points), surprising given many transgender people experience violence and/or victimization (see below for summary); and little data on eating disorders (n=3 data points), despite body image concerns[15] and the hypothesized relation between body image and sexual risk.[16]

(2) Sexual and Reproductive Health

Sexual and reproductive health is the second most frequently studied area of transgender health (n=219/981 data points; 22.3%). The number of STI data points compared to other sexual and reproductive health data points is inflated because many studies of STIs tested for multiple specific organisms (e.g., gonorrhea and chlamydia), thereby creating multiple data points for that study. Transgender women are disproportionately impacted by HIV and other STIs, therefore it may not be surprising that 75% (163/219) of the sexual and reproductive health outcomes in the published literature include HIV or STI prevalence. However, when examined by assigned sex at birth, it becomes clear that this focus on HIV/STIs reflects a focus on transgender people assigned a male sex at birth. This also demonstrates that other sexual and reproductive health concerns receive little attention in research among transgender populations. For example, only 15 data points addressed non-infectious reproductive health concerns, and none addressed fertility or pregnancy.

(3) Substance Use

Substance use is the third most frequently studied health indicator (n=193/981 data points). Data more commonly focus on alcohol (n=35 data points, 18.2%), marijuana (n=25 data points, 13.0%), any illicit drug use (type not specified, n=16 data points, 8.3%), and tobacco use (n=14 data points, 7.3%). A noteworthy finding is that research on substance abuse, dependence, or disorder only comprises 5.2% of substance use data (n=10 data points). Substance use outcomes are heterogeneous and inconsistently operationalized across data points, including time of recall (e.g., last 30 days, last 3 months, past 6 months, last year, lifetime) making comparison across studies difficult. Substance use has been conceptualized as a coping mechanism to manage minority stress;[17] however, scarce are data examining this association among transgender people.

(4) Violence/Victimization

Research on violence and/or victimization experiences among transgender people faces methodological challenges, most commonly use of unstandardized and often non-validated measures of violence and victimization. Despite these limitations, research demonstrates a high burden of violence and/or victimization experiences in transgender people globally. Overall, 105 data points were identified examining violence and/or victimization in transgender people, 80 data points (76.2%) presenting prevalence data only. The median prevalence estimate for violence and/or victimization experienced is 44.0%. Violence and/or victimization data points were sexual (34.3%), physical (17.1%), psychological/ emotional (6.7%), verbal (3.8%), or type not specified (38.1%). Verbal and psychological/ emotional violence and victimization appear under-researched highlighting the need for studies to include multiple dimensions of abuse.

(5) Stigma/ Discrimination

Only 14 articles (93 data points) in the published literature included stigma/discrimination as health outcomes. Of these 14 studies, the majority (n=10) were conducted in North America. Chile, Argentina, and Iran are the only other countries that published data on stigma/ discrimination against transgender people as health outcomes, leaving notable gaps in data from regions outside of North and South America. A little over half (54%) of outcomes specifically address stigma and discrimination in healthcare, including denial of care and postponement of care due to stigma. However, there remains a dearth of literature on the outcomes of interventions designed to reduce anti-transgender stigma and discrimination. Clearly, more research is needed to better understand how to address stigma and discrimination in order to improve healthcare access and utilization for transgender populations (Sidebar 4).

(6) General Health

The general health of transgender people is the least researched aspect of the transgender global burden of disease. The general health category (e.g., mortality, diabetes, hormone use, metabolic syndrome, cancer) has the fewest data points (n=68/981 data points) with 40 distinct health indicators (28 health indicators have only a single data point). The majority of research (76.5%, n=52) reports unadjusted prevalence estimates only.

Current Gaps and Opportunities

For transgender people, health inequities are hypothesized to arise from systematic exposure to multiple, intersecting social stressors, including legal and other structural factors that are a result of being part of a socially marginalized group.[18] Social and economic exclusion are therefore conceptualized as causal pathways to adverse health—however, we found very few studies actually linking these social stressors to health indicators. Further, study designs are largely cross-sectional, limiting causal inference. Also scarce are intervention studies examining changes in health status alongside implementation of heath behavior or other social and structural change interventions to improve the lives of transgender people. Studies of legal issues and their impact on transgender health are needed, including research on structural factors relating to human rights like criminalization (related to gender identity and expression as well as sex work) and legal recognition.

The Way Forward: Recommendations

Below we offer recommendations based on our research synthesis to guide future health research focused on transgender populations.

"Count" Transgender Populations

Social determinants (e.g., age, sex, gender, race, socioeconomic status) shape health status of people across the world. The World Health Organization (WHO) defines social determinants of health as "the conditions in which people are born, grow, live, work and age" and states explicitly that "these circumstances are shaped by the distribution of money, power and resources at global, national and local levels."[19] Social inequalities resulting from social determinants are conceptualized as driving health inequities.[20] Health inequities refer to avoidable, remediable, unfair health inequalities between populations.[20] A social determinants perspective explicitly links reductions in health inequality to achievement of health equity.[21]

Health inequality monitoring refers to the systematic tracking of health inequalities over time, including the magnitude of disparities in the face of interventions such as policies, programs, and practices.[22] Equity stratifiers refer to dimensions of social inequalities being monitored (i.e., place or residence, race or ethnicity, etc.).[22] Few population-level data exist to monitor the health of transgender people worldwide. This is because routine national and international health surveillance efforts in the vast majority of countries do not assess gender identity as an equity stratifier. This is a major gap in furthering understanding of the health inequities burdening transgender people (Sidebar 5). It is also a missed opportunity to understand intersecting social statuses (e.g., disability status, caste) and health. There is a need for surveillance definitions of transgender people for global use. Studies restricting samples to people with diagnosed gender identity disorder or gender dysphoria do not capture the range of transgender people who comprise the overall population (e.g., non-binary transgender identities).

As White and colleagues described in Paper 1 of this issue, a recommended approach to capturing health-related data by transgender status is to use a two-step method.[3,23–25] This

method uses assigned sex at birth and current gender identity to cross-classify respondents as transgender (discordant sex/gender responses) or non-transgender (concordant sex/gender responses). It also allows for diverse gender identities to be captured. Researchers have operationalized the two-step method using a variety of questions and response options (Sidebar 6). There have also been differences in the order of question asking (sex followed by gender identity, or vice versa) and whether gender identity is assessed using “check one” or “check all” instructions. The strength of a two-step method is that it explicitly captures dimensions of both natal sex (sex at birth) and gender (current gender identity). It also permits categorization of subpopulations of transgender people by natal sex and gender identity. A two-step method has not been used widely across the world. Studies are needed in different contexts and settings that implement this approach using consistent definitions of transgender. We recommend that special care be taken in designing instructions and lead-in text for the two-step method, including adaptations for the specific geographic context in terms of language and cultural understandings of sex and gender. Training of interviewer staff and research teams are also recommended, as well as a process to confirm transgender responses in order to minimize misclassification bias.

Put the “Gender” Back into Transgender Health

Sex and gender are determinants of health across a wide variety of geographic contexts.[19,26–31] Causal mechanisms for poor health are both sex- and gender-related; however, sex and gender are commonly conflated in research.[26] For example, terms referring to assigned sex at birth (“male” and “female”) and gender identity (“men” and “women”, respectively) are commonly used interchangeably in the scientific literature, including in transgender research. This leads to a lack of attention as to whether health differences are due to sex, gender, both, or neither,[26] which affects understanding of health inequities. Synthesizing research on the health of transgender people reveals gaps in the specificity and operationalization of sex and gender differences in population research more broadly.

Developing new conceptual models and integrating and testing existing frameworks is needed to guide research in transgender population health. Several conceptual models have been applied to transgender health, including social determinants and social ecological models,[19,32] gender affirmation,[33] gender minority stress,[17,34,35] syndemic production,[36] and health and human rights.[2,37] These models overlap in their shared recognition that multiple and intersecting levels of risk and resiliency shape the health of transgender people and that, therefore, multilevel contextually-relevant interventions are necessary. However, these models do not apply a gender analysis,[26] a social epidemiologic approach that explicitly considers socially derived gender exposures and outcomes, sex-linked physiological or biological differences, and the interplay of both gender and sex.[26,38–40] Transgender people share many of the same risks and social and structural determinants of disease, health, and wellbeing as non-transgender people (e.g., socioeconomic status). However, transgender people also experience unique biological, behavioral, social, and structural contextual factors surrounding health risks and resiliencies—including those related to challenging the congruence or conflation of sex and gender such as legal recognition of gender identity. We therefore recommend that future research in transgender population health use a *gendered situated vulnerabilities* framework to investigate whether

and how sex-gender mechanisms[26] shape health-related risks and resiliencies for population health outcomes.

Gendered situated vulnerabilities refer to the ways in which health is shaped by the distribution of power along lines of gender.[41,42] The vulnerabilities transgender people face vis a vis health are related to challenging gendered relations of power and policing of gender by social structures. We refer to these as *situated* because the health risks and resiliencies facing transgender populations cannot be understood devoid of the multilevel sexed and gendered contexts which shape them. We use the term *vulnerabilities* to describe the ways that these contexts put transgender people "at risk for risk."[43,44] We do not conceptualize transgender people as an inherently vulnerable population; but rather, view this community as a population facing sex- and gender-related situated vulnerabilities for different health conditions. As shown in the synthesis of current research, some of the health conditions differentially distributed by transgender status include mental health, infectious diseases, and substance use and abuse.

Integrate Health and Human Rights and Multi-Sectorial Approaches

Transgender people have the right to legal recognition of their gender identity, access to gender affirmation, and a right to self-determination and autonomy.[45–48] Although the Office of the High Commissioner for Human Rights denounces widespread discrimination against transgender people,[6] systematic social and economic marginalization, stigma, pathologization, discrimination, violence, and other human rights violations, including in healthcare, continue to drive and/or exacerbate health inequities. Improving the health and access to healthcare of transgender people globally requires a wide array of stakeholders and mobilizing diverse multi-sector partnerships. Many barriers to healthcare and adverse health risks are addressable through law and policy, which some countries have begun to address through gender identity laws, legislation regarding gender affirmative care, anti-discrimination and protective measures. For example, in 2012 the Argentinian Senate passed the first gender identity law in the world authorizing transgender people to change their legal gender markers with the only requirement being a simple administrative process, with improved access to hormonal treatments and/or surgical procedures that only requires informed consent (as per standards of care endorsed by the World Professional Association for Transgender Health; WPATH),[49,50] and under governmental coverage.[51] Evaluation of the effect of these legal changes and improvements on the health of transgender people is needed. Implementation science, an emerging domain of methods aiming to harness generalizable information that can inform the effectiveness of programs and policies,[52] is well-suited for such evaluations.

Transgender health research is not without challenges. Public health researchers must work together with policymakers, healthcare providers, and communities and their political organizations to address systematic institutionalized marginalization. In general, social, ethnical, and psychological aspects of research are not considered "high" on the hierarchy of evidence-for-practice.[53,54] This is compounded by challenges of researching a discriminated population where there is institutionalized censure, and in some cases criminalization, of not only transgender communities themselves, but the researchers and clinicians who engage

with them. In most countries, transgender is not included in formal training curricula for medicine, epidemiology, public health, education, legal, and social service systems, shaping a poor foundation for research and core competency in transgender health. Integrating public health practice, research, education, advocacy, and funding is critical to address the health needs of transgender people and their allies seeking to understand and ameliorate transgender health disparities.

