Appendix of participation for validation

Population size estimates among transgender people in South Africa

20 October 2021

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This report was prepared by the Best Health Solutions (BHS) on behalf of Beyond Zero (BZ). Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the South African National AIDS Council (SANAC).

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ACRONYMS AND ABBREVIATIONS

AFSA	**AIDS Foundation South Africa**
AM	**Anchored Multiplier**
BZ	**Beyond Zero**
C	**Captured**
CBOs	**Community-Based Organisations**
CDC	**Centers for Disease Control and Prevention**
CIs	**Confidence Intervals**
CRC	**Capture Recapture**
DSD	**'Disorder of Sex Development'**
FSW	**Female Sex Worker**
GF	**Global Fund**
CCM	**Country Coordinating Mechanism**
GIS	**Geographic Information System**
HIV	**Human Immunodeficiency Virus**
HS	**Household Survey**
IDU	**Injecting Drug User**
KP	**Key Populations**
LGBTI	**Lesbian, Gay, Bisexual, Transgender and Intersexual**
LGBTQI+	**Lesbians, Gays, Bi-sexuals, Trans-gender, Intersex, Queer**
NACOSA	**Networking HIV & AIDS Community of Southern Africa**
NPO	**Non- Profit Organisation**
NSP	**National Strategic Plan for HIV, TB and STIs**
PEPFAR	**President's Emergency Plan for AIDS Relief**
PR	**Principal Recipients**
PSE	**Population Size Estimate**
RDS	**Respondent Driven Sampling**
SANAC	**South African National AIDS Council**
SANAC TSU	**South African National AIDS Council Technical Support Unit**
SM	**Service Multiplier**
SMM	**Service Multiplier Method**
SRHR	**Sexual and Reproductive Health and Rights**
SRs	**Sub-recipients**
STIs	**Sexually Transmitted Infections**
TB	**Tuberculosis**
TG	**Transgender**
UNAIDS	**Joint United Nations Programme on HIV and AIDS**
UOM	**Unique Object Multiplier**
WHO	**World Health Organization**
WOTC	**Wisdom of the Crowds**

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Transman: A person who was assigned female at birth, but identifies as man.

Transwoman: A person who was assigned male at birth, but identifies as woman.

Nonbinary, gender queer and gender non-conforming: A person identified outside the gender binary of 'man' and 'woman', identifying as neither, as both, or as somewhere on a spectrum between the two

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At the onset, let me highlight that this transgender population size estimate study is important and timely, as it seeks to inform the next generation of the South African National Strategic Plan and the Country Operational Plan. This study will also inform further Provincial Implementation Plans and other key planning initiatives at a local level.

Population size estimates of transgender people are not readily available. This problem compounded by the fact that official government records are mainly based on the sex assigned at birth and rarely report gender identity. As such, a lack of population size estimates of the transgender population made it difficult for service providers and government to provide adequate services to transgender people for prevention and treatment of various diseases such as HIV, TB and STIs.

A lack of population size estimates negatively impacts response planning, target setting, resource allocation, and the provision of data for monitoring and evaluating program outcomes and impacts. It is important to know the size of the transgender population and the geographic spread of transgender focused healthcare service providers in the country.

The lack of reliable and valid population size data and stigma and discrimination against these populations continue to encumber the design, development, and implementation of appropriate prevention, care, and treatment interventions targeting key populations. Primary healthcare providers and community-based organisations should be trained in transgender healthcare. The results of this study have improved our understanding of transgender population size estimates and the mapping of transgender focused service points nationally. The results of this study are also essential as they will guide the government and other service providers in transgender focused planning and allocation of resources.

Transgender people face barriers to accessing quality health care, social and legal services. They experience stigma and discrimination, discomfort, distress where opportunities to express their identity are denied or where that identity is not respected. These barriers contribute to heightened vulnerability to HIV infection and lasting consequences on their social and mental health. They also have profound adverse effects not only on transgender individuals but also on society as a whole. I, however, urge all members of the transgender community to fully utilize the LGBTQI sector.

To conclude, regardless of their sexual orientation or gender identity, everyone deserves equal access to opportunities and services, and their safety should be protected.

I plead for an inclusive society

Dr. Sisanda Gaga
C.E.O

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LGBTIQ+

EXECUTIVE SUMMARY

The South Africa Global Fund Country Coordinating Mechanism (GF CCM) is responsible for overseeing the implementation of HIV and TB programmes funded by the Global Fund to Fight AIDS, TB and Malaria (GF) in the country. The GF CCM develops priorities for the programmes, determines envelop for disease split (HIV and TB), and ensures that the programme deliverables are met. The GF CCM appointed Beyond Zero (BZ) NPO as one of the Principal Recipients (PRs) for the 2019 – 2022 funding cycle. BZ oversees the implementation of the transgender programme that aims to deliver a comprehensive, integrated, peer-led HIV/TB/SRHR package for TG in line with the NSP package, and the National LGBTI HIV Plan.

The TG programme model is delivered through a combination prevention programme approach to reduce the transmission of HIV, STIs and TB by tailoring a combination of biomedical, behavioural and structural interventions and the mode of delivery to the setting and population. The study sought to generate trans-gender population size estimates necessary to inform policy formulation and programming. The objectives of this study were to conduct the size estimation of TG people in South Africa and to establish a compre-hensive geo-spatial map and database per district.

Various sources of data were utilised to obtain the final estimates of the size of the transgender population in South Africa. These were both primary (respondent driven sampling, service multiplier, wisdom of the crowd) and secondary sources (administrative records, capture recapture). The sampling methods used were convenience, purposive, snowballing and respondent driven sampling. Ethical approval for this study was granted by the University of Johannesburg.

Data collection was conducted from 19 July to 27 August 2021 from three groups. The first group consisted of individuals selected using Respondent Driven Sampling (RDS) method which was designed to recruit (TG) respondents only. The second group was made up of service providers who included communi-ty-based organisations (CBOs), endocrine clinics and health facilities offering services to TG population, and the third group comprised of key informants and allies who participated via a shared link on social media platforms.

There is an estimated total of 179 327 (95% CI 174 609 to 184 059) transgender people in South Africa which corresponds to 0.30 (95% CI 0.29 to 0.31) of the total population. These findings are in line with global estimates of TG people according to UNAIDS, as they estimated that between 0.1% and 1.1% of reproductive age adults are TG (UNAIDS, 2014).

For the Eastern Cape, it was estimated that 21 951 (95% CI 18 598 to 25 489) transgender people live in the province, which corresponds to 0.29 (95% CI 0.23 to 0.36) of the total population of the Eastern Cape. For the Free State province, it was estimated that 5 967 (95% CI 3 962 to 8 518) transgender people live in the province, which corresponds to 0.31 (95% CI 0.28 to 0.34) of the total population of the Free State. For Gauteng, it was estimated that 50 916 (95% CI 43 823 to 53 434) transgender people live in the province, which corresponds to 0.31 (95% CI 0.28 to 0.34) of the population of Gauteng.

For KwaZulu Natal (KZN), it was estimated that 22 388 (95% CI 16 524 to 25 124) transgender people live in the province, which corresponds to 0.18 (95% CI 0.14 to 0.22) of the population of KZN. For Limpopo, it was estimated that 18 960 (95% CI 14 900 to 21 763) transgender people live in the province, which corresponds to 0.31 (95% CI 0.25 to 0.37) of the total population of Limpopo.

For Mpumalanga, it was estimated that 14 769 (95% CI 11 321 to 18 479) transgender people live in the province, which corresponds to 0.31 (95% CI 0.24 to 0.39) of the total population of Mpumalanga. For the North West province, it was estimated that 10 184 (95% CI 7 055 to 12 250)

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transgender people live in the province, which corresponds to 0.23 (95% CI 0.17 to 0.30) of the total population of the North West.

For the Northern Cape, it was estimated that 9 781 (95% CI 6 406 to 9 982) transgender people live in the province, which corresponds to 0.62 (95% CI 0.49 to 0.77) of the total population of the Northern Cape. For the Western Cape, it was estimated that 26 439 (95% CI 21 444 to 29 969) transgender people live in the province, which corresponds to 0.36 (95% CI 0.30 to 0.42) of the total population of the Western Cape.

In this study a total of 87 214 transgender people were estimated to be transwomen while 66 076 were gender non-conforming and 28 065 were transmen in South Africa. The mapping exercises revealed that Gauteng, Western Cape and KwaZulu Natal have the highest concentration of transgender focused service providers these areas were also found to have higher population size estimates of transgender people across the country. Congruent with the demand for transgender related services, it is incumbent upon the government and donor agencies to increase investment in social, structural, biomedical and behavioural interventions targeted at the growing number of TG key population groups.

The transgender population size estimation will go a long way in informing programming and policy in South Africa. Effective implementation of the population size estimation project was as a result of working collaboratively with various transgender focused organisations. A combination of wisdom of the crowd, service multiplier and respondent driven sampling methods were used. In the context of the COVID 19 pandemic, use of online data collection links coupled with social media played a critical role in reaching out to transgender people and transgender focused service providers in various districts.

Transgender field teams played a critical role in the identification of diverse seeds in the respondent driven sampling approach. Consultations with transgender focused organisations further assisted with the mapping of transgender focused service points.

1. INTRODUCTION

The South Africa Global Fund Country Coordinating Mechanism (GF CCM) is responsible for overseeing the implementation of HIV and TB programmes funded by the Global Fund to Fight AIDS, TB and Malaria (GF) in the country. The GF CCM develops priorities for the programmes, determines envelop for disease split (HIV and TB), and ensures that the programme deliverables are met.

The GF CCM has appointed Beyond Zero (BZ) NPO as one of the Principal Recipients (PRs) for the 2019 – 2022 funding cycle. In turn, BZ has appointed sub-recipients (SRs) to implement comprehensive HIV prevention programme activities targeting transgender (TG) people. The comprehensive package of health and social care and services are provided via a tiered approach into three levels:

Figure 1: Package of health and social care and services

CORE	Offered to all TG people reached, directly provided by sub-recpients (SRs) in the Global Fund Programme
LAYERS	Offered to some TG people (needs basis), directly provided by (SRs) in the Global Fund Programme
LINKAGE	Offered to some TG people (needs basis), provided by government/other partners Referral, linkage and follow-up by Global Fund SRs

The programme aims to deliver a comprehensive, integrated, peer-led HIV/TB/SRHR package for TG in line with the NSP package, and the National LGBTI HIV Plan. The investment will reach 1,680 TG with a defined package of services, achieving 70% saturation in 4 priority districts: Mangaung (Free State province), Carpricorn (Limpopo province), Gert Sibande (Mpumalanga province) and Garden Route (Western Cape province). BZ as the PR has appointed SRs to implement the delivery of a comprehensive, integrated, peer-led HIV/TB/SRHR package for transgender people (TG) in line with the NSP package, and the National LGBTI HIV Plan.

