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[Marilyza Sott Bender](#), [Michele Kremer Sott](#), [Vitória Merten Fernandes](#), [Mikaela Aline Bade München](#) ...+3 more authors

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Article

A Science Mapping Analysis of Sixty-Seven Years of Scientific Evolution about the Transgender Population

Mariluz Sott Bender^{1,3,*}, Michele Kremer Sott², Vitória Merten Fernandes³, Mikaela Aline Bade München³, Isadora Ferretti Gonçalves³, Silvia Virginia Coutinho Areosa¹ and Nicola Luigi Bragazzi^{4,*}

¹ Department of Psychology, University of Santa Cruz do Sul, Santa Cruz do Sul 96816-501, Brazil; maribendersott@hotmail.com (M.S.B.); sareosa@unisc.br (S.V.C.A.)

² Business School, Unisinos University, Porto Alegre 91330-002, Brazil; sott.mk@gmail.com

³ Multiprofessional Residency Program in Urgency and Emergency, Santa Cruz Hospital, Santa Cruz do Sul, 96810-072, Brazil; vitoriafernandes@unisc.br (V.M.F.); mmunchen@unisc.br (M.A.B.M.); isadorag@unisc.br (I.F.G.)

⁴ Laboratory for Industrial and Applied Mathematics (LIAM), Department of Mathematics and Statistics, York University, Toronto, ON M3J 1P3, Canada

* Correspondence: robertobragazzi@gmail.com (N.L.B); maribendersott@hotmail.com (M.S.B.)

Abstract: Gender and identity issues permeate society as a whole. Therefore, the matters involving transgender individuals should be analysed in order to understand the difficulties experienced by this population and the social practices implemented. In this sense, the objective of this study was to investigate the strategic themes and their evolution in relation to the theme. For this, a bibliometric performance and network analysis (BPNA) was carried out with the existing data in the Web of Science database between 1954 and march 2021. Twenty-three thousand and four hundred and seventy-one (23,471) articles were identified, which were included in the SciMAT software to perform a bibliometric analysis, resulting in the graph of the thematic evolution structure and the strategic diagram, in which 8 motor themes and a cross-cutting theme of great magnitude are highlighted, which are discussed in depth. The results show the relation between the transgender theme and gender, identity, sexual orientation, hormone therapy and gender-affirming surgery. It is concluded that, despite the large number of associated researches, some areas of study are still incipient, such as the inclusion of transgender people in the formal labor market and in the prison context, thus opening field for further studies.

Keywords: transgender; nonbinary; transsexual; queer; gender diversity; gender identity disorder; bibliometrics; science mapping.

1. Introduction

The sexuality theme has always been a taboo in the most distinct societies. Adding to that, there is the human difficulty of dealing with the difference, which is still perceived as problematic and viewed with prejudice. This reinforces the power relation of socially accepted groups over those considered different. What does not fit in the rigid established heteronormative standards, may be considered as deviation from the norm or an illness process. Prevails a definition of masculine and feminine based on sexual organs and its embodied performance [1]. Humanity processes and cultural expressions coexist that normalize, territorialize and homogenize differences [2].

There is an understanding of gender and sex as intrinsic, where sex is delimited by the biological constitution of the body, and gender refers to the social meanings attributed to these bodies [3]. This reality makes it very difficult to deconstruct the identity categories and realize that the difference, made up of subjective experiences, crosses several trans

subjectivities [3]. This difficulty is based on gender heteronormativity, which defends heterosexuality and traditional gender expressions [4].

However, the dichotomous issues of male and female gender are not enough to encompass the multiple faces of human sexuality. One of these faces is formed by the group commonly known as LGBT (lesbians, gays, bisexuals and transsexuals). Despite the discussions, variations and letter additions to the acronym over the years, it continues to be used in a large number of papers, and is therefore adopted throughout this study. Besides, the term transgender is used, to encompass all non-cisgender identities such as transsexuals, intersexuals, transvestites, Drag Queens and Drag Kings [5].

In this context, transgender individuals, whose gender identities are different from their biological sex, find little to no space to live the fullness of their sexuality. Thus, emerges the understanding that gender issues are not limited to the biological, because the perceptions about bodies are constituted by cultural and symbolic aspects [6]. Therefore, the theme starts to arouse great interest in the international scientific community [7].