Engage Transgender People: A Participatory Population Perspective

Within transgender communities, immediate survival needs may supersede perceived health risks and undermine traditional research approaches—i.e., research may seem to have little meaning and relevance to people's lives. Poverty, food insecurity, mobility, and security issues may affect research participation and attrition rates, as may intersectional issues of sex work, refugee status, and homelessness. Inclusion of transgender people in public health efforts and working with the local community and its political organizations in each geographic area to advance transgender health and human rights agendas is essential. The use of a "participatory population perspective"[55] and community-based participatory research principles[56] represent an important future step to ensure health-related research and interventions are responsive to the real-life issues transgender people face. This means conducting research "with" and not "on" transgender populations,[57] as well as being transparent in methodological sections of research articles about whether and how transgender communities were engaged in the research process. Meaningful engagement of transgender people will ensure research is culturally specific to local community needs, research questions and surveys are gender-affirming, and the science (e.g., study design, sampling) is appropriately aligned with and feasible for the study population.

Limitations of the Review

Given the lack of definitional consistency within research among transgender populations, conducting a synthesis of transgender population health requires a complex set of diverse search terms and key words to accurately identify the current health research (See Web Appendix for protocol). Notably, the term "transgender" was only recently added to PubMED as a MeSH term in 2013. From 2001–2012, "transsexualism" was the index term. In the U.S., the phrase *gender minority* has been used to describe transgender people to be inclusive of a broad array of diverse gender identities, not just people who self-identify as transgender.[1] "Gender minority" is currently not indexed. We recommend that it be added as a MeSH term.

Some data characterizing transgender populations did not satisfy the objectives of the review. Data describing sexual satisfaction or quality of life were not included because these measures are often reported in clinical studies of gender reassignment surgical outcomes. While the focus here was on public health studies, we refer readers to recent review papers of gender reassignment outcomes.[7,8] Studies examining neuroanatomical or neuropsychological differences between transgender populations were excluded. These data are critical, especially as new surgical procedures are developed, but they are also outside of

the scope of the current review on the global burden of disease in transgender people from a public health perspective.

A noteworthy limitation of this synthesis pertains to reporting data at the level of data points in some instances, rather than reporting at the study level. This could inflate some estimates reported (i.e., studies with more data points contribute more data). Thus, the count of data points presented in this review is not to be interpreted as a measure of the quality of data. We also excluded qualitative studies which are a rich source of inquiry.

This review was limited to peer-reviewed literature. Many non-peer reviewed sources from the World Health Organization, Pan American Health Organization, Public Health Agency of Canada, UNAIDS, Centers for Disease Control, and additional health agencies and organizations including grassroots community-based needs assessments provide invaluable data. Partnerships between community members and researchers to collect data represent an important step in improving future transgender health research worldwide.

Conclusions

The global disease and health burden of transgender people remain understudied, particularly in relation to the impact of stigma, discrimination, social, and structural factors that affect the health of this underserved population.[48] Lack of standardized survey items to identify transgender respondents limits existing health surveillance efforts. Lack of consistent operationalization of transgender status across studies limits generalizability of findings. Using a two-step approach to standardize data collection in health—modified for the specific geographic context, language, and locale—will allow researchers, policymakers, and transgender people themselves to add to monitor and evaluate efforts to achieve health equity. Measuring sex and gender dimensions in health research will contribute to understanding and ameliorating health inequities for all.

Despite substantial gaps in empirical research, there are sufficient actionable data highlighting unique biological, behavioral, social, and structural contextual factors surrounding health risks and resiliencies for transgender people that need interventions.[48] Studies are needed that conceptually integrate and examine transgender-specific social determinants of health, including incorporating a framework of *gendered situated vulnerabilities*. A comprehensive public health approach including access to gender affirmation (social, medical, legal), improved health systems informed by high quality data, and effectively partnering with local transgender communities to ensure responsiveness of and cultural specificity of programming represents an important next step. Dedicated funding to ensure consistency of definitions for health surveillance and research initiatives involving transgender people are essential to inform evidence-based decisions regarding the scale and content of programs. Multisector partnerships that integrate health and human rights represent a critical next step to advance social justice and ultimately the health of transgender people worldwide.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

APPENDIX

Table I.

Non-Standardized Operationalizations of "Transgender" (n=95 Definitions) Across 116 Studies.

#	Definition of Transgender (and subpopulation focus if within-group data)
1	assigned male at birth but subsequently did not regard themselves as "completely male" in all situations or roles
2	Transgender adults
3	Participants reporting "often" or "very often" to the item "I wish I was the opposite sex"
4	responded "transgender" or "other (specify)" to the survey question "What is your gender?"
5	DSM-IV-TR criteria for GID
6	transgender women
7	answered "transgender" to the survey
8	any person who believed her male biological sex assigned at birth was in conflict with her gender identity as a transwoman
9	Identifying as transgender
10	Transgender
11	self-identified as a transgender woman
12	Two-step method of measuring natal sex/gender status
13	self-identified transgender or transsexual woman
14	self identified as transgender (defined as transsexual, crossdresser/transvestite, drag queen/king, or other transgender)
15	self-identified MtF transsexual (21), MtF cross-dresser (22)
16	patients from 1992–2012 with a diagnosis of GID, not yet in hormone treatment or undergone reassignment surgery
17	self-identified as male-to-female or transfemale
18	self-identified male-to-female, male-to-other, female-to-male, and female-to-other
19	all self-identified transgender women, regardless of stage of gender transition
20	assigned male sex at birth, but assume a feminine gender expression or identity
21	suspected or diagnosed GID
22	diagnosis of gender dysphoria by ICD-10 criteria
23	Trans GB-MSM, who are defined as trans men who had indicated they had a sexual minority identity and were not exclusively attracted to cis women
24	gender identity disorder
25	self-identified as male-to-female or female-to-male for gender identity
26	self-identified transwoman
27	Transgender men
28	"gender diverse" (self-identified as either transgender or gender queer)
29	(1) were born or assigned female at birth; (2) self-identified as male or along the transmasculine spectrum
30	Hijra
31	Male to female transsexuals on cross-sex hormones
32	GID diagnosis
33	self identified as transgender
34	self-identified as a transgender woman or not identifying with assigned male birth gender
35	criteria for early- or late-onset gender identity disorder
36	Identified as transwomen

#	Definition of Transgender (and subpopulation focus if within-group data)
37	Individuals with GID seeking sexual reassignment surgery
38	Transgender persons
39	All persons diagnosed with GID at the Center for Sexology and Gender Problems at the Ghent University Hospital (Ghent, Belgium) between 1986 and June 2012 and who underwent at least 3 months of cross-sex hormone therapy
40	assigned male gender at birth but identifying as a woman
41	Diagnosis of gender identity disorder according to DSM-IV
42	Male to female transgender youth
43	Transwomen
44	Discrepancy between a person's psychological gender and the morphological, biological, and social sex, which is often perceived as "non-self" and belonging to the opposite sex
45	Participants were assigned a male gender at birth but identify as female and currently or previously identify as transgender
46	Hijras are the transgender individuals found in the Indian subcontinent, popularly known as the "third gender," probably because these individuals do not conform to the conventional notions of male or female gender, but move between the two, challenging accepted gender definitions.
47	identifying as a transgender woman (categorized as male sex at birth but identify as a woman)
48	self-identified as transgender
49	self-identified as transgender/gender-queer
50	TGs were enrolled based on their outward characteristics from sex-work venues and cabaret show theaters
51	Trans people
52	Transgender individuals are persons whose gender identity differs from their biological sex
53	Transgender, gender nonconforming, and other gender youth
54	Wide variety of trans identities
55	self identify on questionnaire: "Do you think you are transgender?"
56	Transgender females
57	transgender person
58	transgendered subject enters into a relationship with medical, psychotherapeutic, and juridical institutions in order to gain access to certain hormonal and surgical technologies for enacting and embodying itself
59	Transvestite
60	transvestites, transsexuals, and transgender
61	VHA users from FY2009 with at least one diagnosis of GID
62	All self identified transgender types (e.g. transsexuals, cross-dressers, and so on)
63	biologically male at birth, self-identified as a woman, 16 or older
64	children and adolescents referred to the Gender Identity Clinic and diagnosed with gender identity disorder
65	diagnosis of transsexualism
66	Female to male transsexuals on cross-sex hormones
67	Hijra sex workers
68	identify within the umbrella of transgender
69	Male sex at birth that self-identify as females
70	Male to female transsexuals who have undergone sexual reassignment surgery
71	self identified as transgender or "other" in response to gender
72	self identify on questionnaire: "Are you transgender?"
73	self-identified as transgender, transsexual, and/or female with a biological or birth sex of male

#	Definition of Transgender (and subpopulation focus if within-group data)
74	Self-report HIV negative transgender women with anal or oral intercourse with a male or transgender woman partner in the previous 12 months
75	assigned a female sex at birth who identify as male, man, or genderqueer
76	Biological males who idenitifed as female or transgender for at least the previous three months, and reported sexual activity (oral and/or anal sex) with men in the same time period
77	Diagnosis of gender identity disorder by a mental health professional
78	formal diagnosis of GD/GID
79	HIV infected transgender men on HAART
80	Male to female transgender
81	male to female transgenders who have not had sexual reassignment surgery
82	Participants who self-identified as transgender, queer, or questioning on a survey item about their gender identity
83	Self identification of an internal gender identity different from the one assigned at birth
84	self identified as transgender on survey
85	self identify on questionnaire: “Do you identify as transgender/gender-nonconforming?”
86	Self-identified FTM transgender persons
87	self-identified MTF transsexual
88	self-identify as transsexual
89	self-identifying as a transwoman or feminine-identified/male-born person
90	Transgender MSM
91	Female to male transsexuals prior to cross-sex hormone therapy
92	Transgender individuals
93	Transgender women: born male, express female identity
94	Female to male transmasculine adults
95	Transsexuals

Table II.

Methodological Overview of Transgender Health Study Designs as Reported by Study Authors (n=116 studies).

Column A		Column B		Column C	
Study Design	**# Studies**	**Sampling Method**	**# Studies**	**Measures of Association**	**# Studies**
Cross-sectional	90	Clinic-based recruitment (gender dysphoric participants) and internet-based recruitment (controls)	29	Prevalence	95
Prospective cohort	7	Internet-based or online recruitment	17	Age-standardized prevalence	1
Repeated cross sectional survey	2	Approached through trans organizations, referrals from venues, and internet advertisements	6	RDS-weighted prevalence	3
Pre post intervention design	2	Probability-based sampling	3	Standardized Mortality Ratio (SMR)	1
Randomized controlled efficacy trial	1	Respondent-driven sampling	8	Period prevalence (per 100,000 patients)	3

Column A		Column B		Column C	
Study Design	**# Studies**	**Sampling Method**	**# Studies**	**Measures of Association**	**# Studies**
Retrospective chart review, case review, case series, case records	11	Recruitment from transgender events and conferences, or LGBT events including Pride Festivals	7	Incidence rate	4
Retrospective cohort	2	Not Specified	4	Cases/1000 persons	1
Case-control	1	Purposive community sampling	4	Risk ratio	1
		Recruited from HIV-prevention program or outreach	3	Odds ratio	7
		Convenience sample	2	Adjusted Odds Ratio	16
		Peer outreach and snowball sampling	2	Unadjusted conditional odds	1
		Venue-based sampling	2	Adjusted conditional odds	1
		Snowball sampling	2	Hazard ratio	2
		Snowball sampling and quota sampling	1	Beta (regression coefficient)	7
		Snowball sampling, listservs, and websites	1	Point-biserial correlations	1
		Brief-intercept sampling	1	Contrast estimate	1
		Recruitment letter to students	1	Median	1
		Organization-based recruitment	1	Mean score	4
		Clinic-based, venue-based, peer outreach and referral	1	Chi square	2
		Random sample from prison census	1	t-test	2
		Random sample of selected gurus with all associated hijiras	1	MANOVA	1
		Clinic service case records	2	Pearson’s correlation	1
		HIV/STD Surveillance Registries	1		
		Clinic and location-based recruitment	1		
		School-based	1		
		Randomly selected high-schools	1		
		Venue-day-time sampling	1		
		Census	1		
		Clinic-based recruitment and peer referral	1		
		Community agency-based recruitment	1		
		Peer referral	2		
		Snowball/chain referral and venue based	1		
		Argentine Union of Sexual Workers registration	1		
		Community and internet-based	1		