The TG programme model is delivered through a combination prevention programme approach to reduce the transmission of HIV, STIs and TB by tailoring a combination of biomedical, behavioural and structural interventions and the mode of delivery to the setting and population.

1.1 Background

The population size of transgender individuals in South Africa is not well known, partly because official records are mainly based on the sex assigned at birth and rarely report current gender identity. Accurate size estimates of the transgender population can help to ensure adequate availability of services to prevent or treat various diseases such as HIV infection; response planning, target setting, and resource allocation, and provide data for monitoring and evaluating programme outcomes and impact (Neal et al., 2020). For instance, estimates of the size of populations at risk of HIV are necessary to understand the scale of the epidemic and in planning appropriate interventions and allocation of resources (Son et al., 2019).

Transgender individuals have a gender identity that differs from their sex were assigned at birth (Meerwijk & Sevelius, 2017). They identify in a way that does not match their assigned sex (Winter et al., 2016). A transgender man is a birth-assigned female who identifies as a man. A transgender woman is a birth-assigned male who identifies as a woman.

Some transgender people identify outside the gender binary of 'man' and 'woman'; identifying as neither, as both, or as somewhere on a spectrum between the two (Winter et al., 2016). Some literature, may refer these as genderqueer, gender non-conforming individuals, agender, individuals who do not identify as a man or woman (Meerwijk & Sevelius, 2017).

In addition, being transgender is not the same as being intersex. Intersex is often used to describe individuals who develop atypically concerning some or all aspects of their biological sex (chromosomal, hormonal, gonadal and/or genital) (Winter et al., 2016). Most intersex conditions are not readily visible. Individuals aware of an intersex condition are usually alerted to the genital ambiguity with which they are born.

In contemporary medical literature individuals with intersex conditions are often described as having a 'Disorder of Sex Development' (DSD) (Diamond, 2009; Winter et al., 2016). This term is resisted by many because intersex conditions should not be regarded as disorders. "Difference of Sex Development" has been suggested as a replacement term (Diamond, 2009).

Transgender people may experience discomfort or distress where opportunities to express their identity are denied or where that identity is not respected. Some may seek gender-affirming healthcare aimed at bodily changes to match their gender identity. They often encounter stigma, discrimination, and abuse in their lives. They are edged towards the margins of society, where they get involved in risky situations and risky behaviour. Globally they bear a heavy burden of violence, as well as of HIV risk.

Some governments are taking steps to address human rights violations against transgender people. Across much of the world, transgender people have difficulty accessing or affording good quality healthcare, whether specific to their gender needs or more general in nature (Winter et al., 2016). They also experience barriers to financial assistance, discrimination, lack of cultural competence by providers, and socioeconomic barriers (Safer et al., 2016).

Transgender people may seek services from healthcare providers for reasons related to their gender incongruence. They may seek information and counselling support to help explore identity issues, or consider difficult transition decisions, and implications for family relationships, employment and broader social stigma. Children and youth with gender issues (as well as their parents and teachers) may need support and information (Winter et al., 2016).

They may seek medical services beyond gender-affirming healthcare. Some will have special sexual and reproductive healthcare needs, for example, associated with gamete storage or care of a surgically constructed vagina. Some may have more general healthcare needs linked to hormones, silicone injections and diseases related to birth-anatomy (for example, prostate cancer in a transgender woman). Current research suggests increased mortality and depression in transgender individuals not receiving optimal care and increased cardiovascular risk related to hormone therapy (Feldman et al., 2016).

1.2 Transgender people, their rights and health

There are reports with a disturbing picture of discrimination and abuse perpetrated by individuals, groups, organizations and broader society (Winter et al., 2016). Research has shown that transgender individuals worldwide are exposed to widespread social stigma, discrimination, harassment, and physical and sexual abuse (Meerwijk & Sevelius, 2017). They encounter workplace discrimination that often results in unemployment or underemployment. Transgender youth often face intolerance at home or school and drop out of education or leave home (Winter et al., 2016).

Previous studies show that transgender people were four times more likely to live in extreme poverty, had double the unemployment rate, and had almost double the homeless rate (Meerwijk & Sevelius, 2017). They drift towards poverty especially if they drop out of education early or leave home and cannot draw on social and financial support. Transgender people encounter problems accessing housing, basic goods and services, or even accessing spaces otherwise public.

Living on the margins of society, often excluded from opportunities available to their fellow citizens, and with health and wellbeing compromised, many are drawn into situations and patterns of behaviour involving unsafe sexual practices and substance abuse that leave them at risk of further ill-health and wellbeing. Some engage in intentional self-harm (Winter et al., 2016).

Excluded from much of the workplace, transgender people often enter a narrow range of 'ghetto' occupations to earn income. Many become involved in sex work often performed under conditions that put the individuals concerned at the risk of acquiring sexually transmitted infections (STIs) (Nadal et al., 2014; Poteat et al., 2015). Studies consistently document a high prevalence of adverse health outcomes in this population, including HIV and other sexually transmitted infections, mental health distress, and substance use and abuse (Reisner et al., 2016).

Transgender individuals had four times the rate of being HIV-infected and 28% postponed medical care because of discrimination and is particularly alarming is that 41% of survey respondents in a study reported at least one suicide attempt (Meerwijk & Sevelius, 2017).

Living life on the economic and social margins, transgender people across much of the world encounter harassment and abuse often at the hands of law enforcement agencies, and based on laws aimed at enforcing public decency and/or combatting cross-dressing and 'impersonation of the other sex'. When arrested and detained, transgender people are often placed in gender-in-appropriate facilities that put them at further risk of assault (Winter et al., 2016).

All these experiences have an impact on the emotional health and wellbeing of transgender people. Many of the challenges faced by transgender people are aggravated by laws and policies which deny them gender recognition. Identity documents undermine privacy when they reveal a transgender person's birth-assigned sex and can exacerbate the risk of discrimination in education, the workplace, housing, healthcare, and elsewhere. Laws and policies that impose onerous preconditions for gender recognition commonly violate a range of rights(Winter et al., 2016).

Therefore, it is important to understand the likely size of the transgender population and the range of their healthcare needs. Primary healthcare providers and others should also be trained in transgender healthcare.

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1.3 Transgender population size

Key populations have driven the HIV/AIDS epidemic in many parts of the world (Abdul-Quader et al., 2014). Lack of reliable and valid population size data, along with stigma and discrimination against these populations, continue to challenge the design, development, and implementation of appropriate prevention, care, and treatment interventions targeting key populations (UNAIDS, 2010). As mentioned above, TG people may seek services from healthcare providers for reasons related to their gender incongruence.

However, we do not know how many transgender people there are or how many experiences need healthcare. Researchers experience challenges in deciding whom to count and by what means. A gold standard method for population size estimation does not exist, but the quality of estimates could be improved by using empirical methods, multiple data sources, and sound statistical concepts (Neal et al., 2020).

Estimating the size of key populations (KP) faces several challenges, which include lack of a sampling frame and that some KP members may not want to be counted, they may choose to be less visible because of the stigma or criminalization of their KP-defining behaviors (Neal et al., 2020). In such circumstances, uncertainty is high.

In addition, the absence of survey items with which to identify transgender respondents in general surveys often restricts the availability of data with which to estimate the magnitude of health inequities and characterize the population-level health of transgender people globally(Reisner et al., 2016). Faced with these difficulties, researchers focused on the most easily counted subgroup, seeking gender-affirming healthcare at specialist clinics.

1.4 Estimating populations from clinic records and other databases

Clinic-based figures are important for the planning of clinic-based services. However, such figures grossly underestimate the size of the broader population of transgender people who cannot or do not access clinics, and tell us little about the much larger numbers which may benefit from services providing support through information and counselling rather than through bodily modification (UNAIDS/WHO, 2016).

Data needed to develop size estimates are generally available in a small number of geographic areas. Typically, these data come from the highest-burden areas where services are located or where size estimates have been developed previously. This will likely produce inflated key population size estimates if applied to the whole country. Therefore, it is recommended that some data be required from lower burden areas for extrapolation purposes (UNAIDS/WHO, 2016).

There are two broad categories of methods used to estimate the size of key populations. Methods under category one (census and enumeration, multiplier, and capture–recapture) collect data directly from the key population at risk, including existing data from related institutions (Abdul-Quader et al., 2014). Methods under category two (population survey, network scale-up) are used to collect data from the general population. Census and enumeration are costly and may miss hidden or hard-to-reach populations. Capture–recapture may yield a more stable and reliable estimate. However, it requires more complex data analysis and can be complex to implement (Abdul-Quader et al., 2014; UNAIDS, 2010).

The multiplier method uses two independent sources of data specific to the key population that is being estimated (Johnston et al., 2013) (Unaids, 2010). The first source is a count or listing from

programme data, including only the population whose size is being estimated, and the second source is a representative survey of the populations whose size is being estimated (Abdul-Quader et al., 2014). The network scale-up method (NSUM) is a relatively new approach in estimatiing key populations and hard-to-find subpopulations (Shokoohi et al., 2012). It is predicated on the assumption that the characteristics of the people that make up an individual's social networks represent, on average, the overall population (Bernard et al., 2010). In this study, we used Successive Sampling Population Size Estimation, Wisdom of the Crowd, Service Multiplier, Social App Multiplier and the Anchored Multiplier Method.

1.5 Purpose of the project

Estimation of key population sizes is essential for programme planning, and monitoring of disease epidemics. Hence Beyond Zero and the SANAC TSU, have commissioned Best Health Solutions to undertake the population size estimate (PSE). The aim of the project was to improve understanding of TG population size estimate (PSE) in a nationally representative sample of districts.

This will help inform current and future programme planning. In this project, the target districts shall include districts where the GF funded TG Programme was implemented as well as the major metropolitan and cities, including estimations in rural and periphery areas.

This study, therefore, attempted to directly estimate the size of the transgender population in nine (9) provinces in South Africa using the Successive Sampling Population Size Estimation, Wisdom of the Crowd, Service Multiplier and the Anchored Multiplier Method, and to extrapolate from these provinces to generate a national population estimate of the transgender people. We also aimed to map and develop a profile for the TG service points TG service points of transgender people by province.

1.6 Objectives

The scope of work entailed the following:

      1.6.1 Conducting the size estimation of TG people in South Africa
      1.6.2 Establishing a comprehensive geo-spatial map and database per district

2.METHODOLOGY

2.1 Study Setting

The TG population size estimates and the geographic mapping exercises were conducted in the Eastern Cape, Free State, Gauteng, KwaZulu Natal, Limpopo, Mpumalanga, Northern Cape, North West and the Western Cape provinces of South Africa. The population size estimates were stratified by province and district as highlighted in Table 1 below. These districts were identified in consultation with the SANAC TSU and funders such as PEPFAR.