Transsexuality, initially called transsexualism (the suffix *ism* identified disease), was later included in the Diagnostic and Statistical Manual of Mental Disorders (DSM), from the American Psychiatric Association, as a gender identity disorder. The 5th version of this manual, released in 2013, replaces this term with gender dysphoria, which refers to the existence of significant suffering or prejudice in any area of the subject's life, related to the incongruity between the gender assigned to their sex at birth and the gender they identify with [8]. This shows a change in perspective, that does not propose the treatment of transsexuality, but of the suffering it can cause, and that, if not treated, can lead to depression and suicide. However, the current version of the International Classification of Diseases (ICD-10), used on a large scale by the medical field, still brings transsexuality as a mental disorder [9]. On the other hand, ICD-11, expected to come into force on January 2022, seeks to overcome this issue by classifying transsexuality as a gender incongruence, inside "conditions related to sexual health".

However, besides the increasing number of papers about gender identity in recent years, especially from 2010 [10], only a relatively low number has focused on non-binary gender identities [11]. Thus, this research aimed to analyze the scientific production related to the "transgender" theme, in order to identify the nuances it has been acquiring through the different studies and historical contexts and give visibility to the social, cultural and psychological challenges to which this population is subjected. The terms used in this study are consistent with the references used, in temporal consonance with the time they were published, and do not reflect bias or value judgement by the researchers. To achieve our goal, a Bibliometric Performance and Network Analysis (BPNA) with the support of the SciMAT (Science Mapping Analysis Software Tool) software was carried out to identify the strategic themes and evolution map of the field of study.

The article is organized into sections: Section 2 demonstrates the materials and methods. Section 3 presents the Science Mapping, the motor themes, the thematic network structure and scientific evolution structure of the most important themes related to the transgender field, besides pertinent discussions. Section 4 presents the conclusion, suggestions for further research and the limitations of this paper.

2. Materials and Methods

A Bibliometric Performance and Network Analysis (BPNA) supported by the SciMAT software was carried out to identify the strategic themes and the evolution map of the field of study. To achieve our goal, the Web of Science database was used to export related documents, as this indexed database has a large volume of quality research [12, 13].

2.1. Dataset

In order to identify related documents, we use a search string of terms related to transsexuality: ("transgender" OR "transsexual" OR "transsexualism" OR

“transsexuality” OR “gender dysphoria” OR “sex change” OR “sex reassignment” OR “gender incongruence” OR “sexual reassignment” OR “gender nonconformity” OR “sexual disorder” OR “queer” OR “non-binary” OR “nonbinary” OR “gender diversity”). These terms were previously used by other authors who, despite having different goals, used similar strings [7, 14], and others who analyzed the main terminologies used in systematic reviews of the field of study [15]. The terms “nonbinary”, which is one of the most used since 2014, and “gender diversity”, which has gained strength in recent years, have been used to give greater scope to the study [11].

We selected articles, articles in press and reviews, in English, with the search terms present in the title, abstract or keywords. We exported 23,477 documents from the Web of Science database, leaving 23,471 after deleting duplicates. The documents were exported on March 13, 2021. The SciMAT software developed in 2012 [16] was used for preprocessing of data and generation of the strategic diagram and evolution maps. SciMAT is a free software tool, which performs bibliometric analysis within a longitudinal map [17, 18, 19]. In the preprocessing step, words with the same meaning were grouped, misspelled terms have been corrected and generic words have been removed. After preprocessing, 40,246 word clusters remained.

2.2. Discovery of strategic diagram and evolution map

In this step, the network was extracted based on the co-occurrence of the authors keywords, to identify the units' nodes. The data were normalized with the Equivalence Index and clustered with the Simple Center Algorithm considering a maximum 12 and minimum 3 network. In addition, we use the core mapper algorithm to calculate the network's co-occurrence [20, 21]. The strategic themes were plotted on a two-dimensional diagram composed by four quadrants where the 'y-axis' indicates the cluster density (internal strength of the network), and 'x-axis' reflects the centrality (degree of interaction of a cluster with others) [22]. The thematic network structure indicates the relations of a cluster with others, and the evolution map identifies the most important themes over time. Figure 1 presents an example of strategic diagram (a), thematic network structure and thematic evolution structure (b).