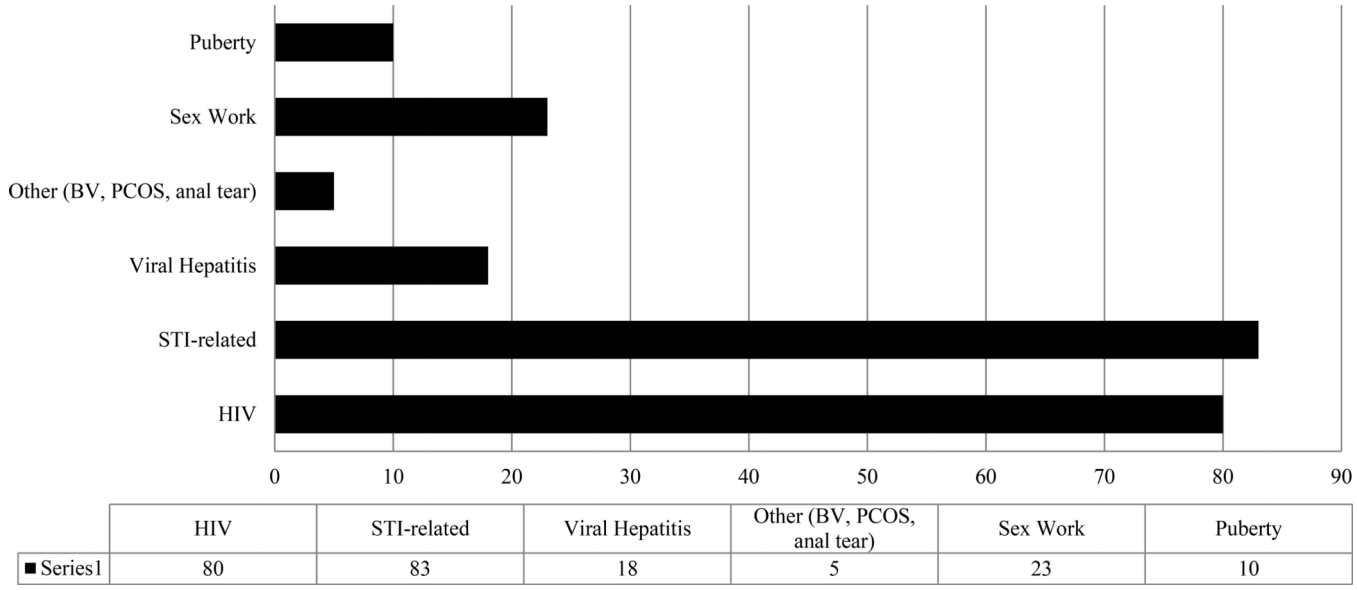
Column A		Column B		Column C	
Study Design	**# Studies**	**Sampling Method**	**# Studies**	**Measures of Association**	**# Studies**
		GSA organization-based recruitment	1		
		Venue-based sampling and incentivized snowball sampling	1		
		Consecutive clinic referral	1		
		Internet and peer referral	1		

Table III.

Mental Health Outcomes in Transgender Health Research (n=303 Mental Health Data Points).

Classification:	# Data Points	%
Mood Disorders (depression, dysthymia, bipolar)	96	31.6
Suicidal and Non-Suicidal Self-Injury (suicide ideation, suicide attempt, self-harm without lethal intent)	50	16.5
Anxiety Disorders (generalized anxiety, PTSD, phobias, OCD)	44	14.5
General Distress and Wellbeing (Psychological Distress, Personal Wellbeing Index)	25	8.3
Somatoform Disorders (Body Dysmorphic Disorders, Somatization)	17	5.6
Schizophrenia and Other Psychotic Disorders	11	3.7
Other Mental Health Issues (grief and loss, loneliness, relationship problems)	10	3.3
Personality Disorders (schizoid, borderline, antisocial)	10	3.3
Impulse Control Disorders Not Elsewhere Classified (Intermittent Explosive Disorder, pathological gambling)	8	2.7
Other Mental Health Diagnosis Not Specified (Other Axis 1 Diagnosis)	8	2.7
Dissociative Disorders	7	2.4
Sleep Disorders	7	2.4
Pervasive Developmental Disorders (Autism, Asperger's)	4	1.4
Eating Disorders (Anorexia Nervosa)	3	1.0
Attention-Deficit and Disruptive Behavior Disorders (Conduct Disorder)	3	1.0

+Percent exceeds 100% due to rounding.



	HIV	STI-related	Viral Hepatitis	Other (BV, PCOS, anal tear)	Sex Work	Puberty
■ Series1	80	83	18	5	23	10

Figure I.

Sexual and Reproductive Health Outcomes in Transgender Health Research (n=219 Data Points).+

+Author Note: Studies that reported HIV and STI data were coded in the “HIV” category. “STI-related” indicates studies reporting only on STIs.

Table IV.

Substance Use Outcomes in Transgender Health Research (n=193 Data Points).

Substance Use Outcome	# Data Points	%
Alcohol Use	35	18.2
Marijuana	25	13.0
Any Illicit Drug Use (Type Not Specified)	16	8.3
Tobacco Use	14	7.3
Cocaine	14	7.3
Methamphetamine	11	5.7
Injection Drug Use (IDU)	11	5.7
Any Substance Use	10	5.2
Heroin	9	4.7
Substance Abuse, Dependence, Disorder	10	5.2
Crack	7	3.7
Substance Use to Cope	5	2.6
Inhalents (Amyl Nitrate, poppers)	3	1.6
Downers	3	1.6
Ecstasy	3	1.6
Hallucinogens	3	1.6
Morality Due to Illicit Drug Use	2	1.1
Stimulant use (Type Not Specified)	2	1.1

Substance Use Outcome	# Data Points	%
Painkiller	2	1.1
Polysubstance Use	2	1.1
Club Drugs	1	0.6
GHB	1	0.6
Steroids	1	0.6
“Other” Recreational Drug Use	1	0.6
Prescription Medication Use	1	0.6
Poly-Drug Use	1	0.6

[+]Percent exceeds 100% due to rounding.

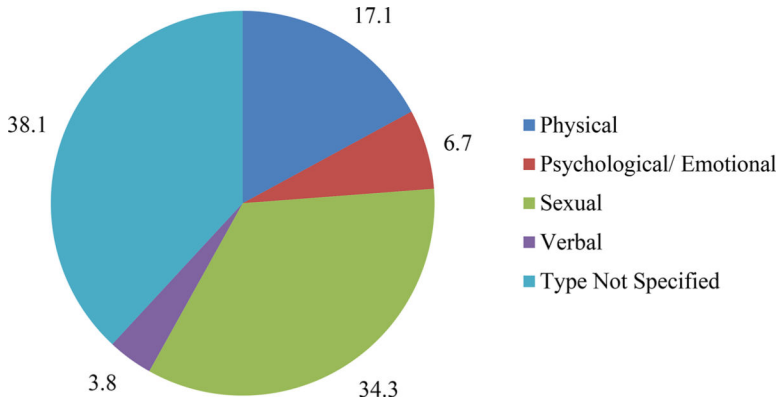


Figure II.
Violence/Victimization in Transgender Health Research (n=105 Data Points).

Table V.

General Health Outcomes in Transgender Research (n=68 Data Points).

General Health Indicator (40 total unique general health indicators)	# Data Points
Diabetes	8
Hormone Use (4 on previous 30 days, 3 on non-prescribed, 1 on injected hormones)	8
Obesity	5
Metabolic syndrome (ATP-III)	3
Asthma	2
Cancer	2
Dyslipidemia	2
Familial hypercolesterolemia	2
General medical condition co-morbidity	2
Hypertension	2
Mortality External causes	2
Venous thrombosis and/or pulmonary embolism	2
All cause mortality	1
Arthritis	1
Blood pressure	1
Cardiovascular mortality	1
Chronic pain	1
Cryptorchidism	1
Digestive problems	1
Disability	1
Hearing	1
High cholesterol	1
Hyperandrogenism	1
Hypercolesterolemia	1
Hyperprolactinemia	1
Idiopathic hyperadrogenemia	1

General Health Indicator (40 total unique general health indicators)	# Data Points
Kidney problems	1
Lung problems	1
Metabolic syndrome (IDF)	1
Mortality Ischemic heart disease	1
Mortality Malignant neoplasm: Digestive tract	1
Mortality Malignant neoplasm: Hematological	1
Mortality Malignant neoplasm: Lung	1
Mortality Unknown cause	1
Myocardial infarction	1
Nonclassic adrenal hyperplasia	1
Primary hypogonadism	1
Secondary hypogonadism	1
Transient ischemic attack; cerebrovascular disease	1
Vision problems	1

Sidebar: Gender Affirmation is Multi-Level

Gender affirmation is not just individual-level—it is a concept that can be applied to healthcare systems and structural, macro-level factors through a social ecological model.[26] For example, gender affirming healthcare refers to care that is sensitive, responsive, and affirming to people's genders. Healthcare systems and models of care need to consider social, psychological, medical, and legal dimensions of people's lives in delivery of care.

Sidebar: Gender Affirmation and Health and Human Rights

Gender affirmation is a human right.[27,28] According to Sevelius (2013), outcomes from lacking gender affirmation can take the form of violence (including sexual violence), experiences of discrimination, and harassment.[8] The International Covenant on Civil and Political Rights adopted in 1966 by the United Nations General Assembly, with170 state parties, has been a foundation of global human rights law,[29] with the main objective that "all peoples have the right of self-determination," the right to human dignity, and equality under the law. Two decades prior, in 1948 United Nations adopted the Universal Declaration of Human Rights (UDHR), widely recognized as one of the most influential statements on human rights.[30] The 2011 Annual report of the United Nations High Commissioner for Human Rights and reports of the Office of the High Commissioner and the Secretary-General acknowledges that transgender people experience high rates of violence, discrimination and denial of rights as a result of their gender identity or expression.[31] The UN report further describes instances of discriminatory laws including state-sponsored violence against transgender people across the globe.