Table 1: Stratification of the study settings by province and district

Province	District
Eastern Cape	Nelson Mandela Metropolitan Municipality
	Buffalo City
Free State	Mangaung
Gauteng	City of Johannesburg
	City of Tshwane
	City of Ekurhuleni
KwaZulu-Natal	eThekwini
	uMgungundlovu
Limpopo	Capricorn
Mpumalanga	Gert Sibande
	Mbombela
Northern Cape	Kimberly
North West	Rusternburg
Western Cape	City of Cape Town
	Garden Route

2.2 Study Population

The participants were resident in South Africa at the time of the study. The study excluded people in institutions such as prisons, barracks, and refugee camps. The inclusion criteria for each target group is outlined below:

Transgender people: these were people who identified as transmen, transwomen, non-binary, gender queer, gender-diverse, gender non-conforming. TG participants were 18 years and above, willing and able to recruit others.

Service providers: comprised representatives from endocrine clinics, private doctors, trans-led organisations, LGBTQI-focused organisations, trans-friendly entertainment centres and pharmacies.

Community members and allies: comprised non-transgender individuals who participated in the online survey that was shared via Twitter, Facebook, Instagram and WhatsApp.
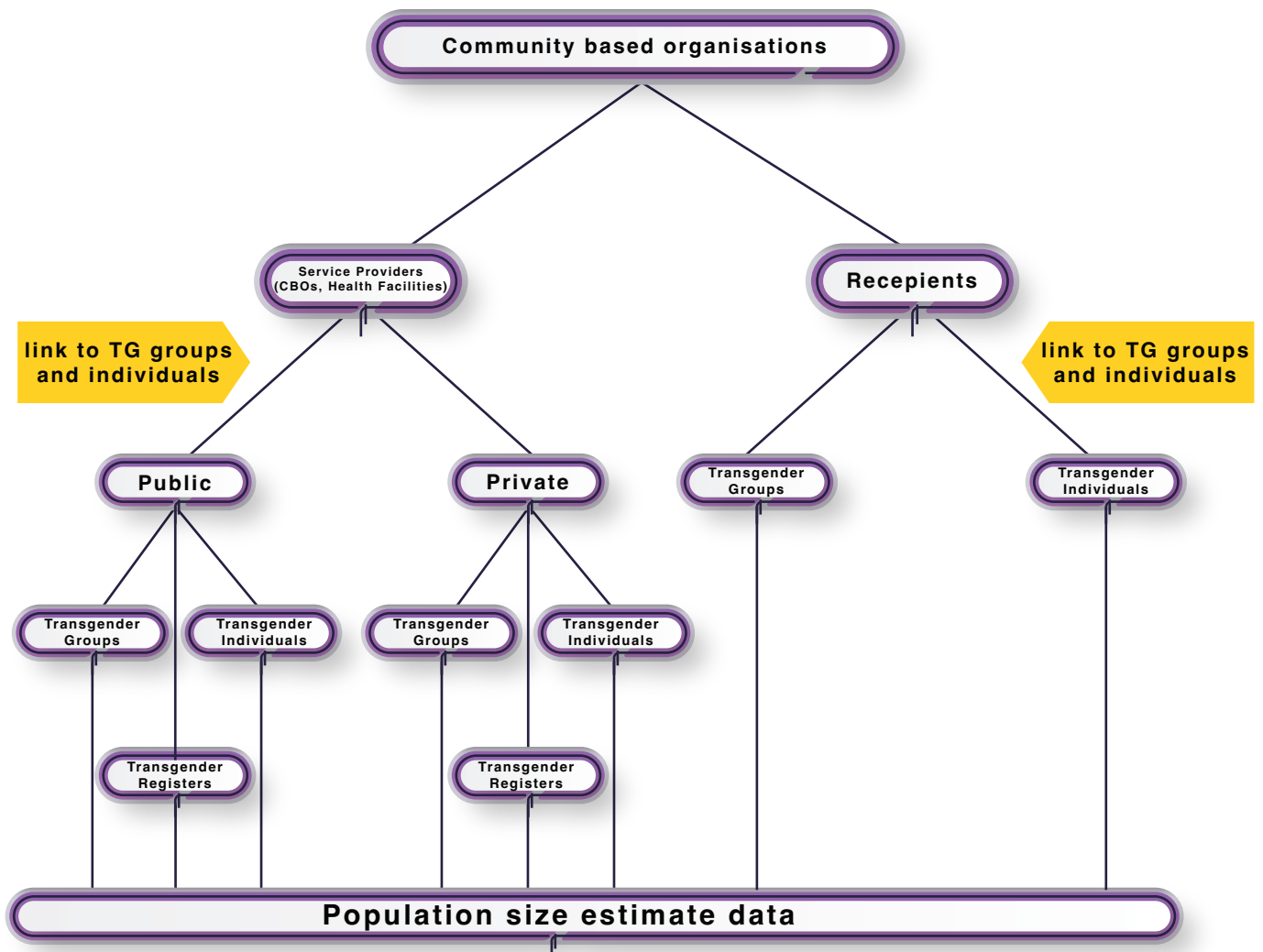
2.3 Study Process

The study followed the phases as depicted in figure 3 below.

Phase 1.
Study Preparation
● Conduct formative assessment
● Define the population and gegraphic area
● Desktop review of existing estimates

Phase 2.
Data Collection
● Training of field teams
● Data collection
● Collate existing data

Phase 3.
Data Analysis, Validation, Reporting
● Data cleaning and validation
● Report writing
● Dissemination of findings

Figure 3: Phases of the study

2.4 Formative Assessment

A formative assessment was conducted during the period 18 March to 11 April 2021. It provided some baseline information on the numbers of TG people reached in 2019 and 2020 by various organisations implementing TG-related programmes. This led to a better understanding of the study's scope, possible limitations, and delimitations, alternative data sources, and site-specific methodologies. The formative assessment exercise informed the costing of the activities and the deployment of resources.

2.5 Sampling and Data Collection

Various sources of data were utilised to obtain the final estimates of the size of the transgender population in South Africa. These were both primary (respondent driven sampling, service multiplier, wisdom of the crowd) and secondary sources (administrative records, capture recapture). Data collection was conducted from 19 July to 27 August 2021.

Data were collected from three groups. The first group consisted of individuals selected using Respondent Driven Sampling (RDS) method which was designed to recruit (TG) respondents only. The second group was made up of service providers who included community-based organisations (CBOs), endocrine clinics and health facilities offering services to TG population, and the third group comprised of key informants and allies who participated via a shared link on social media platforms.

Field team members were transgender people selected from organisations implementing transgender focused work. They were trained on research ethics, data collection tools and methods prior to piloting the tools and commencement of the study. The pilot study led to the design of simplified and easy to read survey tools. The flow of questions was improved and ambiguity minimised in the tools. Web-based online data collection tools were utilized to allow for virtual real-time data collection.

The following data were gathered from CBOs, health facilities and TG groups;
● Actual and / or estimated TG population
● List of TG service points
● List of CBOs offering services to TG population
● List of public and private health facilities offering services to TG population
● Geo-spatial maps and GIS coordinates for CBOs, TG health facilities, and other TG service points.

2.6 Mapping and population size estimation

There are generally two broad categories of methods that have been applied in the estimation of the sizes of key populations. The first category comprises methods that rely on data collected directly from the key population at risk and data from institutions associated with the key population of interest. These include census and enumeration, multiplier, and capture-recapture methods.

The second category includes methods that use data collected from the general population, including population surveys and network scale-up. However, several of these methods from both categories are costly to implement and require considerably long periods of time (Table 2).

Table 2: The lengths of data collection period of previous studies

Place	Target population	Data/ method	Year of data collection	Fieldwork period
Mauritius, entire island	IDU	SM	2009	5 weeks
Mauritius, entire island	FSW	SM	2020	4 weeks
Port Moresby, Papua New Guinea	FSW	SM	2006	8 weeks
Port Moresby, Papua New Guinea	MSM	SM	2006	9 weeks
Goroka, Papua New Guinea	FSW	SM	2007	8 weeks
Bangkok, Thailand	IDU	SM	2009	25 weeks
Chiang Mai, Thailand	IDU	SM	2009	23 weeks
San Francisco, United States	IDU	SM	2005	32 weeks
San Francisco, United States	IDU	SM	2009	21 weeks
Zimbabwe, entire country	FSW	SM, UOM,CRC	2015-2017	87 weeks
Rwanda, entire country	High risk of HIV	HS	2011	10 weeks

SM= service multiplier; HS= household survey; UOM= unique object multiplier, CRC= capture recapture. IDU=Injection Drug Users, FSW= Female Sex Workers, MSM= Men having Sex with Men
Source: Incorporating the service multiplier method in respondent-driven sampling surveys to estimate the size of hidden and hard-to-reach populations (Johnston et al., 2013): Case studies from around the world (Fearon et al., 2020); Estimating the Population Size of Female Sex Workers in Zimbabwe: Comparison of Estimates Obtained Using Different Methods in Twenty Sites and Development of a National-Level Estimate; Blood loss during transurethral prostatic resection with continuous bladder irrigation (Rwanda Biomedical Center/Institute of HIV/AIDS, UNAIDS, 2011).

Complementary approaches were used to estimate the TG population size namely; Service Multiplier, Respondent Driven Sampling, Wisdom of the Crowd and Anchored Multiplier were used to estimate transgender population sizes. Respondent Driven Sampling was used to recruit transgender individuals through successive sampling. The Anchored Multiplier method was used to obtain a consolidated consensus estimate. Geographical mapping was used for mapping providers of TG related services.

2.7 Geographical mapping

In this study, geographic mapping enabled identification of places for primary data collection. TG service points were defined as physical venues where TG individuals visit to access social, structural and biomedical services as shown in the table below.

Table 3: Transgender targeted services

	Examples of Intervention
STRUCTURAL	Promotion of social cohesion, social capital, social inclusion and leadership
	Advocacy interventions for policy , program and/ or service change
	Fighting social and institutional homophobia
	Economic strengthening and supplementary income generation
BIOMEDICAL	Use of male and female condoms and lubricant
	Diagnosis and treatment of STIs with anal, genital and oral manifestations
	Post-exposure prophylaxis (PEP)
	Pre-exposure prophylaxis (PrEP)
	Client-and provider -initiated HIV testing and counselling
	HIV care and treatment
BEHAVIORAL	Individual- level behaviour change through peer education and community-based counselling
	Collective-level behaviour change
	Institutional level behaviour change through health providers
	Media communication for behaviour change
SOCIAL	Entertainment centres that are TG friendly

Field team members visited TG service points and gathered the following data: *name of service point, address, type of services provided and geographic coordinates.*

2.8 Sampling Methods

2.8.1 Respondent-driven sampling

The RDS technique is a form of chain referral sampling (Heckathorn, 1997; Son et al., 2019). It is a social networking–based sampling and analytic approach. The RDS process begins with a selection of seeds, who are members of the target population purposively selected (Paul Douglas Wesson et al., 2019). In this study we utilised digital coupons that were determined through the use of cellphone numbers of respondents. Each seed was given three (3) digital coupons to recruit other transgender people within their social network to participate in the study.