Despite clear inclusion of transgender people in the UN, nations outside the UN, the Vatican, the Organization of Islamic Cooperation, and the United States have routinely

opposed global measures to protect sexual orientation and gender identity.[32] In the United States, only eighteen states plus the District of Columbia have non-discrimination policies, and eight states have interpreted these protections to prohibit discrimination of transition-related healthcare in private and/or state-sponsored health insurance.[33] In contrast, as early as 1972, Sweden became the first in the world to allow transgender people to legally change their gender, and access accessible hormone therapy. In a more sweeping decision, in 2006, the European Union recast its definition of sex equality to include transgender people,[34] whereby it was formerly only implicitly covered via legal precedent. With denial of human rights leading to discrimination, stress, sexual risk-taking, codified gender affirmation may result in reduced discrimination, and better health outcomes for transgender and other gender minority people.[32] Integrating health and human rights is essential for transgender public health.[35,36]

Sidebar: A Call for Health Equity

Health differences are not necessarily inequities.[37–39] In a social determinants of health framework, health inequities involve a health difference produced by injustice or social oppression—by a power differential between groups with less disadvantage compared to groups with advantage. Documenting and understanding population-level health inequities by transgender status necessitates having comparative data. Without comparative data, it is inaccurate to state that "transgender people are *disproportionately* burdened by or experience an inequity in depression." A study consisting of a sample of exclusively transgender people allows examination of within-group health indicators. Thus, findings can indicate that "transgender people bear a high burden of depression" or that "depression is highly prevalent among transgender people sampled." Without a comparison group, such within-group data are not sufficient evidence of a health inequity per say (particularly when prevalence estimates are not age-adjusted). Monitoring health inequities requires comparative data to understand the distribution of disease in transgender people relative to non-transgender people, as well as the opportunity to unpack the mechanisms and pathways (i.e., mediators and potential intervention points) that cause poor health differentially by gender identity.

Sidebar: Sex and Gender as Social Determinants of Population Health

Understanding sex and gender pathways to health means attending to the biological, psychological, social, structural, and behavioral dimensions that shape embodied sex and gender differences—assigned sex at birth, gender identity, gender expression, embodiment, gender roles, and other relevant dimensions that may influence individual health and wellbeing and contribute to population-level health inequities. Gender is multidimensional.[40] Gender pathways to health are multilevel, socio-historically and culturally-dependent, and dynamically change over time. Dimensions of gender affect people's health and wellbeing at multiple levels of influence.[41] Understanding gender as a population determinant of health for ALL people, means not only conceptualizing and measuring different dimensions of gender—including the gendering of the actual material body itself—but also considering the dynamic nature of gender, including that: 1) sex and

gender are not the same, a distinction particularly important in examining transgender people's health;[42] 2) gender is relational (i.e., "a person's gender is not simply an aspect of what one is, but, more fundamentally, it is something that one *does*, and does recurrently, in interaction with others" (p. 140);[43] and 3) gender is fundamental to the social structuring of power and privilege.[44,45] A social ecological model integrating gender analysis examines how sex and gender influence individual, interpersonal, organizational, community and public policy levels can shed light on sex- and gender-related embodiment pathways producing population-level health inequities.

Sidebar: Gender Minority Stress

Building on social stress theories,[46–49] a gender minority stress framework has been used to conceptualize adverse health outcomes that burden transgender people.[50–52] This framework posits that experiences of social stress disproportionately affect transgender people relative to non-transgender people due to a disadvantaged social status and are largely responsible for health inequities. Such a framework integrates vulnerabilities at multiple levels of influence through which social processes become embedded in, and fundamentally shape, biological health outcomes. The distribution of power and capital along lines of gender as well as the social, economic, and psychological consequences of making visible the false conflation of sex and gender situate transgender people in stigmatized minority group. Stressors such as experiences of discrimination, stigma, violence and victimization, social and economic exclusion are all too common among transgender people.

Sidebar: Resilience: A Public Health Opportunity

Health-promoting, salutogenic, and resilience-related factors that may be protective for health risks in transgender populations are grossly under-studied.[53] Deficits-based models permeate existing public health research. Positive growth-fostering coping processes may mitigate health inequities by transgender status. Health promotion will benefit from integrating salutogenic and resilience-focused (i.e., strengths-based frameworks) into public health approaches for transgender people. Multi-level strategies that integrate evidence-based biomedical, behavioral, and structural interventions, and that attend to the gender minority stressors that lead to health risk and vulnerability, as well as resiliencies, are required to successfully address the health needs of transgender people.

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Sidebar 1:

Definitions: Transgender People

Transgender people have a current gender identity or expression that is different from their sex assigned at birth. G*ender minority* was introduced in 2011 as part of the landmark Institute of Medicine report commissioned by the U.S. National Institutes of Health (NIH) entitled, *The Health of Lesbian, Gay, Bisexual, and Transgender People: Building a Foundation for Better Understanding*.[1] Gender minority is meant to be an inclusive umbrella term which includes people who may identify as transgender or have other diverse genders. Transgender people have diverse sexual orientation identities, attractions, and behaviors.

Sidebar 2:

Differentiating Transgender People from People Who are Intersex

Intersex people/people with Disorders of Sex Development (DSD) [or in community terms Diverse Sexual Development (DSD)[2]] are those born with bodies that vary from both male and female bioanatomies, including chromosomes, gonads, genitals and/or other secondary sex characteristics. Some intersex/DSD people consider themselves to be transgender; however, most do not. This research synthesis does not include a review of intersex/DSD research. This is because many primary issues in intersex/DSD health are different from those of transgender people (i.e., infant genitoplasty and gonadectomy, ongoing care for intersex/DSD adults, iatrogenic effects of genital surgery and gonad removal, etc.).[3–7] The heterogeneity and complexity of Intersex/DSD health warrants its own research synthesis which is beyond the scope of the current paper.

Sidebar 3:

Evolving Terminologies

In public health research, transgender populations are categorized according to assigned sex at birth and gender identity. This is because some health indicators (e.g., prostate health), are only applicable for people assigned a male sex at birth. *Trans feminine* refers to transgender people assigned a male sex at birth who are on the transgender spectrum—identifying as women, female, male-to-female (MTF), transgender women, trans women, and many other diverse gender minority identities across the world (e.g., hijra, kathoey, travestis, waria). *Trans masculine* describes transgender people assigned a female sex at birth who are on the transgender spectrum—identifying as men, male, female-to-male (FTM), transgender men, trans men, and many other diverse gender minority identities (genderqueer, stud, aggressive, Sadhin). Greater attention to non-binary genders is needed in research, including transgender people who do not identify as feminine or masculine, or who integrate both. Transgender people exist all over the world. Definitions and terminology continue to dynamically evolve to describe the population across different local, national, and global contexts.

Sidebar 4:

Gender Affirmation: A Key Determinant of Transgender Health

A key social determinant of health for transgender populations worldwide is ***gender affirmation*.** Gender affirmation has been defined as an interpersonal and shared process through which a person's gender identity is socially recognized.[8–10] However, gender affirmation is not only social—social recognition of gender also involves other institutions such as healthcare and law. Gender affirmation can thus be conceptualized as having four core facets: social (e.g., name, pronoun), psychological (e.g., internal, felt self), medical (e.g., cross-sex hormones, surgical intervention, other body modification), and legal (e.g., legal gender markers, name change). Gender affirmation depends on a variety of factors—including context and setting (i.e., country and region) and issues relating to accessibility of cross-sex hormones (in terms of availability of medications, accessibility to culturally competent healthcare providers), socioeconomics and poverty, criminalization of sexual and gender minorities, legal barriers to changing gender markers and identity recognition, etc. There is not a single path to gender affirmation—no "one size fits all" approach describes how transgender people affirm and embody their gender.[11] Some people may socially, but not medically, affirm their gender; others may socially and medically but not legally do so. Gender affirmation sometimes, but not always conforms to binary categories of being female or male. Non-binary refers to having a transgender identity that does not utilize female or male dichotomies as reference points.

Sidebar 5:

The Right to Inclusion in Health Surveillance

A first-line argument made for non-inclusion of measures to identify transgender people in routine health surveillance efforts has been the small population size. How large is the transgender population globally? It depends how the population is measured. Over the past 15 or so years there has been a paradigm shift in transgender health from a disease-based model (transgender as disorder or mental health "diagnosis") to an identity-based model (transgender as identity).[11,12] (Please see Paper 1 for history and details). Conceptualizing transgender people as having diverse, non-pathological genders rather than as "disordered" re-defines how a "case" is operationalized and measured in health research.[13] Such re-definition of a "case" also necessarily affects prevalence estimates as to the number of transgender people in the world and, potentially, estimation of the distribution, burden, and magnitude of disease inequity in the population. Still, most conservative estimates suggest 0.1%−0.5% of the world population may be transgender.[14,15] Assuming the world population is approximately 7 billion people,[16] this is an estimated 7 to 35 million transgender people globally. That said, does the number of transgender people matter in a population so grossly underserved worldwide?

Sidebar 6:

Example of Two-Step Method in Data Collection

Standardization of data collection to routinely monitor health and disease distribution among transgender people represents a critical step. A two-step method is recommended,[17–20] including by the World Professional Association for Transgender Health (WPATH).[21] Appropriate adaptations to the two-step method are needed in different geographic regions, cultures, and languages.

Reisner and colleagues (2014) implemented the two-step method in the Growing Up Today Study (GUTS), a U.S. prospective cohort of >16,000 youth enrolled in 1996.[22] Step 1 asked: "What sex were you assigned at birth, on your original birth certificate? (check one)" with response options "female" and "male." Step 2 asked: "How do you describe yourself? (check one)" with response options "female", "male", "transgender", "do not identify as female, male, or transgender." Cross-tabulating these questions gives a two by four (2×4) contingency table with eight cells demonstrating different sex and gender combinations. Overall, 0.33% of the cohort self-identified as transgender or another gender minority in 2010.

Table.

Example of Using a Two-Step Method to Capture Data on Transgender People from the U.S. Growing Up Today Study (GUTS).

	Assigned Sex at Birth	
Current Gender Identity	**Male**	**Female**
Male	Cisgender	Trans Masculine *
Female	Trans Feminine *	Cisgender
Transgender	Trans Feminine *	Trans Masculine *
Do Not Identify As Male, Female, or Transgender	Trans Feminine *	Trans Masculine *

Cisgender = Non-Transgender

* Adding these cells results in overall prevalence of Transgender.

The two-step approach can help to not only understand population size and health inequities facing transgender people, but can also aide in explicit consideration of sex and gender differences more broadly—and health inequities that may be due to assigned sex, current gender, both, or neither. The two-step method thus facilitates a gender analysis in population health.[23–25]

Key Messages

- A comprehensive public health approach to address the health of transgender people requires ensuring access to gender affirmation, evidence-based healthcare delivery systems, and effective partnerships with local transgender communities.
- The health-related vulnerabilities among transgender people underscore the need to explicitly consider sex and gender pathways and mechanisms in epidemiologic research and public health surveillance more broadly.
- Multi-sector partnerships linking health with advocacy, social justice, and human rights are critical to address the public health needs of transgender people across the world.
- Lack of standardized survey items on population-based surveys to identify transgender respondents limits existing public health surveillance efforts and availability of representative samples.
- The global disease and health burden of transgender people remains understudied, particularly the impact of stigma, discrimination, violence, and other social and structural factors that affect the health of this underserved population, as well as interventions to mitigate stigma.
- Despite substantial gaps in empirical research, there are sufficient actionable data highlighting unique biological, behavioral, social, and structural contextual factors surrounding health risks and resiliencies for transgender people that need interventions.
- Consistency of definitions for health surveillance and research initiatives that include transgender people are essential, including dedicated funding to support these efforts.

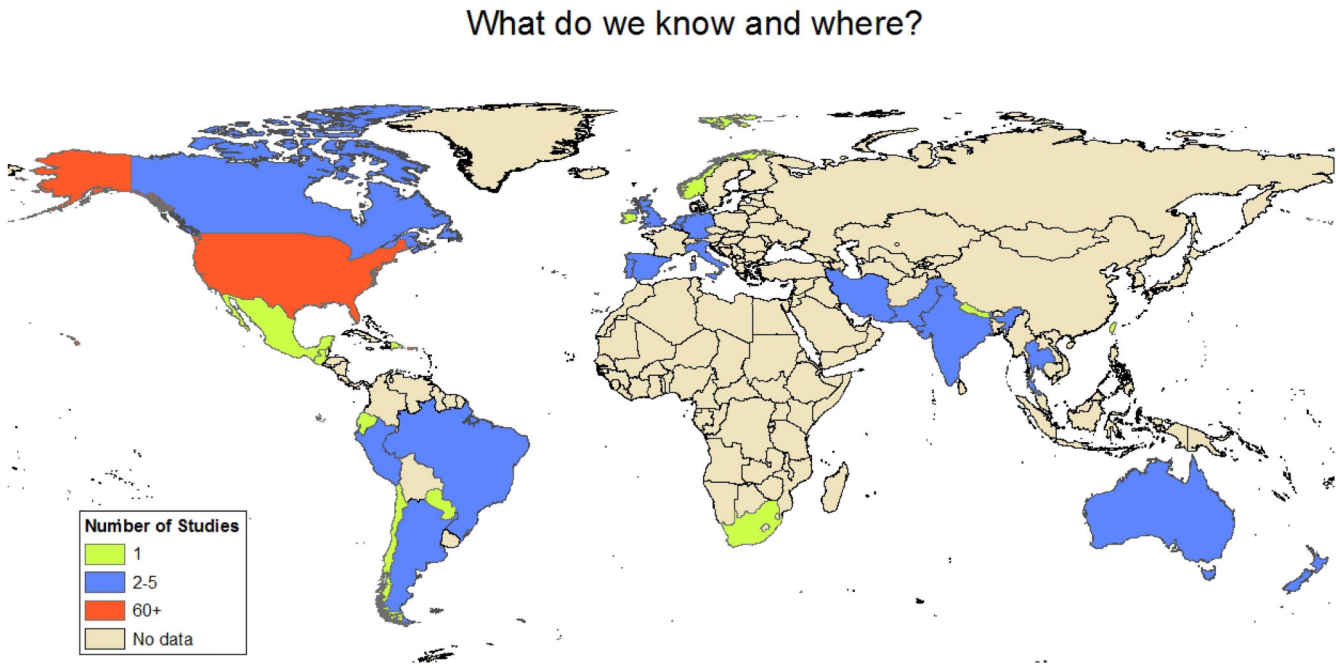

Figure 1.
Map of the Distribution of Studies in Transgender Health (n=116).

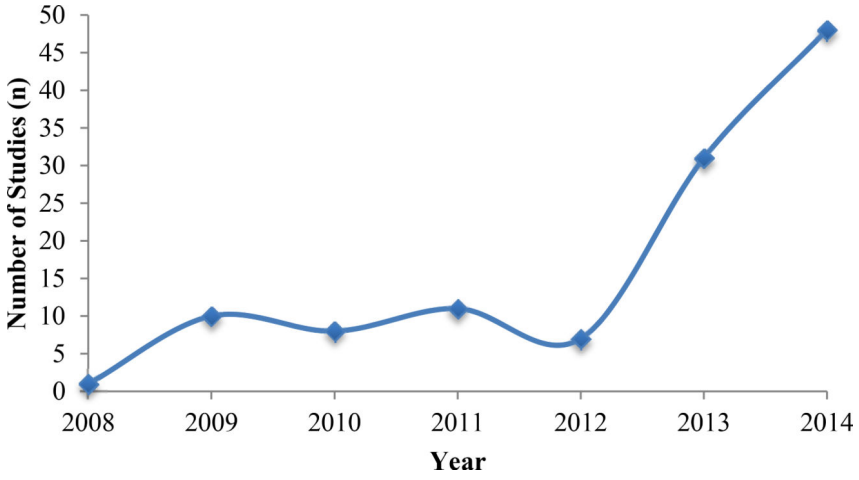

Figure 2.
Number of Studies Containing Transgender Health and Disease Burden Per Year (n=116).

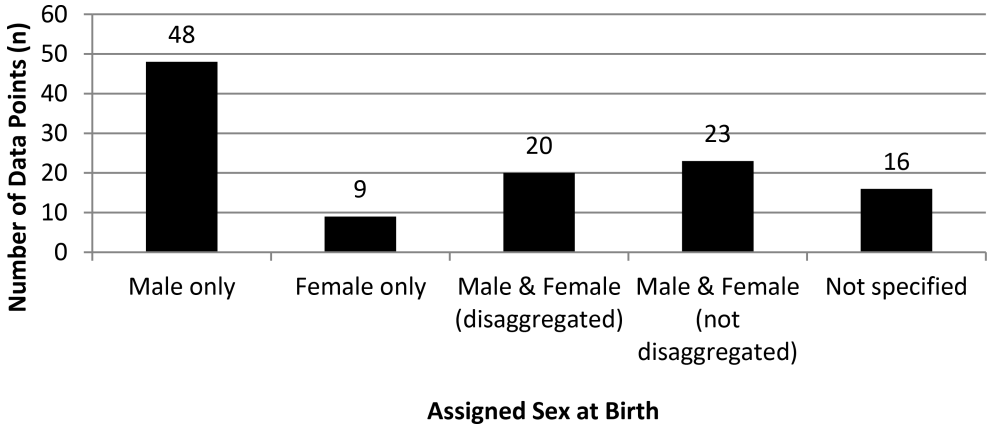

Figure 3.

Distribution of Studies By Assigned Sex at Birth in Transgender Health Research (n=116 studies)

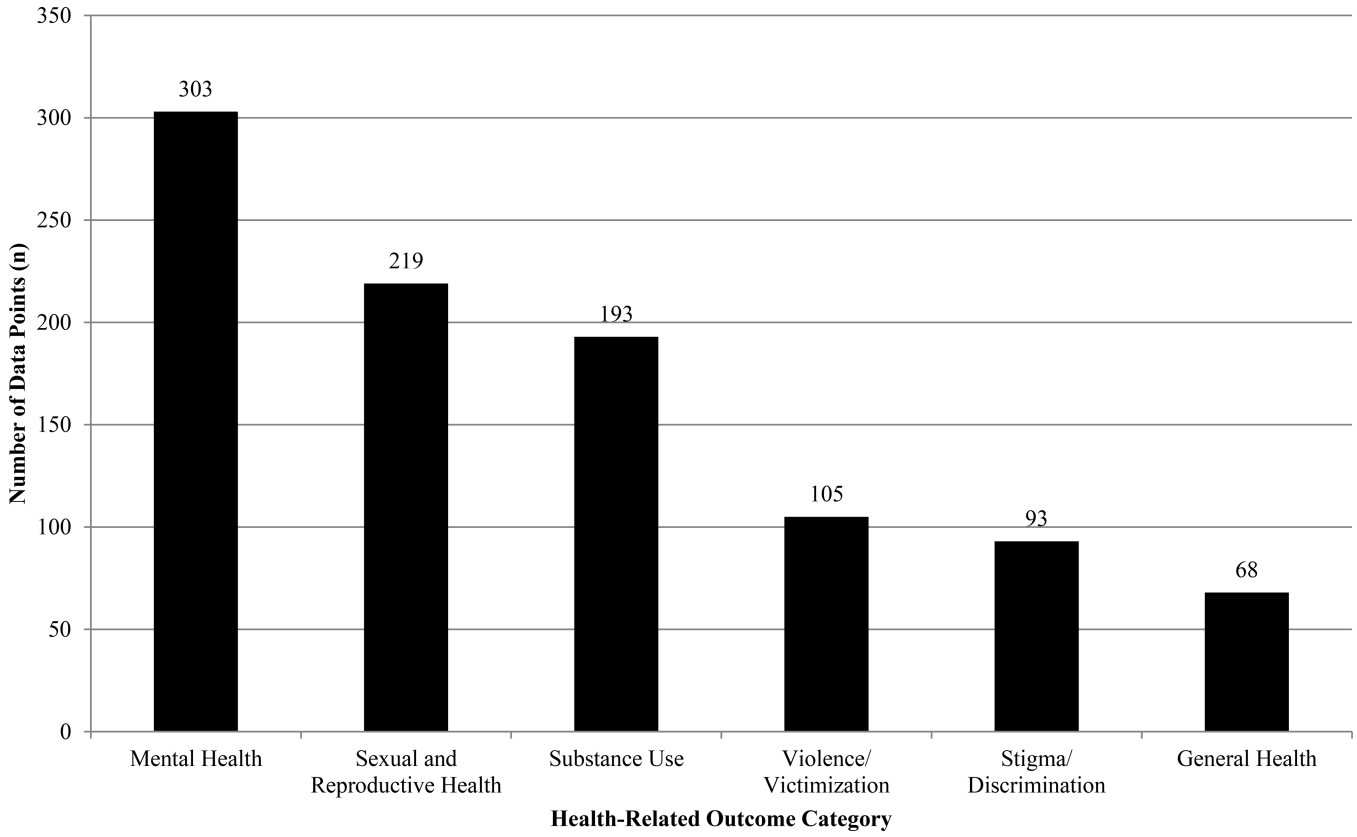

Figure 4.

Distribution of Data Points Grouped Into Six Health-Related Outcome Categories in Global Transgender Health Research (n=981).

Table 1. Transgender and Other Gender Minority Population Health Research 2008–2014 by Region, Country, and then Author.

	Location	Sampling method	Sample	Assigned sex at birth	Sample size	Measure of prevalence/ association	Significant associations	Health outcome measures
North America								
Bauer, 2013[1]	Ontario, Canada	Respondent-driven sampling	Trans gay, bisexual, and/or have sex with men	Female	173	Prevalence	None	Depressive symptoms
Moody, 2013[2]	Canada	Internet-based	Transgender	Both	133	Beta	Perceived support from family, emotional stability, child-related concerns	Suicidal behavior
Alvarez-Wyssmann, 2013[3]	Mexico City, Mexico	Chart review	HIV infected transgender men on HAART	Female	127	Prevalence	None	Diabetes
Reisner, 2014[4]	Boston, USA	Chart review	Female to Male transgender with diagnosis of GID	Female	23	Prevalence	None	HIV seroprevalence, history of STIs, axis 1 diagnosis, axis 2 diagnosis, depression, anxiety, substance use disorder, PTSD, bipolar disorder, adjustment disorder, suicide attempt
Shipherd, 2012[5]	Boston, USA	Trans conference-based	Male to Female transsexual and cross dresser veterans	Male	43	Prevalence	None	High cholesterol, blood pressure, vision problems, hearing problems, chronic pain, arthritis, digestive problems, cancer, lung problems, kidney problems, diabetes, depression, PTSD, anxiety, other mental health
Dowshen, 2011[6]	Chicago, USA	Convenience sample	Young transgender women	Male	92	Prevalence	None	Drunk or buzzed in past 3 months
Garofalo, 2012[7]	Chicago, USA	Active recruitment at local transgender gathering spots and passive recruitment through flyer distribution	Young transgender women	Male	51	Prevalence	None	HIV self-report, new STI diagnosis past 3 months
Fletcher, 2014[8]	Los Angeles, USA	Venue-based recruitment	Community-based HIV prevention program attendees	Male	517	Prevalence	Marginally homeless, homeless	HIV self-report, cocaine use last 30 days, crack use last 30 days, methamphetamine use last 30 days, heroin use last 30 days, marijuana use last 30 days, hormone use last 30 days