The choice of seeds was critical as the seeds must be well-known and respected people in the TG community. It works on two assumptions, firstly that people are connected, and secondly that subsequent referrals are independent of the seed. In other words, recruitment relies on personal networks and enrolment takes place independent of seed preference.

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Table 4: Distribution of seeds per district

Province	Sample Size	Number of Seeds	Maximum Waves
Eastern Cape	357	10	10
Free State	94	5	4
Gauteng	375	15	6
KwaZulu Natal	109	8	4
Limpopo	138	3	7
Mpumalanga	446	7	9
North West	101	2	11
Northern Cape	261	4	14
Western Cape	169	8	8
Total	**2050**	**62**	

The formative assessment exercise informed the final number of seeds shown in the table above. Seed selection was done to ensure diversity based on *age, gender identity (transgender men, transgender women, nonbinary, gender-queer, and gender non-conforming).*

The figure below illustrates the seeds and recruitment waves.
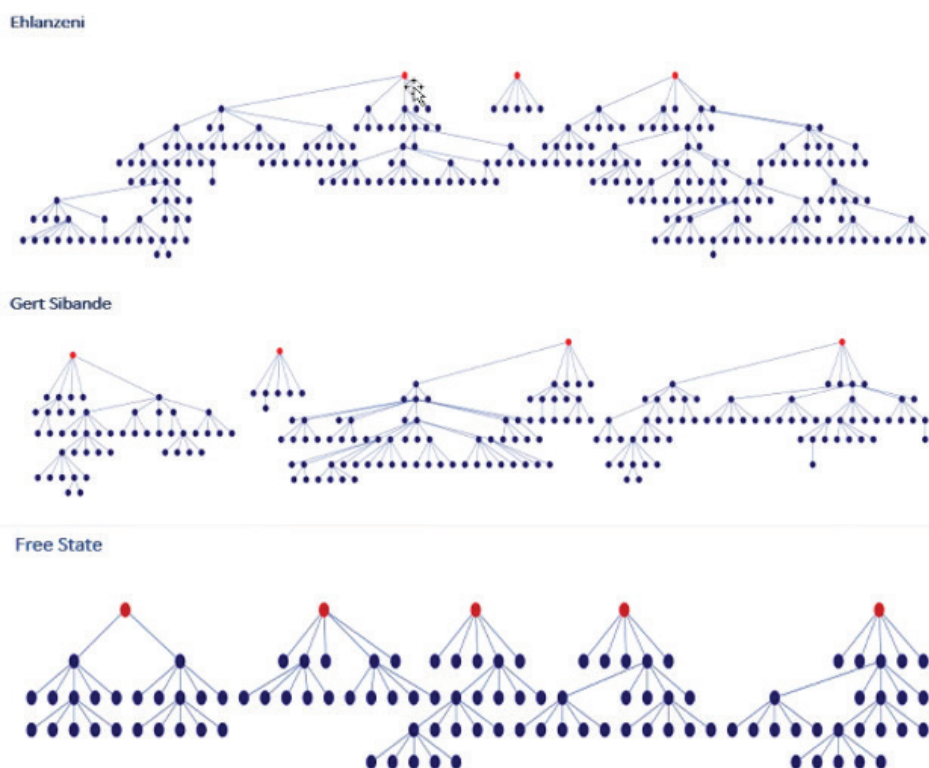
Figure 4: Recruitment waves sample

The inclusion criteria for being a seed was based on; (1) a person who identifies as TG, (2) aged 18 years and above, and (3) willing and able to recruit up to 3 participants. Each of the eligible seeds was provided with 3 (digital) coupons. They were asked to recruit three TG people known to them. Those three people in the second wave were also asked to recruit three people into successive waves. Incentives were provided to all people who were enrolled in the study. Incentives were allocated based on the number of participants recruited with a maximum allocation of R100.

Strengths of respondent driven sampling

● Reached the TG population through their networks
● Allowed peer-to-peer introduction of study participants
● Cost effective method to reach TG people
● Involved minimum travel as we used a shared link and cell numbers as Unique Identifiers
● Posed few questions to respondents yet achieved the expected results
● Allowed for confidentiality as recruitment spread via networks
● Minimised movements of TG people yet increased security of participants compared to centralised physical pick up of coupons
● Sharing the link minimized contact and the spread of COVID
● Allowed for convenient and snowballing sampling among TG individuals

2.8.2 Purposive sampling

Purposive sampling, also known as judgmental, selective, or subjective sampling, is a form of non-probability sampling in which researchers rely on their own judgment when choosing members of the population to participate in their surveys (Kothari, 2004). Service providers were purposively selected as relevant custodians of rich information on TG people. A data base of TG focused organisations was obtained from Global Fund and PEPFAR funded organisations. All organisations in the list were contacted and they were also requested to provide contact details of other organisations in their districts who are doing TG focused work as part of snowballing.

2.8.3 Convenience sampling

Convenience sampling is a type of non-probability sampling method that relies on data collection from population members who are conveniently available to participate in the study (Kothari, 2004). A convenience sampling approach was adopted in the implementation of Wisdom of the Crowd method. At the formative assessment stage, TG-focused organisations were consulted on the most popular social media platforms used by transgender individuals. The four most commonly used social media platforms were: WhatsApp, Twitter, Facebook, and Instagram.

In order to reach an extended TG audience, district specific posts on social media were boosted. To narrow the focus of the post in the district, the following key words were used; 'trans', 'transman', 'transwoman', 'gender non-conforming', 'queer', 'non-binary', 'LGBTQ', 'LGBTQI', and 'LGBTQI+'. The rainbow and pansexual pride flags were also used. Administrators of TG focused online social media groups were also approached and requested to share the online questionnaire. A total of 5 544 participated using this method, The Table below shows the breakdown of number of organisations per district.

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2.9 Population size estimation methods

The table below shows the methods used in the population size estimation exercise.

Table 5: Expected consolidated summarized PSE table of results and interaction platform used

Interaction	Participants	Online platform	Wisdom of the crowd	Service Multiplier	RDS
Online	TG Individuals	Facebook	x		
		Twitter	x		
		Whatsapp	x		
		Instagram	x		
Face To Face	TG Individuals		x		x
	Service Providers		x	x	

Results were consolidated, compared and the anchored multiplier was used to determine the final estimates.

2.9.1 Service Multiplier Method

Service Multiplier Method (SMM) was deployed in this study. It makes use of two data sources that are specific to the key population that is being estimated, 1) a count or listing of clients receiving a service from programme data (e.g., HIV test or treatment) and 2) survey data (Johnston et al., 2013).

The key assumptions that SMM follows are (1) there should be a non-zero probability of the population being counted to be included in both sources (2) there should be no individual who will be counted more than once in each multiplier (non-duplicated data) (3) the two data sources should be independent of each other and (4) the sample size for survey should be representative of the sampled population (Unaids, 2010).

Service providers were requested to give the exact count or an estimate of transgender people who received their service at least once in the years 2019 and 2020. The number of unduplicated counts of trans people reached by service providers was assembled for the computation of the estimates (M). In the RDS questionnaire, each respondent was asked to identify a provider from whom they received a TG related service at least once in the years 2019 and 2020.

The numerator in the formula is the number of transgender people who received a service during the reference period, while the denominator is the proportion (P) provided through the RDS survey.

The total population size is obtained as follows:

N = 1/P * M = M/P

where

N is the population size estimate
M is the total number of those who received a service as captured in the survey
P is the RDSAT-adjusted proportion

Strength of the service multiplier method

● Data come from key stakeholders that are trusted in TG service provision
● Data come from a local level

2.9.2 Successive Sampling Population Size Estimation

Successive sampling (SS)–population size estimation (PSE) is a Bayesian technique used to infer the unknown size (N) of key populations based on data collected from respondents selected using RDS. The data from the RDS survey that are crucial for the implementation of SS PSE are each participant's social network size, maximum number of coupons allocated to recruiters, and identification of recruiter and the recruited. Before making the population size estimation, we imputed each person's visibility to produce better SS-PSE estimates when the self-reported social network sizes contain missing data and outliers. Visibility was imputed using data from each participant's self-reported network size and the number of people they were able to recruit into the study. Following on Bayesian modelling notation, the SS PSE equation takes the form:

$$N = p(\theta|x,\alpha) \propto p(x|\theta)p(\theta|\alpha)$$

Where $p(\theta|x,\alpha)$ is posterior distribution of the parameter, $p(x|\theta)$ is sampling distribution of the data x, and $p(\theta|\alpha)$ is the prior distribution of the parameter.

The above model was used to compute a distribution of likely possible values for N for the observed RDS recruitment chains under assumptions about the RDS sampling process.

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2.9.3 Wisdom of the Crowds

Wisdom of the Crowds (WOTC) method is based on the assumption that; (1) population members in a large sample are likely to have unique information about the population and (2) individual responses to a question asked to all respondents in the sample are not influenced by other responses. When responses are aggregated, outliers are likely to negate each other and the method produce plausible population estimates (Okal et al., 2013; Quaye et al., 2015; Sulaberidze et al., 2016)(Rich et al., 2018).

Participants in the RDS survey, online social media platforms (Instagram, Facebook, WhatsApp and Twitter), and TG service providers were asked to provide their best estimates on the number and range of the population size of TG in their districts. The median, minimum, and maximum number of TG reported by the study participants were calculated from the WOTC estimates.

Strength of 'Targeted' Wisdom of the Crowd

- Allowed for peer-to-peer introduction of study participants through sharing and tagging on social media platforms
- Cost effective method of reaching TG people via social media
- Reached TG individuals who have not yet publicly disclosed their gender identity
- Allowed for wider reach and targeting

2.9.4 Anchored Multiplier

The anchored multiplier (AM) method is a technique developed to address high variability among population size estimates from different methods and data sources (Paul D. Wesson et al., 2019). Traditionally, researchers have tended to use the median of the various estimates computed and regard it as the best estimate, while others have reached consensus using their prior knowledge from experience working in an area (Khalid et al., 2014).

Using the median of the different estimates assumes that all the data sources and methods of estimation are associated with the same types of biases, but this is not always the case. The AM method uses a Bayesian framework to synthesise different population size estimates into one consensus estimate (Paul D. Wesson et al., 2019). A convenient feature of the AM calculator is its ability to allow the user to capture point estimates and their associated confidence intervals (CIs) in the model with the CIs serving to highlight more accurate estimates which have greater weight in the final consensus estimate (Paul D. Wesson et al., 2019).