Reback, 2014[9]	Los Angeles, USA	Outreach based	Male to female transgender	Male	2136	Adjusted odds ratio; prevalence	African-American, Methamphetimine, Crack, Injection drug, sex work, unprotected anal sex with sex work partner	HIV self-report; alcohol past 30 days, marijuana past 30 days, cocaine past 30 days, crack past 30 days, injection drug/hormone
Simons, 2012[10]	Los Angeles, USA	Clinic-based recruitment	Transgender adolescents	Both	28	Prevalence; pearson's correlation coefficient	Less parental support	Significant depression; higher rates of depression
Simons, 2013[11]	Los Angeles, USA	Clinic-based recruitment	Transgender youth	Both	66	Beta	Parental support	Depressive symptoms
Rohde Bowers, 2011[12]	Los Angeles County, USA	Venue based	High risk HIV prevention program attendees	Male	1033 (320 transgender)	Prevalence	None	HIV self-report, alcohol (5 or more drinks), marijuana, methamphetamine, injected methamphetamine, cocaine, crack, ecstasy, GHB, amyl nitrate, heroin, injected heroin, hormones (non-prescribed), injected hormones
Benotsch, 2013[13]	Mid-Atlantic, USA	Clinic-based recruitment	Transgender	Both	155	Prevalence	Individuals reporting non-medical use of prescription drugs	HIV-self report, BSI-depression, BSI-anxiety, BSI-somatic distress, BSI-Global Severity Index, alcohol use in past 3 months, cocaine use in past 3 months, methamphetamine use past 3 months, marijuana use past 3 months, poppers use past 3 months, ecstasy use past 3 months heroin use past 3 months, other recreational drug use past 3 months
McElory, 2012[14]	Missouri, USA	Pride festivals recruitment	Sexual and gender minority individuals	NS	6537	Prevalence	None	Smoking
Irwin, 2014[15]	Nebraska, USA	Community and internet-based	LGBT adults	Both	770 (92 transgender)	Adjusted odds ratio	Transgender	Suicidal ideation
Reisner, 2010[16]	New England, USA	Venue-based	Transmen	Female	16	Prevalence	None	Herpes self-report, trichomonas self-report, bacterial vaginosis self-report, alcohol use during sex, marijuana use during sex, hallucinogen use during sex, ecstasy use during sex
Shipherd, 2011[17]	New England, USA	Trans conference	Transgender	Male	97	Prevalence	None	Post-traumatic stress disorder, depressive symptoms
Hwahng, 2014[18]	New York, USA	Organization based, venue	HIV uninfected male to female transgender	Male	572	Prevalence	None	Major depression (early and late adolescence), suicidal ideation (early and late adolescence)

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		referrals, and internet						
Koken, 2009[19]	New York, USA	Peer outreach and snowball	Transwomen	Male	20	Prevalence	None	HIV self-report
Leinung, 2013[20]	New York, USA	Clinic-based recruitment	Transsexual	Male	192	Prevalence	None	Drug and substance use, HIV
				Female	50	Prevalence	None	Drug and substance abuse
Nuttbrock, 2009[21]	New York, USA	Organization based, venue referrals, internet advertisements	HIV uninfected male to female transgender	Male	571	Odds ratio	Commercial sex partners, androphilic, unemployment, sex identity disclosure, female attire in public, casual sex partners, substance use, psychoactive drug injection, Hispanic	HIV infected, syphilis, hepatitis B, hepatitis C
Nuttbrock, 2010[22]	New York, USA	Organization based, venue referrals, internet advertisements	HIV uninfected male to female transgender	Male	571	Prevalence	None	Lifetime major depression, lifetime suicide plans, lifetime suicide attempt
Nuttbrock, 2013[23]	New York, USA	Organization based, venue referrals, internet advertisements	HIV uninfected male to female transgender	Male	230	Adjusted odds ratio; odds ratio	Employment, sex work, transgender presentation, hormone therapy; psychological gender abuse, physical gender abuse	Major depression
Nuttbrock, 2013[24]	New York, USA	Organization based, venue referrals, internet advertisements	HIV uninfected male to female transgender	Male	230	Prevalence; hazard ratio	Gender abuse, education, preoperative, non-white ethnicity, committed partners (unprotected) receptive anal intercourse, commercial partners (unprotected) receptive anal intercourse, depressive symptoms, legitimate income, hormone therapy, sexual reassignment surgery, younger age, sexually attracted to men only, casual partners (unprotected) receptive anal intercourse, CES-D score >=20	HIV seroprevalence, depression; incident HIV/STI, depressive symptoms
Nuttbrock, 2014[25]	New York, USA	Organization based, venue referrals, internet advertisements	HIV uninfected male to female transgender	Male	230	Adjusted odds ratio	Income, sex work, transgender presentation, hormone	Alcohol use, cannabis use, cocaine use, any substance use

							therapy, gender abuse, depressive symptoms	
Pathela, 2014[26]	New York City, USA	HIV/STD surveillance registries	Transgender women living with HIV	Male	345	Incidence	Transgender, diagnosed with HIV at a younger age, living with HIV for less time	STD coinfection with HIV
Flentje, 2014[27]	San Francisco, USA	Clinic based recruitment	Individuals entering substance abuse treatment	Male	13649 (146 transgender)	Prevalence; adjusted odds ratio	Transgender status	Methamphetamine; alcohol, cocaine, heroin, marijuana, other drug use,
				Female	13649 (53 transgender)	Prevalence	None	Alcohol, cocaine, heroin, methamphetamine, other drug use
Gamarel, 2014[28]	San Francisco, USA	Purposive sampling in community spaces	Transgender females and their primary non transgender male partner	Male	382 (191 transwomen)	Adjusted odds ratio	Financial hardship, discrimination, relationship stigma	Depressive distress
Jefferson, 2013[29]	San Francisco, USA	NS	Transwomen	Male	100	Adjusted odds ratio; odds ratio	Coping self-efficacy; transgender identity, racism, transphobia, high combined discrimination	Depression
Operario, 2011[30]	San Francisco, USA	Venue-based	Transgender adults in relationship with non-trans men	Male	174	Prevalence	None	HIV self-report, STI diagnosis or symptoms past 12 months, any alcohol use past 3 months, any illicit drug use past 3 months, any injection drug use past 3 months, depression
Operario, 2014[31]	San Francisco, USA	Purposive community sampling	Self-identifying transgender women	Male	191	Prevalence	None	Self-reported HIV, depressive symptoms, alcohol intoxication past 30 days, illicit drug use past 30 days
Rapues, 2013[32]	San Francisco, USA	Respondent-driven sampling	Male to female transgender	Male	314	Prevalence (RDS weighted)	None	HIV seroprevalence, HIV self-report, hepatitis C
Reisner, 2014[33]	San Francisco, USA	Purposive sampling in community spaces	Transgender females and their primary non transgender male partner	Male	382 (191 transwomen)	Prevalence; adjusted odds ratio	Age, financial hardship, discrimination	Depressive distress, HIV self-report; non-marijuana illicit drug use
Santos, 2014[34]	San Francisco, USA	Respondent-driven sampling	Transfemale	Male	314	Adjusted odds ratio; prevalence	Any methamphetamine	HIV seroprevalence; crack cocaine, powdered cocaine, club drugs, downers, painkiller, hallucinogens, heroin, marijuana, alcohol, binge drinking, any substance
Sevelius, 2009[35]	San Francisco, USA	Clinic and location based	Transgender	Male	153	Prevalence	None	HIV self-report, injecting drug use past year, alcohol use (five or more drinks per day) stimulant use

Wilson, 2014[36]	San Francisco, USA	Respondent-driven sampling	Transgender women	Male	235	Prevalence	None	HIV seroprevalence, injection drug use
Wilson, 2014[37]	San Francisco, USA	Respondent-driven sampling	Transgender women	Male	233	Prevalence	None	HIV seroprevalence, injected drugs
Nemoto, 2014[38]	San Francisco and Oakland, USA	Purposive community sampling	Transgender women with a history of sex work	Male	573	Prevalence	Race	Depressive symptoms, self-reported HIV, STI history in past 12 months
Brennan, 2012[39]	Chicago and Los Angeles, USA	Clinic-based, venue-based, and peer outreach and referral	Young transgender women	Male	151	Prevalence; point biserial correlations; adjusted odds ratio	Intimate partner violence, unprotected anal intercourse, polysubstance use; 3 or 4 syndemic index factors (low self-esteem, polysubstance use, victimization, and intimate partner violence) vs 0	Polysubstance use; HIV self-report
Bradford, 2013[40]	Virginia, USA	Internet and peer referral	Transgender	Both	350	Prevalence	None	HIV seroprevalence
Blosnich, 2013[41]	USA	Clinic-based recruitment	Veterans Health Association users with diagnosis of GID	NS	1326 in 2009 1162 in 2010 1326 in 2011	Period prevalence	None	Suicide-related event
Bockting, 2013[42]	USA	Internet-based	Transgender adults	Both	1093	Adjusted odds ratio	Transwomen compared to transmen, age, education, enacted stigma, felt stigma, peer support, family support, identity pride	Depression, anxiety, somatization, Global Severity Index
Budge, 2013[43]	USA	Internet-based	Transgender adults	Male	226	Beta	Transition status, social support	Depression, anxiety
				Female	125	Beta	Transition status, social support	Depression, anxiety
Effrig, 2011[44]	USA	College campus survey	College students	NS	21686 (86 transgender or “other” gender	Prevalence	None	Attempted suicide, suicidal ideation
Feldman, 2014[45]	USA	Internet based	Transgender	Both	1229	Prevalence	None	HIV self-report
Fredriksen-Goldsen, 2014[46]	USA	Community-agency based	LGBT adults 50 and older	NS	2201 (174 transgender)	Prevalence	None	Disability, Obesity
Horvath, 2014[47]	USA	Internet based	Rural and urban transgender	Male	692	Prevalence	None	HIV self-report, regular heavy alcohol use, binge alcohol use,

								marijuana use, non-marijuana drug use
				Female	523	Prevalence	None	HIV self-report, regular heavy alcohol use, binge alcohol use, marijuana use, non-marijuana drug use
Hotton, 2013[48]	USA	NS	Young transgender women	Male	116	Prevalence; odds ratio	Life stress	Substance use in past 3 months, alcohol use in the past 3 months
House, 2011[49]	USA	Internet-based	LGBT adults	Both	1126 (164 transgender)	Adjusted odds ratio	Transgender compared with male	Non-suicidal self-harm, attempted suicide
Mustanski, 2013[50]	USA	Venue-based	LGBT youth	Both	237 (21 transgender)	Prevalence	None	Lifetime suicidal attempt
Peitzmeier, 2014[51]	USA	Clinic-based	Clinic patients receiving Pap tests	Female	3858 (233 transgender)	Prevalence	None	HIV seroprevalence
Rath, 2013[52]	USA	Probabilty-based	Young adults	NS	4159 (12 transgender)	Prevalence	None	Major depressive disorder, current alcohol use, cigarette use
Reisner, 2013[53]	USA	Brief intercept	Transmasculine	Female	73	Prevalence	All health outcomes compared to depression only	Lifetime clinical depression, alcohol abuse, current or former smoking, asthma, obese; avoided/ delayed health care, younger age, queer or non-binary sexual orientation
Reisner, 2014[54]	USA	Convenience sample	Transfeminine gender identity	Male	3878	Prevalence; risk ratio	Jail/prison time, mistreated/victimized in jail/prison, denied healthcare in jail/prison	HIV self-report, daily cigarette smoker, substance use to cope, suicide attempt
Reisner[55]	USA	Clinic-based	Participants from the Community Health Center Core Data Project	Both	2653 (31 transgender)	Prevalence	Transgender	Suicidal ideation, attempted suicide ever, substance abuse history, smoking, HIV self-report
Sánchez, 2009[56]	USA	Transgender event	Male to female transsexuals	Male	53	Beta	Transgender-related fears	Psychological distress
Sevelius, 2009[57]	USA	Snowball sampling, listservs, web sites	Trans MSM	Female	45	Prevalence	None	HIV self-report, STI diagnosis ever, HPV, gonorrhea, chlamydia, herpes, trichomoniasis, bacterial vaginosis, hepatitis C, pelvic inflammatory disease, pubic lice
South and Central America								
Toibaro, 2009[58]	Buenos Aires, Argentina	Clinic-based recruitment	Patients at a clinic	Both	4118 (105 transgender)	Prevalence	None	HIV seroprevalence, syphilis, drug use, alcohol use

Carobene, 2014[59]	Argentina	Not specified	Trans sex workers	NS	273	Prevalence	None	HIV seroprevalence, HBV seroprevlance, HCV seroprevalence
Socias, 2014[60]	Argentina	Snowball sampling and quota sampling	Transgender	Male	452	Prevalence	None	HIV self-report
Rocha, 2013[61]	Brazil	Transvestite clinic case records	Transvestites	NS	59	Prevalence	None	Alcohol use, drug use
Johnston, 2013[62]	Dominican Republic	Respondent-driven sampling	Gay, transsexuals, and MSM	Male	1388 (83 transsexuals)	Adjusted odds ratio	Transsexual compared to MSM	HIV seroprevalence
Aguayo, 2013[63]	Paraguay	NS	Transwomen	Male	311	Prevalence	None	HIV, syphilis
Lipsitz, 2013[64]	Lima, Peru	Clinic-based recruitment	Men and transwomen	Male	2717 (332 transwomen)	Prevalence	None	HIV seroprevalence
Verre, 2014[65]	Peru	Peer outreach and snowball	MSM and transgender women	Male	5148 (714 transgender)	Prevalence	None	HIV seroprevalence, syphilis seroprevalence
Europe								
Wierckx, 2013[66]	Ghent, Belgium	Clinic-based recruitment	Transgender persons diagnosed with GID and on cross-sex hormone therapy	Male	214	Cases/1000 persons	Transwomen compared to age matched women	Myocardial infarction, transient ischemic health attack, type 2 diabetes,
				Female	138	Cases/1000 persons	Transmen compared to age matched men	Type 2 diabetes, cancer
Auer, 2013[67]	Munich, Germany	Clinic based recruitment	Transsexuals with a diagnosis of GID, not in hormone therapy or undergone reassignment surgery	Female	131	Prevalence	None	Pubertal and menstrual irregularities, premature or delayed menarche, oligomenorrhea, polymenorrhea, amenorrhea, adrenal hyperplasia, polycystic ovary syndrome, hypogonadism, anorexia nervosa
				Male	192	Prevalence	None	Pubertal irregularities, delayed oigarche, cryptorchidism, no pubertal voice change
Judge, 2014[68]	Dublin, Ireland	Clinic-based recruitment	Patients with suspected or confirmed GID	Male	159	Prevalence	None	Hypertension, dyslipidemia, diabetes, depression, schizophrenia, bipolar affective disorder, self-harm/ suicide attempt, asthma, Asperger's
				Female	59	Prevalence	None	Hypertension, dyslipidemia, diabetes, depression, schizophrenia, bipolar affective disorder, self-harm/ suicide attempt, asthma, Asperger's

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Manieri, 2014[69]	Torino, Italy	Clinic-based recruitment	Transgender subjects undergoing hormone therapy	Male	56	Prevalence	None	Obesity, hypercholesterolemia, hypertriglyceridemia, diabetes, metabolic syndrome, HIV seroprevalence,
				Female	27	Prevalence	None	Obesity, metabolic syndrome
Imbimbo, 2009[70]	Italy	Clinic-based recruitment	Male to female transsexuals who have undergone sexual reassignment surgery	Male	139	Prevalence	None	Contemplated suicide, attempted suicide
Asscheman, 2009[71]	Amsterdam, Netherlands	Clinic based recruitment	Transsexuals on cross-sex hormones	Male	966	Adjusted Hazard Ratio; Standardized Mortality Ratio	Male to Female transsexual compared to the age and sex adjusted general population	Cardiovascular mortality; All-cause mortality, mortality from malignant neoplasm, AIDS, external causes, illicit drug use, suicide
				Female	365	Standardized Mortality Ratio	Female to male transsexual compared to the age and sex adjusted general population	Mortality from external causes, illicit drug use
de Vries, 2010[72]	Amsterdam, Netherlands	Clinic-based recruitment	Children and adolescents referred to Gender Identity Clinic	Both	205	Incidence	None	Autism spectrum disorder
de Vries, 2011[73]	Amsterdam, Netherlands	Clinic-based recruitment	Adults and adolescents with a diagnosis of GID	Male Female	207 adults, 43 adolescents	Prevalence	None	Depression, schizophrenia, hysteria, hypochondria, paranoia, psychopathic deviate, hypomania, other mental health outcomes
					86 adults, 40 adolescents	Prevalence	None	Depression, schizophrenia, hysteria, hypochondria, paranoia, psychopathic deviate, hypomania, other mental health outcomes
Almeida, 2014[74]	Lisbon, Portugal	Clinic-based recruitment	Sex workers	NS	151 (20 transgender)	Prevalence	None	HIV seroprevalence
Guzman-Parra, 2014[75]	Malaga, Spain	Clinic-based	Transsexuals	NS	379	Prevalence	None	Lifetime only cannabis use, lifetime only cocaine use, current cannabis use
Hill, 2011[76]	London, UK	Clinic-based recruitment	Transgender sex workers	Both	24	Prevalence	None	HIV seroprevalence, syphilis, genital herpes, chlamydia-negative urethritis or proctitis, gonorrhea, chlamydia, hepatitis B, any STI
Pasterski, 2014[77]	London, UK	Clinic-based recruitment	Adults with gender dysphoria or GID	Both	91	Prevalence	None	Autism spectrum disorder

Davey, 2014[78]	England	Clinic-based recruitment	Individuals diagnosed with gender dysphoria and age and gender-matched controls	Both	206 (103 transgender)	PWI mean score; SCL-90-R mean score; SF-36 v.2 mean score	Gender dysphoric	PWI total score; global severity index, somatization, obsessive-compulsive, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoneuroticism; mental health component summary, social functioning, role limitations due to emotional problems, mental health
Claes, 2014[79]	United Kingdom	Clinic-based recruitment	Transsexuals	Male	103	Prevalence	None	Non-suicidal self-injury
				Female	52	Prevalence	None	Non-suicidal self-injury
Turner, 2014[80]	United Kingdom	Clinic-based recruitment	Persons who sell sex	Male	96 (13 transgender)	Prevalence	None	Chlamydia, gonorrhea, genital warts
Heylens, 2014[81]	Netherlands, Belgium, Germany Norway	Clinic-based recruitment	Adults seeking gender reassignment surgery	Both	298	Prevalence	None	One or more Axis 1 personality disorders, one or more Axis 2 personality disorders, affective disorders, anxiety disorders, substance-related disorders, eating disorders, psychotic disorders
Central and South Asia								
Kalra, 2013[82]	Mumbai, India	Clinic-based recruitment	Hijra (individuals who do not conform to the conventional notions of male or female gender)	Male	50 (49 male, 1 female)	Prevalence	None	Depressive disorder, dysthymic disorder, alcohol abuse or dependence
Arora, 2013[83]	New Delhi, India	NS	MSM and transgender women	Male	65 (24 transgender)	Prevalence	None	Anal dysplasia
Ramakrishnan, 2012[84]	Tamil Nadu, India	Probability-based	Transgender	Both	807	Prevalence	None	HIV seroprevalenece, lifetime syphilis
Brahmam, 2008[85]	India	Probability-based	MSM and Hijra	Male	4600 (575 Hijra)	Prevalence	None	HIV seroprevalence, syphilis seroprevalence, HSV-2 seroprevalence
Aghabikloo, 2012[86]	Tehran, Iran	Clinic-based recruitment	Transsexuals with GID seeking sexual reassignment surgery	Female	25	Prevalence	None	Mood disorders, anxiety disorders, suicide attempts, substance-related disorder
				Male	44	Prevalence	None	Mood disorders, anxiety disorders, suicide attempts, substance-related disorder
Ahmadzad-Asl, 2013[87]	Tehran, Iran	Chart review	Transsexuals with a diagnosis of GID	Male	138	Prevalence	None	General medical condition co-morbidity; current smoker, psychiatric co-morbidity

				Female	143	Prevalence	None	General medical condition co-morbidity; current smoker, psychiatric co-morbidity
Javaheri, 2010[88]	Tehran, Iran	Clinic-based recruitment	Transsexuals	Both	40	Prevalence	None	Thought of committing suicide, suicide attempt
Bhatta, 2014[89]	Nepal	Snowball/cha in referral and venue-based	Male to female transgender persons	Male	232	Prevalence	None	Alcohol in last 6 months, smoking in last 6 months
Rehan, 2011[90]	Karachi and Lahore, Pakistan	Random sample of gurus	Hijras	Male	400	Prevalence	None	Extra-inguinal lymphadenopathy, urethral discharge, anal discharge, anal warts, anal tears, genital ulcers
Emmanuel, 2013[91]	Pakistan	Peer referral	Key populations	Male	16642 (3714 Hijra sex workers)	Prevalence	None	HIV seroprevalence, injected drugs in the past 6 months
South East Asia								
Chemnasiri, 2010[92]	Bangkok, Chaing Mai, Phuket, Thailand	Venue-day-time	MSM and transgender women	Male	827 (241 transgender)	Prevalence	None	HIV seroprevalence, history of STIs, used alcohol ever, used drugs ever
Gooren, 2015[93]	Thailand	Snowball sampling	Kathoeys (transgender women)	Male	60	Prevalence	None	Unprescribed hormone use
			Toms (transgender men)	Female	60	Prevalence; t-test	Using cross-sex hormones	Unprescribed hormone use; bodily harm, mental health
Yadegarfard, 2013[94]	Thailand	Organization-based recruitment	Transgender	Male	190	MANOVA	Age, education, >10 sexual partners	PANSI-positive (Positive and Negative Suicide Ideation Inventory), PANSI-negative, depression, loneliness, HIV self-report
Lai, 2010[95]	Taiwan	Recruitment letter sent	First year college students	Male	2585 (49 gender dysphoric)	Odds ratio	Gender dysphoria compared to non-gender dysphoric	Generalized anxiety disorder, panic disorder, hypochondriasis, major depressive disorder, body dysmorphic disorder, schizoid personality, suicidal ideation, anxiety disorder, depressive disorder, other mental health disorders
				Female	2615 (176 gender dysphoric)	Odds ratio	Gender dysphoria compared to non-gender dysphoric	Generalized anxiety disorder, hypochondriasis, major depressive disorder, body dysmorphic disorder, schizoid personality, suicidal ideation, anxiety disorder, depressive disorder, other mental health disorders