In this study, the estimates based on the wisdom of the crowd, service multiplier and RDS were loaded into the AM calculator with their associated confidence intervals to generate the consensual estimate.

2.10 Data Management

2.10.1 Data collection

The data collection process involved four main streams of instruments:
1. RDS
2. Online social media
3. Service providers
4. Mapping

Data were collected using closed ended survey questions. These surveys were distributed using online platforms which were shared with the respondents. This allowed for real time data collection and tracking of progress. All data collected were stored in the cloud, and not on the cellphones of the respondents or field teams. All data were backed up in password protected cloud servers with access limited to the lead team members.

Respondent Driven Sampling

The survey instrument that was administered through online links collected the same data elements as in the RDS except the cell phone numbers of the respondents. Data were collected using online links and exported into Excel for data cleaning and further processing.

Service provider

The field teams shared the online survey with service providers for completion. Progress in terms of completion of the questionnaire by service providers was tracked and periodically updated. Reminders were sent to service providers requesting them to complete the questionnaire and to share contacts of other service providers in their district.

Mapping

Collection of mapping data was done through the following methods
● Field teams visited the TG specific service points in communities to obtain the GPS location.
● Field teams shared the link with the service providers for them to open a GPS enabled link that autopopulated the GPS position of the service points
● The physical addresses of the service points were also used to generate the GPS locations

2.10.2 Quality assurance plan

Quality assurance was integrated in the design and programming of the instrument through the inclusion of skip logic patterns. Data reviews and quality checks were undertaken daily. All potential duplicates were verified by calling the respondents. In the RDS, duplicates were either allocated a unique coupon number or deleted if it was the same transgender person. Additional key population TG service points were added during the data validation phase.

2.10.3 Data analysis

Software programmes used for data analysis were Excel, Stata v 17, Anchored Multiplier programme, Cytoscape, Arc GIS. Excel, Stata v 17 and Anchored Multiplier programme were used to mine quantitative data and generating the estimates. Cytoscape was used to analyse social networks which represented the recruitment waves from RDS. Arc GIS was used to generate the maps.

2.11 Ethical considerations

All participants in this study were informed that confidentiality and privacy should be maintained at all times. No information was shared with third parties without their consent. Participation in the study was voluntary. The participants granted their consent before completing the questionnaire. Respondents had the right to participate or stop participating in the study at any given point. This study did not involve any physical or psychological harm to participants.

The protocol and research instruments together with consent forms, were submitted to the University of Johannesburg Ethics Committee, for which ethical approval was granted (Ethics Clearance Number: UJ_FEBE_FEPC_00297).

2.12 COVID 19 related regulations

Virtual platforms were used to minimise contacts between respondents and field teams. During briefing sessions field team members and service providers who were in the same spaces were requested to maintain social distancing and wear masks. In situations where face to face interviews were conducted social distancing, sanitising and wearing of masks was mandatory.

3. PSE FINDINGS

3.1 Transgender population size estimation by method

Table below shows the transgender population size estimate computed from the Anchored Multiplier Method, which synthesises results from multiple methods. It is estimated that about 179 327 (95% CI 174 609 to 184 059) TG people live in South Africa, which corresponds to 0.30 (95% CI 0.29 to 0.31) of the total population of the country.

Table 6: Population size estimation of Transgender people in SA by method, 2021

Name	Mean	Lower	Upper	Population Count (Mean)	Population Count (Lower)	Population Count (Upper)
Anchored Multiplier Variance Adjusted	0.30	0.29	0.31	179 327	174 609	184 059
Anchored Multiplier	0.31	0.30	0.31	183 593	180 306	186 778
Prior	0.30	0.29	0.31	179 056	174 380	183 732
Service Multiplier Method	0.31	0.30	0.32	187 323	182 914	191 732
Successive Sampling PSE	0.24	0.14	0.32	142 863	82 283	192 854
Wisdom of the crowd (social media: TG people only)	0.33	0.27	0.40	201 045	159 873	242 216

3.2 Transgender population size estimated by province

The TG population size estimates computed from the Anchored Multiplier Method, which synthesises results from multiple methods at a provincial level are shown in the table below.

For the Eastern Cape, it was estimated that 21 951 (95% CI 18 598 to 25 489) transgender people live in the province, which corresponds to 0.29 (95% CI 0.23 to 0.36) of the total population of the Eastern Cape. For the Free State province, it was estimated that 5 967 (95% CI 3 962 to 8 518) transgender people live in the province, which corresponds to 0.31 (95% CI 0.28 to 0.34) of the total population of the Free State. For Gauteng, it was estimated that 50 916 (95% CI 43 823 to 53 434) transgender people live in the province, which corresponds to 0.31 (95% CI 0.28 to 0.34) of the population of Gauteng.

For KwaZulu Natal (KZN), it was estimated that 22 388 (95% CI 16 524 to 25 124) transgender people live in the province, which corresponds to 0.18 (95% CI 0.14 to 0.22) of the population of KZN. For Limpopo, it was estimated that 18 960 (95% CI 14 900 to 21 763) transgender people live in the province, which corresponds to 0.31 (95% CI 0.25 to 0.37) of the total population of Limpopo.

For Mpumalanga, it was estimated that 14 769 (95% CI 11 321 to 18 479) transgender people live in the province, which corresponds to 0.31 (95% CI 0.24 to 0.39) of the total population of Mpumalanga. For the North West province, it was estimated that 10 184 (95% CI 7 055 to 12 250) transgender people live in the province, which corresponds to 0.23 (95% CI 0.17 to 0.30) of the total population of the North West.

For the Northern Cape, it was estimated that 9 781 (95% CI 6 406 to 9 982) transgender people live in the province, which corresponds to 0.62 (95% CI 0.49 to 0.77) of the total population of the Northern Cape. For the Western Cape, it was estimated that 26 439 (95% CI 21 444 to 29 969)

For the Northern Cape, it was estimated that 9 781 (95% CI 6 406 to 9 982) transgender people live in the province, which corresponds to 0.62 (95% CI 0.49 to 0.77) of the total population of the Northern Cape. For the Western Cape, it was estimated that 26 439 (95% CI 21 444 to 29 969) transgender people live in the province, which corresponds to 0.36 (95% CI 0.30 to 0.42) of the total population of the Western Cape.

Table 7: Population size estimated for TG people in South Africa by province, 2021

Method	Population sizes point, 95% Confidence Interval		
	Estimate	Lower Bound	Upper Bound
Eastern Cape	21 951	18 598	25 489
Free State	5 967	4 844	7 207
Gauteng	50 916	46 946	54 950
KwaZulu Natal	22 388	19 313	25 743
Limpopo	18 960	16 511	21 569
Mpumalanga	14 769	12 432	17 263
North West	10 184	7 782	12 861
Northern Cape	9 781	7 678	12 158
Western Cape	26 439	24 235	28 711
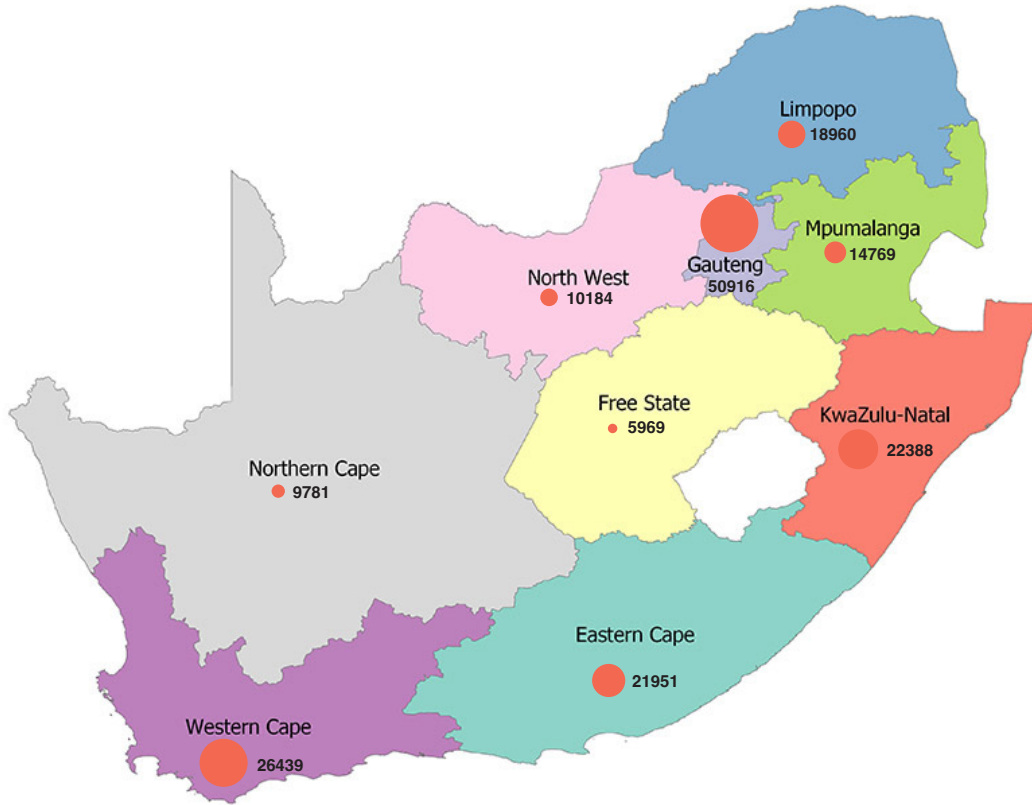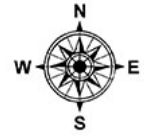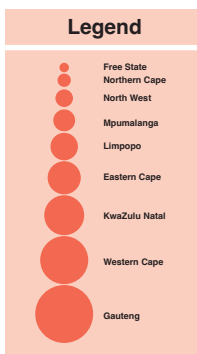
Figure 5: Transgender population size estimate per province

3.2 Tansgender population size estimates by district

The gender distribution of the TG population size estimates at district level are reported in Table 8 below. Across the districts, transwomen account for the largest proportion of the of the TG population.