Oceania								
Kelly, 2014[96]	Brisbane, Australia	Venue-based	LGBT youth	NS	161 (24 transgender)	Prevalence	None	Alcohol, tobacco, any illicit drug use, poly-drug use, cannabis, stimulants, inhalants, prescription, medications, LSD, opiates, steroids
Pell, 2011[97]	Sydney, Australia	Clinic-based recruitment	Transgender	Male	141	Prevalence	None	Mental health diagnosis, HIV, past or present intravenous drug use
				Female	17	Prevalence	None	Mental health diagnosis, past or present intravenous drug use
Boza, 2014[98]	Australia	Internet-based	Transgender identity	Both	243	Prevalence	None	Depressive symptoms, suicide attempt
Clark, 2014[99]	New Zealand	Randomly selected high school recruitment	Students	NS	8166 (96 transgender)	Adjusted odds ratio	Transgender compared with non-transgender	Significant depressive symptoms, self-harmed in last 12 months, attempted suicide
Pitts, 2009[100]	Australia and New Zealand	Internet based	Trans people	Both	253	Number and types of discrimination	Chi square; prevalence	Depression; thoughts of suicide or hurting self in past 2 weeks, thoughts of feeling down, depressed or hopeless, major depressive episode
Multi-country								
Becerra-Fernandez, 2014[101]	Not specified-abstract	Not specified-abstract	Female to Male transsexuals prior to cross-sex hormone therapy	Female	77	Prevalence	None	Obesity, polycystic ovary syndrome, metabolic syndrome, hyperandrogenism
Reisner, 2014[102]	Latin America/ Caribbean, Portugal, Spain	Internet based	MSM	Male	35483 (158 MtF transgender)	Prevalence	None	Suicide attempt ever, depressive distress past week, HIV self-report, any STI past 12 months, syphilis, gonorrhea, chlamydia, HPV, genital herpes
				Female	35483 (32 FtM transgender)	Prevalence	None	Suicide attempt ever, depressive distress past week, HIV self-report, any STI past 12 months, gonorrhea, HPV, genital herpes
Buchbinder, 2014[103]	Brazil, Ecuador, Peru, South Africa	NS	MSM and transgender women	Male	2499 (162 transgender women)	Prevalence, incidence	None	HIV seroprevalence
Meier, 2013[104]	19 countries	Internet-based	Female to male transgender	Female	503	Contrast estimate	Attracted to both men and women	Anxiety

Table 2. Transgender and Other Gender Minority Population Health Research **on** Stigma, Discrimination, Violence/ Victimization, and Sex Work Among 2008–2014 by Region, Country, and then Author.

	Location	Sampling method	Sample	Assigned sex at birth	Sample size	Measure of prevalence/ association	Significant associations	Health outcome measures
North America								
Bauer, 2014[105]	Ontario, Canada	Respondent-driven sampling	Trans emergency department patients	Male	195	RDS-weighted prevalence	None	Ever avoided emergency department because trans, negative emergency department experience, refused or ended care, hurtful or insulting language, refused to discuss trans concerns, told not really trans, discouraged from exploring gender, provider does not know enough to provide care, belittled or ridiculed, thought gender marker on ID was a mistake, refused to examine parts of body
				Female	214	RDS-weighted prevalence	None	Ever avoided emergency department because trans, negative emergency department experience, refused or ended care, hurtful or insulting language, refused to discuss trans concerns, told not really trans, discouraged from exploring gender, provider does not know enough to provide care, belittled or ridiculed, thought gender marker on ID was a mistake, refused to examine parts of body
McGuire, 2010[106]	California, USA	Gay Straight Alliance organization-based recruitment	LGBT and allies students	NS	2260 (68 transgender)	T-test	Transgender compared to non-transgender	Feeling unsafe at school
Harawa, 2010[107]	Los Angeles, USA	Random sample from prison census	MSM and male to female transgender inmates	Male	101 (19 transgender)	Prevalence	None	Receiving money, protection, food, or other goods in exchange for sex
Rohde Bowers, 2011[12]	Los Angeles County, USA	Venue based	High risk HIV prevention program attendees	Male	1033 (320 transgender)	Prevalence	None	Exchange sex
Hwahng, 2014[18]	New York, USA	Organization based, venue referrals, and internet	HIV uninfected male to female transgender	Male	572	Prevalence	None	Verbal gender abuse early adolescence, physical gender abuse early adolescence, verbal or physical gender abuse early adolescence, verbal gender abuse late adolescence, physical gender abuse late adolescence, verbal or physical gender abuse late adolescence

Nuttbrock, 2010[22]	New York, USA	Organization based, venue referrals, internet advertisements	HIV uninfected male to female transgender	Male	571	Prevalence	None	Lifetime gender-related psychological abuse, lifetime gender-related physical abuse
Nuttbrock, 2013[23]	New York, USA	Organization based, venue referrals, internet advertisements	HIV uninfected male to female transgender	Male	230	Adjusted odds ratio	Employment, sex work, transgender presentation, hormone therapy	Psychological gender abuse, physical gender abuse
Nuttbrock, 2013[24]	New York, USA	Organization based, venue referrals, internet advertisements	HIV uninfected male to female transgender	Male	230	Prevalence	None	Psychological or physical gender abuse, psychological and physical gender abuse
Reisner, 2010[16]	New England, USA	Venue-based	Transmen	Female	16	Prevalence	None	Sex work ever, internalized homophobia
Rapues, 2013[32]	San Francisco, USA	Respondent-driven sampling	Male to female transgender	Male	314	Prevalence (RDS weighted)	None	Commercial sex work
Sevelius, 2009[35]	San Francisco, USA	Clinic and location based	Transgender	Male	153	Prevalence	None	Sex work
Wilson, 2014[37]	San Francisco, USA	Respondent-driven sampling	Transgender women	Male	233	Prevalence	None	Engagement in sex work
Nemoto, 2014[38]	San Francisco and Oakland, USA	Purposive community sampling	Transgender women with a history of sex work	Male	573	Prevalence	Race	Sex work in past 6 months
Brennan, 2012[39]	Chicago and Los Angeles, USA	Clinic-based, venue-based, and peer outreach and referral	Young transgender women	Male	151	Prevalence; point biserial correlations; beta	Intimate partner violence, unprotected anal intercourse, polysubstance use; syndemic index (low self-esteem, polysubstance use, victimization, intimate partner violence)	Victimization, intimate partner violence; history of sex work
Bradford, 2013[40]	Virginia, USA	Internet and peer referral	Transgender	Both	350	Prevalence; Adjusted odds ratio	Suburban vs urban setting, FTM spectrum, racial/ethnic minority, education, low-income, living full time, age at transawareness, hormones, hormone therapy needed but not obtained past 3 months, counseling or psychotherapy needed but not obtained past 3 months, forced or unwanted sex,	Health care discrimination, employment discrimination; discrimination

							physically attacked, tobacco problem ever, drinking problem, family not supportive, being connected to the transgender community, hostility or insensitivity in school	
Benotsch, 2013[13]	Mid-Atlantic, USA	Clinic-based recruitment	Transgender	Both	155	Prevalence	Individuals reporting non-medical use of prescription drugs	Discrimination-gender identity
Bockting, 2013[42]	USA	Internet -based	Transgender adults	Both	1093	Prevalence, beta	Non-white race/ ethnicity, income, investment in passing, outness, age, transgender women compared to transgender men	Enacted stigma, felt stigma
Cruz, 2014[108]	USA	Internet based	Transgender participants from the National Discrimination Survey	Both	4049	Prevalence; odds ratio	Trans discrimination or both discrimination and affordability; male vs other identity, female vs male identity, female vs other identity, somewhat genderqueer identity, hormones, top surgery, bottom surgery main place seeking care,, no health insurance, income	Postponement of curative care due to discrimination
Dank, 2014[109]	USA	School-based recruitment	Students	NS	5647 (18 transgender)	Prevalence	Transgender status	Physical dating violence, psychological dating abuse, cyber dating abuse, sexual coercion
House, 2011[49]	USA	Internet-based	LGBT adults	Both	1126 (164 transgender)	Prevalence	None	Interpersonal trauma, experiences of discrimination
Kosciw, 2009[110]	USA	Internet-based	Secondary school students	NS	5420 (245 transgender)	Beta	Transgender identity compared to male identity	Victimization related to sexual orientation, victimization related to gender expression
Mitchell, 2014[111]	USA	Internet based	13–18 year olds completing the Teen Health and Technology survey	Both	5498 (189 transgender, 209 gender nonconforming or other gender)	Prevalence; adjusted conditional odds	Transgender vs cisgender male, gender nonconforming or other gender vs cisgender male	Sexual harassment (any mode, in-person, online, by text message, by phone call, some other way), made obscene or sexual comments, asked for sexual information, asked to do something sexual, touched grabbed or pinched, showed/sent obscene or sexual messages, intentionally brushed up against, spread sexual rumors, blocked/ cornered; non-distressing sexual

								harassment; distressing sexual harassment
Reisner, 2013[53]	USA	Brief intercept	Transmasculine	Female	73	Prevalence	None	Perceived discrimination by health care provider
Reisner, 2014[54]	USA	Convenience sample	Transfeminine gender identity	Male	3878	Prevalence; risk ratio	Jail/prison time, mistreated/victimized in jail/prison, denied healthcare in jail/prison	Denied healthcare in jail, mistreated victimized in jail/ prison; sex work, any physical assault, any sexual assault
Reisner, 2014[55]	USA	Clinic-based	Participants from the Community Health Center Core Data Project	Both	2653 (31 transgender)	Prevalence	Transgender	Childhood abuse, experienced intimate partner violence, any victimization as adult, verbally attacked, physically attacked, sexually harmed, any discrimination, employment discrimination, healthcare discrimination
Ybarra, 2014[112]	USA	Targeted online recruitment	LGBT youth	Both	5542 (442 transgender)	Prevalence	None	Online peer victimization: bullying, in person peer victimization: bullying, online peer victimization: sexual harassment, in person peer victimization: harassment
South and Central America								
Marin, 2013[113]	Argentina	Sexual Workers Union registration	Female sex workers and transvestites	NS	950 (110 transgender)	Prevalence	None	Discrimination in health care
Socias, 2014[60]	Argentina	Snowball sampling and quota sampling	Transgender	Male	452	Prevalence; chi square; adjusted odds ratio	Any internalized stigma, history of sex work, experienced police violence, ever arrested, perceived discrimination by healthcare workers, perceived discrimination by patients, current residency in Buenos Aires; extended health insurance	Sex work, healthcare avoidance because of transgender identity
Delgado, 2014[114]	Chile	Snowball	Gay men and transgender women	Male	437 (121 transgender)	Prevalence	None	Not being hired or being fired, being denied access or permanence in a public place, poorly-assisted by public officials, not accepted or excluded from school, not accepted or excluded from a group of friends, molested or harassed by neighbors, not accepted or excluded from a social group, not accepted or

								excluded from family, not accepted or excluded from a religious environment, verbal or physical mistreatment or being denied help by the police
Miller, 2011[115]	Guatemala city, Guatemala	Respondent-driven sampling	MSM and transgender women	Male	505 (99 transgender)	Prevalence	None	Transactional sex
Europe								
Prunas, 2014[116]	Milan, Italy	Census	Transgender victims of transphobic murder	Male	20	Prevalence	None	Sex work, primary indicator of LGBT hate crime, secondary indicator of LGBT hate crime
Central and South Asia								
Brahmam, 2008[85]	India	Probability-based	MSM and Hijra	Male	4600 (575 Hija)	Prevalence	None	Selling sex
Javaheri, 2010[88]	Tehran, Iran	Clinic-based recruitment	Transsexuals	Both	40	Prevalence	None	Being discriminated against for being transsexual
Oceania								
Pell, 2011[97]	Sydney, Australia	Clinic-based recruitment	Transgender	Male	141	Prevalence	None	Past or present sex work
Multi-country								
Reisner, 2014[102]	Latin America/ Caribbean, Portugal, Spain	Internet based	MSM	Male	35483 (158 MtF transgender)	Prevalence	None	Transactional sex past 12 months, childhood gender-related harassment, adulthood gender-related harassment
				Female	35483 (32 FtM transgender)	Prevalence	None	Transactional sex past 12 months, childhood gender-related harassment, adulthood gender-related harassment

GID=Gender identity disorder; NS=not specified; MSM=men who have sex with men.

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