Table 8: TG PSE district-level distribution by gender

			Non-conforming			Transmen			Transwomen		
			Estimate	Lower	Upper	Estimate	Lower	Upper	Estimate	Lower	Upper
Eastern Cape	1	Nelson Mandela Metropolitan Municipality	1 381	1 170	1 603	601	510	698	1 982	1 680	2 302
	2	Buffalo Municipality	906	768	1 052	395	334	458	1 301	1102	1 510
Free State	3	Mangaung	207	168	250	501	406	605	898	729	1 084
Gauteng	4	City of Johannesburg	6 098	5 622	6 581	2 671	2 463	2 883	10 079	9 293	10 878
	5	City of Tshwane	4 072	3 754	4 395	1 783	1 645	1 925	6 730	6 206	7 264
	6	City of Ekurhuleni	4 140	3 817	4 468	1 813	1 672	1 957	6 843	6 309	7 385
KwaZulu Natal	7	eThekwini	2 437	2 102	2 802	1 963	1 693	2 257	2 978	2 569	3 425
	8	uMgungundlovu	757	653	871	610	526	701	925	798	1 064
Limpopo	9	Capricorn	1 627	1 416	1 850	399	347	454	2 210	1 924	2 514
Mpumalanga	10	Gert Sibande	1 267	1 066	1 481	758	638	886	1 945	1 637	2 273
	11	Ehlanzeni (Mbombela)	1 817	1 530	2 124	1 088	916	1 271	2 790	2 348	3 261
Northern Cape	12	Frances Baard (District Kimberly)	1 934	1 518	2 404	176	138	219	949	745	1 180
North West	13	Bojanala (Rusternburg)	2 426	1 854	3 064	449	343	567	1 617	1 236	2 042
Western Cape	14	City of Cape Town	3 739	3 427	4 060	2 830	2 594	3 073	10 205	9 355	11 083
	15	Garden Route	567	520	616	429	393	466	1 548	1 419	1 681

3.3 Distribution of the TG population by gender

The distribution of TG population by gender is shown in the table below. A total of 87 214 transgender people were estimated to be transwomen while 66076 were gender non-conforming and 28 065 were transmen in South Africa.

Table 9: Distribution of TG population by gender

	Non-conforming			Transmen			Transwomen		
	Estimate	Lower	Upper	Estimate	Lower	Upper	Estimate	Lower	Upper
Eastern Cape	7 646	6 478	8 878	3 330	2 821	3 866	10 976	9 299	12 745
Free State	770	625	930	1 861	1 510	2 247	3 336	2 708	4 030
Gauteng	16 473	15 188	17 778	7 215	6 653	7 787	27 228	25 105	29 385
KwaZulu Natal	7 394	6 379	8 502	5 956	5 138	6 849	9 037	7 796	10 392
Limpopo	7 282	6 341	8 284	1 786	1 555	2 032	9 892	8 614	11 253
Mpumalanga	4 713	3 967	5 509	2 821	2 375	3 297	7 235	6 090	8 457
North West	5 499	4 202	6 945	1 018	778	1 286	3 666	2 802	4 630
Northern Cape	6 183	4 854	7 686	562	441	699	3 035	2 383	3 773
Western Cape	5 893	5 402	6 399	4 460	4 088	4 843	16 086	14 745	17 469
South Africa	**66 076**	57 691	75 038	**28 065**	24 503	31 871	**87 214**	76 145	99 042

3.4 Results from service provider method

The estimates of the TG population size from the service provider method was 187 323 in South Africa as seen in table below. Gauteng (28%, n=52 841) was estimated to have the highest proportion of TG people followed by Western Cape (14%, n=26 462). The national estimate of the TG population size according to the service providers is equivalent to 0.31% of South Africa's population size (61 million).

Table 10: Service provider method – the coefficient method, 2021

Province	Estimate	Lower bound	Upper bound
Eastern Cape	22 979	18 570	27 388
Free State	6 603	2 194	11 012
Gauteng	52 841	48 432	57 250
KwaZulu Natal	20 104	15 695	24 513
Limpopo	19 504	15 095	23 913
Mpumalanga	15 580	11 171	19 989
North West	12 129	7 720	16 538
Northern Cape	11 121	6 712	15 530
Western Cape	26 462	22 053	30 871
South Africa	187 323	182 914	191 732

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3.5 Wisdom of the crowd - all genders

The estimates of the TG population size from the wisdom of the crowd based on data collected on social media from all genders is shown below. The estimates of the TG population size from wisdom of the crowd based on all genders that responded to the survey link on social media was method was 166 589.

Table 11: Wisdom of the crowd from social media data: Estimates based on all genders, 2021

Province	District	Sample size	Estimate	Lower bound	Upper bound
Eastern Cape	Buffalo City District	100	10 177	7 448	12 906
Eastern Cape	Nelson Mandela Bay Metropolitan	243	12 005	10 226	13 784
Eastern Cape	Sarah Baartman District	162	2 801	2 328	3 274
Free State	Mangaung Metropolitan	110	4 475	3 455	5 496
Gauteng	City of Ekurhuleni Metropolitan	413	10 056	8 894	11 217
Gauteng	City of Johannesburg Metropolitan	1 115	24 714	22 985	26 444
Gauteng	City of Tshwane Metropolitan	824	12 854	11 778	13 931
Gauteng	Sedibeng District	122	2 534	2 029	3 040
KwaZulu-Natal	Zululand District	109	2 123	1 677	2 568
KwaZulu-Natal	eThekwini Metropolitan	752	16 907	15 525	18 288
KwaZulu-Natal	uMgungundlovu District	84	2 280	1 741	2 819
Limpopo	Capricon District	62	5 530	4 044	7 017
Limpopo	Mopani District	30	4 382	2 227	6 537
Limpopo	Sekhukhune District	7	4 096	*2 030	10 221
Limpopo	Vhembe District	6	2 558	222	4 894
Mpumalanga	Ehlanzeni District Municipality	196	6 998	5 943	8 053
Mpumalanga	Gert Sibande District	121	3 131	2 483	3 780
North West	Bojanala Platinum District	82	3 805	2 933	4 677
North West	Dr Kenneth Kaunda District	33	2 975	1 542	4 409
North West	Ngaka Modiri Molema District	234	2 169	1 871	2 467
Northern Cape	Frances Baard District	77	3 231	2 380	4 083
Northern Cape	John Taolo District	41	1 698	1 127	2 269
Northern Cape	Pixley Ka Seme District	27	1 887	1 340	2 434
Western Cape	Cape Winelands District	30	1 748	911	2 586
Western Cape	City of Cape Town Metropolitan	354	18 582	16 503	20 661
Western Cape	Garden Route District	210	2 872	2 445	3 299
Total		**5 544**	**166 589**	**132 025**	**201 152**

Sekhukhune and Vhembe districts had the lowest numbers of respondents hence affecting the estimates for these districts. However, it must be noted that these two were not in the initial list of selected districts.

Wisdom of the crowd - TG respondents only

The estimates of the TG population size from the wisdom of the crowd based on data collected on social media from TG people only is shown below. The estimates of the TG population size from wisdom of the crowd based on TG people only that responded to the survey link on social media was method was 205 716.

Table 12: Wisdom of the crowd from social media data: Estimates based TG respondents only, 2021

Province	District	Sample size	Estimate	Lower bound	Upper bound	Std. Error
Gauteng	City of Johannesburg Metro	760	32 194	29 874	34 514	1 182
KwaZulu-Natal	eThekwini Metro	544	20 952	19 178	22 727	903
Western Cape	City of Cape Town Metro	307	20 540	18 231	22 849	1 174
Gauteng	City of Tshwane Metro	518	17 727	16 192	19 262	781
Eastern Cape	Nelson Mandela Bay Metro	183	14 458	12 240	16 677	1 124
Gauteng	City of Ekurhuleni Metro	272	13 151	11 537	14 766	820
Eastern Cape	Buffalo City District	72	12 614	9 023	16 204	1 801
Mpumalanga	Ehlanzeni District Municipality	144	8 431	7 092	9 770	677
Limpopo	Capricon District	46	6 819	4 984	8 655	911
Limpopo	Mopani District	20	5 889	2 854	8 923	1 450
Free State	Mangaung Metro	79	5 564	4 234	6 893	668
Limpopo	Sekhukhune District	5	4 671	*5 267	14 610	3 580
North West	Dr Kenneth Kaunda District	15	4 609	1 643	7 576	1 383
North West	Bojanala Platinum District	64	4 348	3 283	5 412	533
Northern Cape	Frances Baard District	58	3 719	2 628	4 810	545
Mpumalanga	Gert Sibande District	105	3 441	2 717	4 165	365
Gauteng	Sedibeng District	68	3 353	2 551	4 156	402
Western Cape	Garden Route District	170	3 201	2 701	3 702	254
KwaZulu-Natal	Zululand District	45	3 198	2 298	4 097	446
Eastern Cape	Sarah Baartman District	132	3 099	2 538	3 659	283
Limpopo	Vhembe District	4	2 747	*1 750	7 245	1 413
North West	Ngaka Modiri Molema District	129	2 721	2 247	3 195	240
KwaZulu-Natal	uMgungundlovu District	59	2 604	1 886	3 322	359
Western Cape	Cape Winelands District	15	2 327	696	3 959	761
Northern Cape	Pixley Ka Seme District	10	1 697	424	2 970	563
Northern Cape	John Taolo District	14	1 642	574	2 709	494
National		**3 838**	**205 716**	**154 606**	**256 826**	

*Sekhukhune and Vhembe districts had the lowest numbers of respondents hence affecting the estimates for these districts. However, it must be noted that these two were not in the initial list of selected districts.

3.6 Wisdom of the crowd - non-TG respondents

The estimates of the TG population size from the wisdom of the crowd based on data collected on social media from non-TG people only is shown below. The estimates of the TG population size from wisdom of the crowd based on non-TG people only that responded to the survey link on social media was method was 70 772.

Table 13: Wisdom of the crowd from social media data: Estimates based on non-TG respondents, 2021

Province	District	Sample size	Estimate	Lower bound	Upper bound	Std. Error
Eastern Cape	Buffalo City District	28	3 910	2 042	5 778	910
Eastern Cape	Nelson Mandela Bay Metro	60	4 524	3 265	5 783	629
Eastern Cape	Sarah Baartman District	30	1 490	1 017	1 963	231
Free State	Mangaung Metro	31	1 701	1 037	2 364	325
Gauteng	City of Ekurhuleni Metro	141	4 084	3 420	4 748	336
Gauteng	City of Johannesburg Metro	355	8 701	7 815	9 588	451
Gauteng	City of Tshwane Metro	306	4 606	4 050	5 162	282
Gauteng	Sedibeng District	54	1 503	1 088	1 918	207
KwaZulu-Natal	Zululand District	64	1 367	1 034	1 699	166
KwaZulu-Natal	eThekwini Metro	208	6 326	5 556	7 097	391
KwaZulu-Natal	uMgungundlovu District	25	1 515	915	2 115	291
Limpopo	Capricon District	16	1 824	633	3 014	559
Limpopo	Mopani District	10	1 369	44	2 695	586
Limpopo	Sekhukhune District	2	2 658	*6 993	12 308	760
Limpopo	Vhembe District	2	2 179	*3 297	7 655	431
Mpumalanga	Ehlanzeni District Municipality	52	3 030	2 277	3 783	375
Mpumalanga	Gert Sibande District	16	1 103	398	1 808	331
North West	Bojanala Platinum District	18	1 876	1 053	2 700	390
North West	Dr Kenneth Kaunda District	18	1 614	781	2 447	395
North West	Ngaka Modiri Molema District	105	1 490	1 215	1 766	139
Northern Cape	Frances Baard District	19	1 744	1 107	2 381	303
Northern Cape	John Taolo District	27	1 727	1 006	2 448	351
Northern Cape	Pixley Ka Seme District	17	1 998	1 414	2 583	276
Western Cape	Cape Winelands District	15	1 169	610	1 728	261
Western Cape	City of Cape Town Metro	47	5 792	4 154	7 430	814
Western Cape	Garden Route District	40	1 472	929	2 016	269
Total		**1 706**	**70 772**	**36 570**	**104 974**	

The map below shows the population estimates of transgender people based on data from wisdom of the crowd collected from non-TG people and TG respondents. The legend is located at the bottom right hand corner. The colour coding (green to red) shows estimates from non-TG respondents. The darker the green colour (e.g. Gert Sibande) the lower the TG population size and the red shows a higher population size estimate (e.g. City of Johannesburg).

The second population estimates are from TG respondants only from the data obtained from wisdom of the crowd. The smaller the purple circle the lower the TG population size estimates (e.g. Vhembe) and the bigger the circle the higher the population size estimate (e.g. City of Johannesburg). The two population size estimates have been overlapped for ease of comparison.
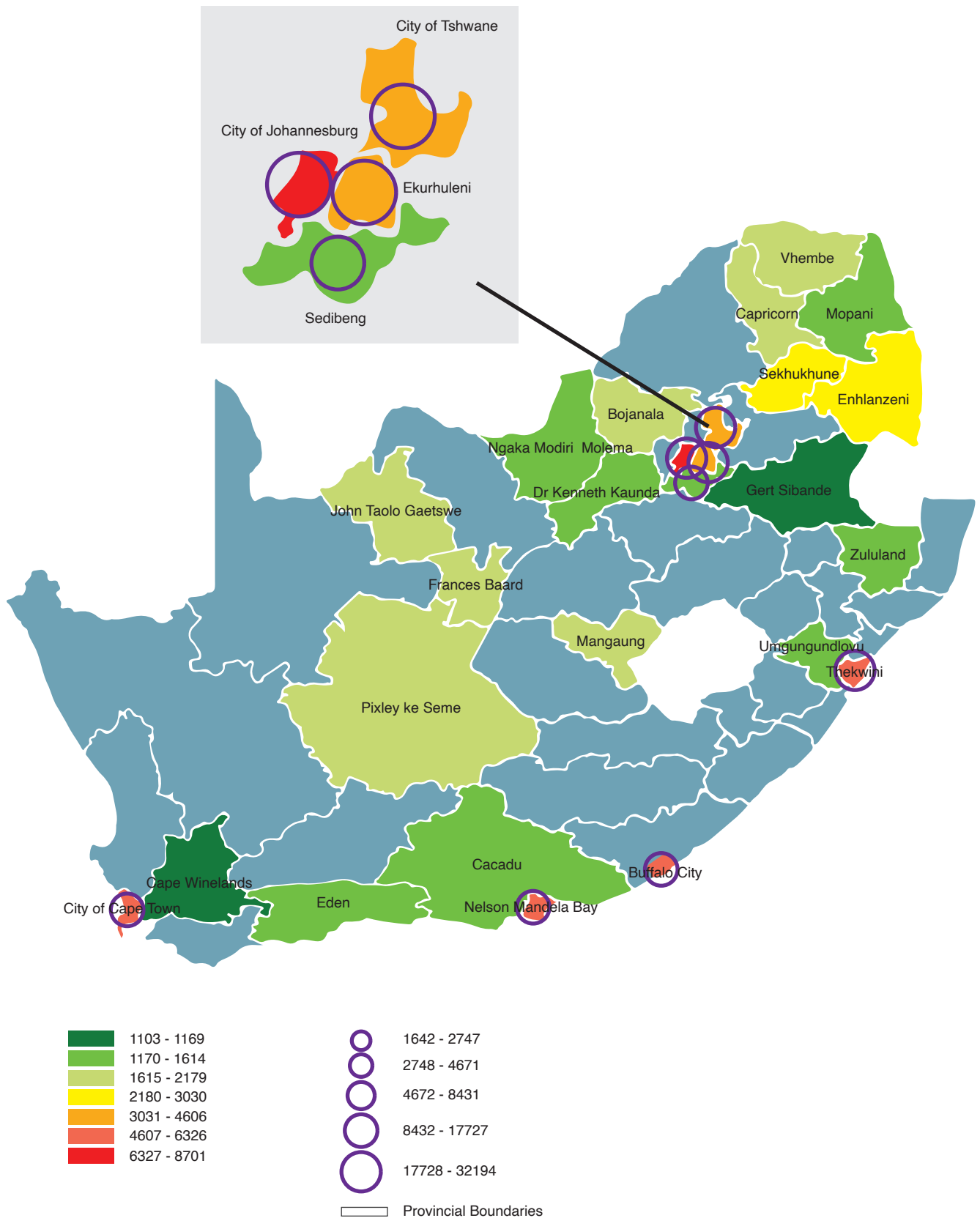
Figure 6: Transgender Population Averages Estimates in South Africa

Map legend (choropleth):
- 1103 - 1169
- 1170 - 1614
- 1615 - 2179
- 2180 - 3030
- 3031 - 4606
- 4607 - 6326
- 6327 - 8701

Map legend (circles):
- 1642 - 2747
- 2748 - 4671
- 4672 - 8431
- 8432 - 17727
- 17728 - 32194
- Provincial Boundaries

District labels on map: City of Tshwane, City of Johannesburg, Ekurhuleni, Sedibeng, Vhembe, Capricorn, Mopani, Sekhukhune, Enhlanzeni, Bojanala, Ngaka Modiri Molema, Dr Kenneth Kaunda, Gert Sibande, Zululand, John Taolo Gaetswe, Frances Baard, Mangaung, Umgungundlovu, Thekwini, Pixley ke Seme, Cacadu, Buffalo City, Cape Winelands, Eden, Nelson Mandela Bay, City of Cape Town

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3.7 Proportions of TG population that is hidden by province

The breakdown of TG population by gender is shown in the table below.

Table 14: Proportions of hidden TG people by province

|	Population	Proportion hidden			Size of hidden TG population		
		Estimate	Lower	Upper	Estimate	Lower	Upper
Eastern Cape	20 730	0,16	0,13	0,19	3 268	2 607	3 929
Free State	6 439	0,16	0,12	0,19	999	794	1 205
Gauteng	51 539	0,11	0,08	0,14	5 646	4 003	7 289
KwaZulu Natal	21 888	0,12	0,08	0,15	2 519	1 821	3 217
Limpopo	19 205	0,12	0,09	0,15	2 311	1 699	2 923
Mpumalanga	15 607	0,29	0,26	0,32	4 530	4 032	5 027
North West	10 088	0,41	0,38	0,45	4 180	3 858	4 502
Northern Cape	8 596	0,15	0,12	0,18	1 301	1 026	1 575
Western Cape	27 104	0,12	0,08	0,15	3 166	2 302	4 030
South Africa	181 195	0,18	0,15	0,21	32 827	27 050	38 604

3.8 Geo-Spatial Distribution of Transgender Services
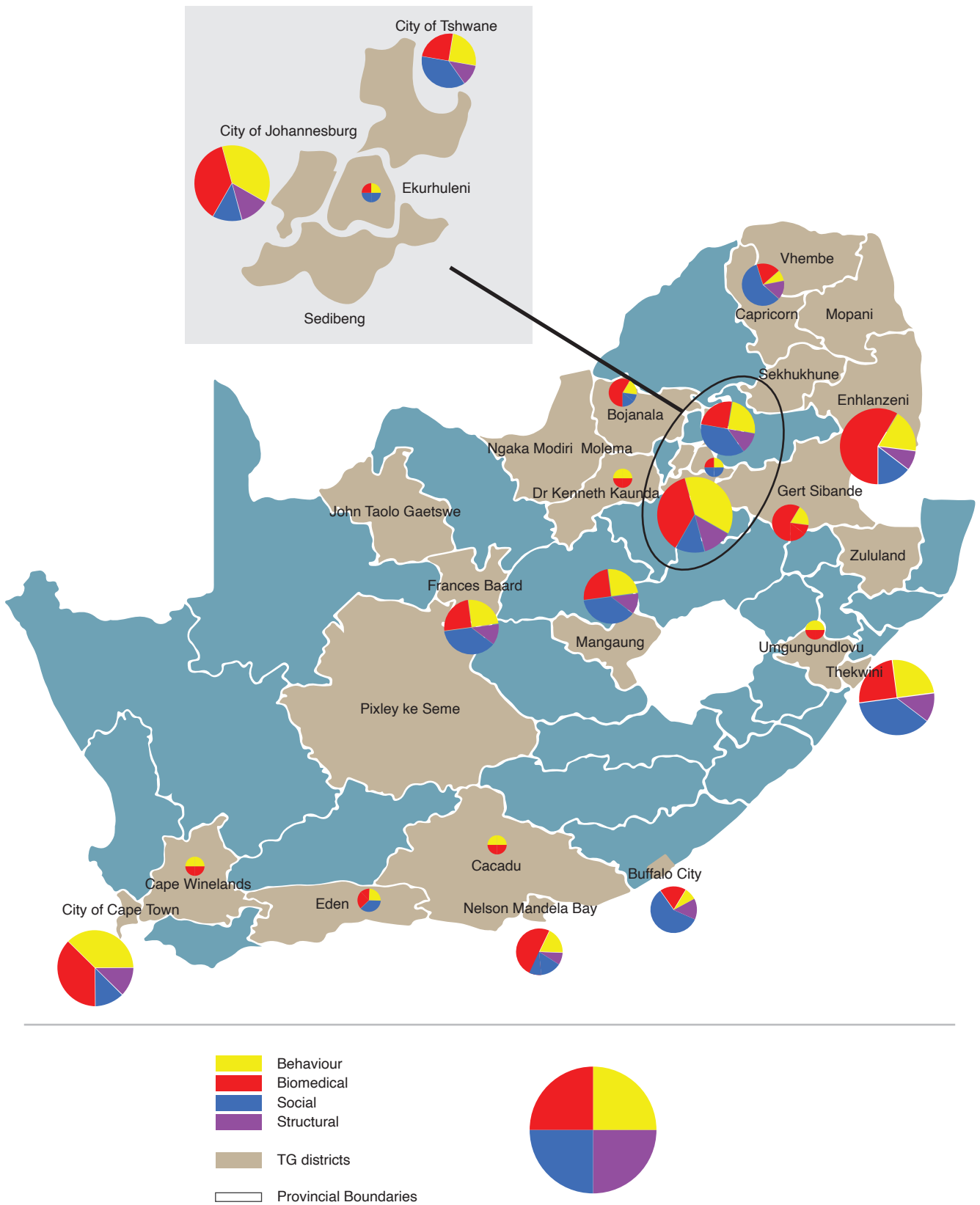
Figure 7: Transgender services by district
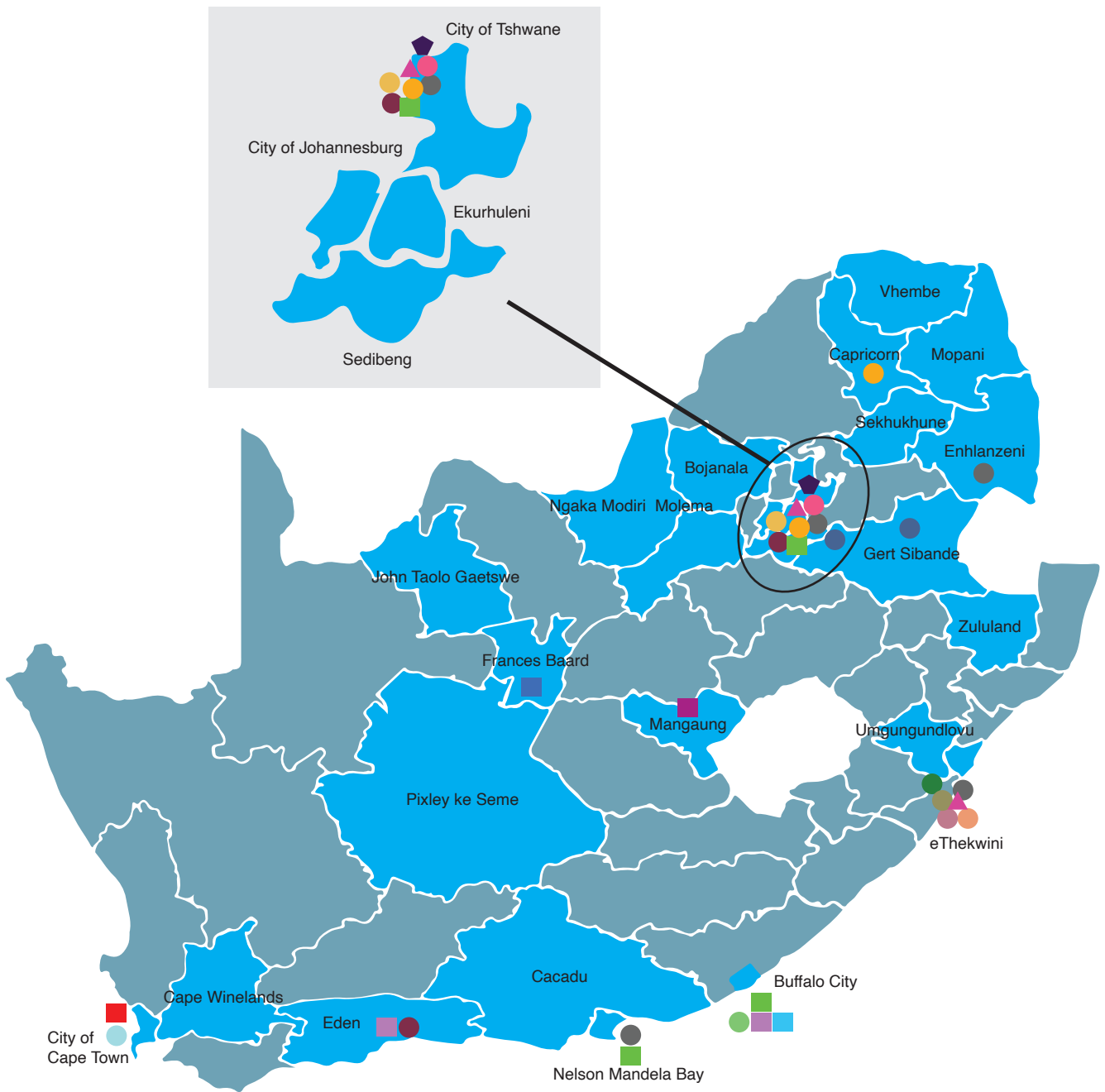
The map shows the distribution of transgender services per district. The pie charts represent the number of services not service providers. The bigger the chart, the more the number of services provided in that district whose information was captured during the mapping exercise. An example is Ehlanzeni district which has the biggest chart. The total number of services is 90, Behavioral = 17, Biomedical = 58, Social = 11, Structural = 4. It is shown in the chart that there is more than 60% of Biomedical services (n=58) in that district. The total number of service providers is 69, however, some service providers offer more than one service.

3.9 Trangender focused implementing partners

The map below shows the distribution of transgender focused service providers across the provinces.

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Figure 8: Trangender focused implementing partners

4. DISCUSSION

The population size estimate generated from the Anchored Multiplier Method was about 179 327 (95% CI 174 609 to 184 059). In 2015, a study supported by HSRC, NACOSA and SANAC conducted a population size estimation which indicated that there were 139 666 transgender people in South Africa (Setswe et al., 2015). Based on the current study, the number of TG people in South Africa corresponds to 0.30% (95% CI 0.29 to 0.31) of the country population, an increase from the 2015 study (0.19 % – 0.21%). The increase in TG people could have been as a result of an increase in TG awareness, sensitisation and a general increase in the population. The implementation of multiple stigma and discrimination reduction programmes across the provinces led to more TG people disclosing their gender identity to at least their close relations. Congruent with the demand for TG related services, it is incumbent upon the government and donor agencies to increase investment in social, structural, biomedical and behavioural interventions targeted at the growing number of TG key population groups.

A comparison of the population size estimate with international numbers or between the current study and the 2015 study is not straightforward. Factors such as methods used, social acceptable, respondent bias tend to affect the number of individuals who are willing to self-report a transgender identity or later on participate in the study (Meerwijk & Sevelius, 2017). In the East and Sourthern Africa region, studies have estimated that the percentage of TG people is 0.31% of the total population (Measure Evaluation, 2018). According to UNAIDS, global estimates of TG people are between 0.1% and 1.1% of reproductive age adults (UNAIDS, 2014). Population-based studies have found that 0.5%–0.9% of adults are transgender (Poteat et al., 2016).

In the United States national survey, the estimated proportion of transgender individuals based on surveys that categorized transgender as gender identity was 0.39% (95% CI 0.16 to 0.62). In terms of overall sample proportion in the US study, college and university students represented the majority (58%), followed by general-population adults (24%) and adult inmates (18%) (Meerwijk & Sevelius, 2017). The most recent population-based data from the United States estimate that 0.5% of the population was identified as transgender (Viswasam et al., 2020).

Data from gender clinics in Europe estimate that from 4 to 600 per 100,000 members of the population seek medical care for gender transition (Poteat et al., 2016). Some of the considerations to make when interpreting the results of that study are that transgender people differ greatly and not all transgender individuals desire or have the resources to seek surgeries, hormone therapy, or change their name or sex designation on legal documents. The analysis based on TG individual data and TG focused service provid-ers provides a more accurate estimate of the number of transgender individuals than estimates based on those who have undergone surgery.

In this study a total of 87 214 transgender people were estimated to be transwomen while 66 076 were gender non-conforming and 28 065 were transmen in South Africa. The 2015, study estimated that there were 72 156 transwomen and 67 510 transmen in South Africa (Setswe et al., 2015). The numbers of transwomen are generally higher in both studies. The population size estimate of transmen in this study is lower than the 2015 estimate. The 2015 study did not catergorise TG people as gender-non conforming, which could have potentially increased the proportion that was catergorised as transmen.

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hThis TG focused population size estimation study utilised a combination of methods such as respondent driven sampling, service multiplier and wisdom of the crowd. The study was also executed through the use of online survey links shared on various social media platforms and email. This approach presented a unique, efficient and targeted way to reach out to TG respondents and TG focused service providers. The need for a TG focused population size estimate study was one of the recommendations emanating from the 2015 study (Setswe et al., 2015).

The weakness of the 2015 study was that it adapted the Priorities for Local AIDS Control Efforts (PLACE) programmatic mapping methodology for estimating the size of key population groups including transgender people. The PLACE approach is based on the basic assumption that there could be a potential association between gender identity and specific locations. At the time of undertaking the 2015 study, the use of social media among TG people might not have been high, serving as one of the potential limitations in the diversity of the methods used.

In this study, a comparison of population estimates derived from wisdom of the crowd method based on data from TG respondents estimated that there are 205 716 TG people while estimates from non-TG people were recorded at 70 772. Such a difference in estimates could potentially be an indication that the TG population is hidden. Discussions with transgender field teams at the data validation stage confirmed that TG are indeed hidden as they face discrimination, violence and lack of access to appropriate health care.

In a 2020 review of 118 published population size estimates studies, 70 were for FSW, 27 for MSM, 21 for PWUD, and none for transgender persons (Viswasam et al., 2020). The paucity of data on transgender persons is concerning in the context of the high burden of HIV among transgender people. This further justifies the need for undertaking population size estimates studies and their utilisation in policy formulation, resource allocation and programme planning.

The results of this study do not claim to be definitive, but they are based on logical assumptions and calculations following established methods of estimating key population sizes. The use of respondent driven sampling, service multiplier and wisdom of the crowd methods provided a range of estimates which when anchored and adjusted for variability using Bayesian modelling provided an arguably more accurate consensual estimate.

5. CONCLUSION

There is an estimated total of 179 327 transgender people in South Africa. The transgender population size estimation will go a long way in informing programming and policy in South Africa. Effective implementation of the population size estimation project was as a result of working collaboratively with various transgender focused organisations. A combination of wisdom of the crowd, service multiplier and respondent driven sampling methods were used. In the context of the COVID 19 pandemic, use of online data collection links coupled with social media played a critical role in reaching out to transgender people and transgender focused service providers in various districts. Transgender field teams played a critical role in the identification of diverse seeds in the respondent driven sampling approach. Consultations with transgender focused organisations further assisted with the mapping of transgender focused service points.

6. RECOMMENDATIONS

Below is a list of recommendation based on this study

- There is a need to use transgender population size estimates to inform programming and policy.
- Transgender focused organisations and TG people must play a leading role in the design and implementation of those TG focused programmes
- This study recommends the use of online data collection links coupled with social media to effectively reach out to transgender people and transgender focused service providers for purposes of population size estimation
- This study recommends close consultations with transgender focused organisations when mapping transgender focused service points
- This study recommends that transgender focused service providers must use an electronic record keeping systems, unique identifies or biometric systems when providing services.

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