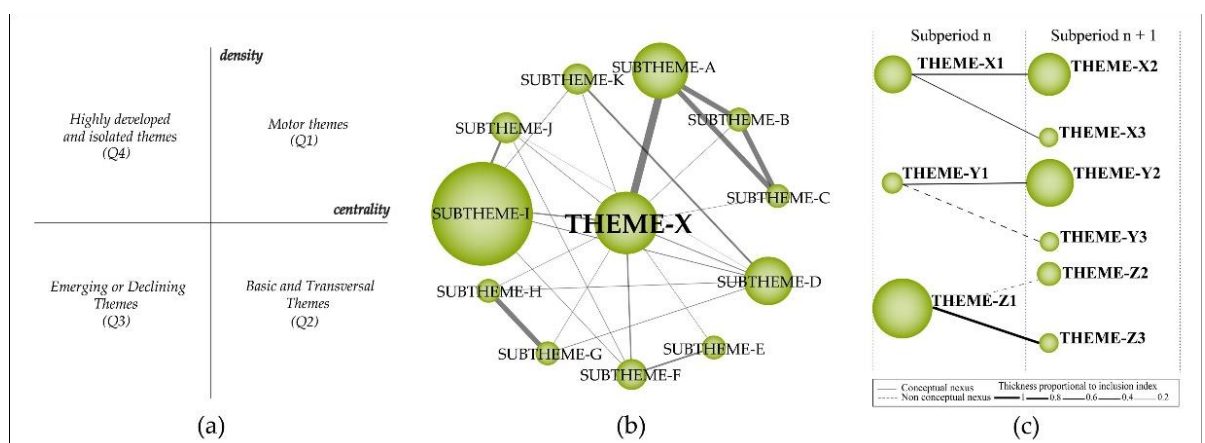


Figure 1. Strategic diagram (a); thematic network structure (b); thematic evolution structure (c).

In this sense, the upper right quadrant contains themes with a high degree of development (motor themes) (i.e., Figure 1 (a)). The lower right quadrant contains basic and transversal themes, which although co-occur with many themes have weak links. The lower left quadrant presents emerging or declining themes in the field of study, and the upper left quadrant highlights themes with few but dense links to other themes. The longitudinal framework (Figure 1 (c)) shows the interest of the research community and evolution of the field over time, where the cluster size is proportional to the number of

published documents and the thickness of the edges represents the strength of the connection between themes [23, 16, 24]. For the longitudinal map, four subperiods were defined: 1954-1990; 1991-2000; 2001-2010; and 2011-2021. The first subperiod includes a longer time due to the low volume of publications and keywords.

3. Science Mapping analysis of transgender theme

Figure 2 shows the performance analysis of scientific production related to the transgender theme from the first articles dating from 1954 until March 2021. It is noted that until around 1990 the number of studies was incipient, showing a slight increase from 1990 to 2000. Since the turn of the century, discussions have gained greater expression, but only from 2010 onwards did the theme gain notoriety and a massive number of publications, which is justified for the struggle of this population to guarantee their rights.

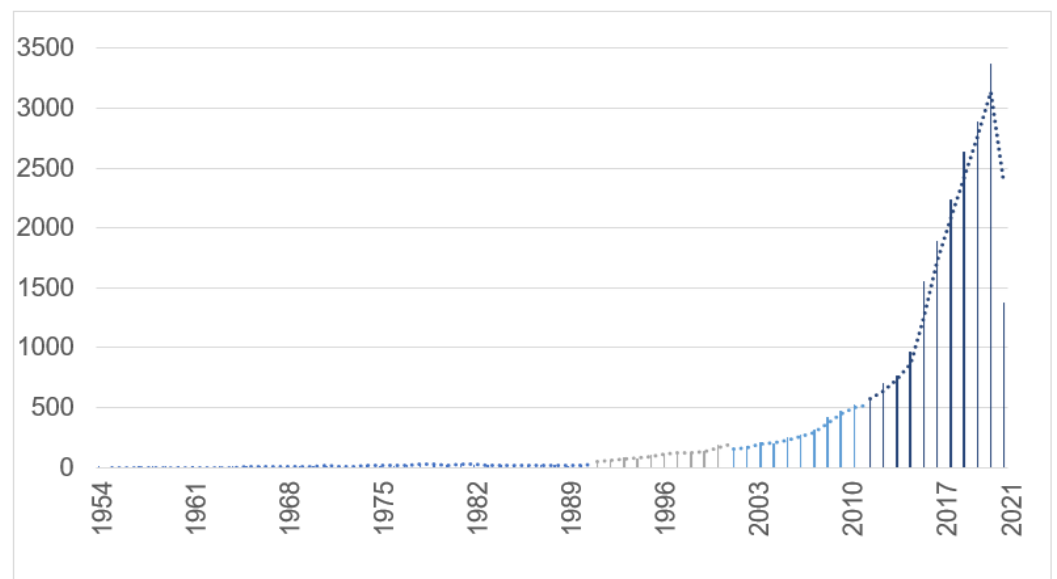


Figure 2. Number of publications over time (1954 - March 13, 2021)

The strategic diagram (Figure 3) presents 35 clusters, subdivided in four quadrants. From the clusters, 9 are motor themes (Q1), 10 basic and transversal themes (Q2), 6 emerging or declining themes (Q3) and 10 highly developed and isolated themes (Q4). The size of the clusters is proportional to the number of associated documents. The transgender cluster has the largest number of related papers (1,659).

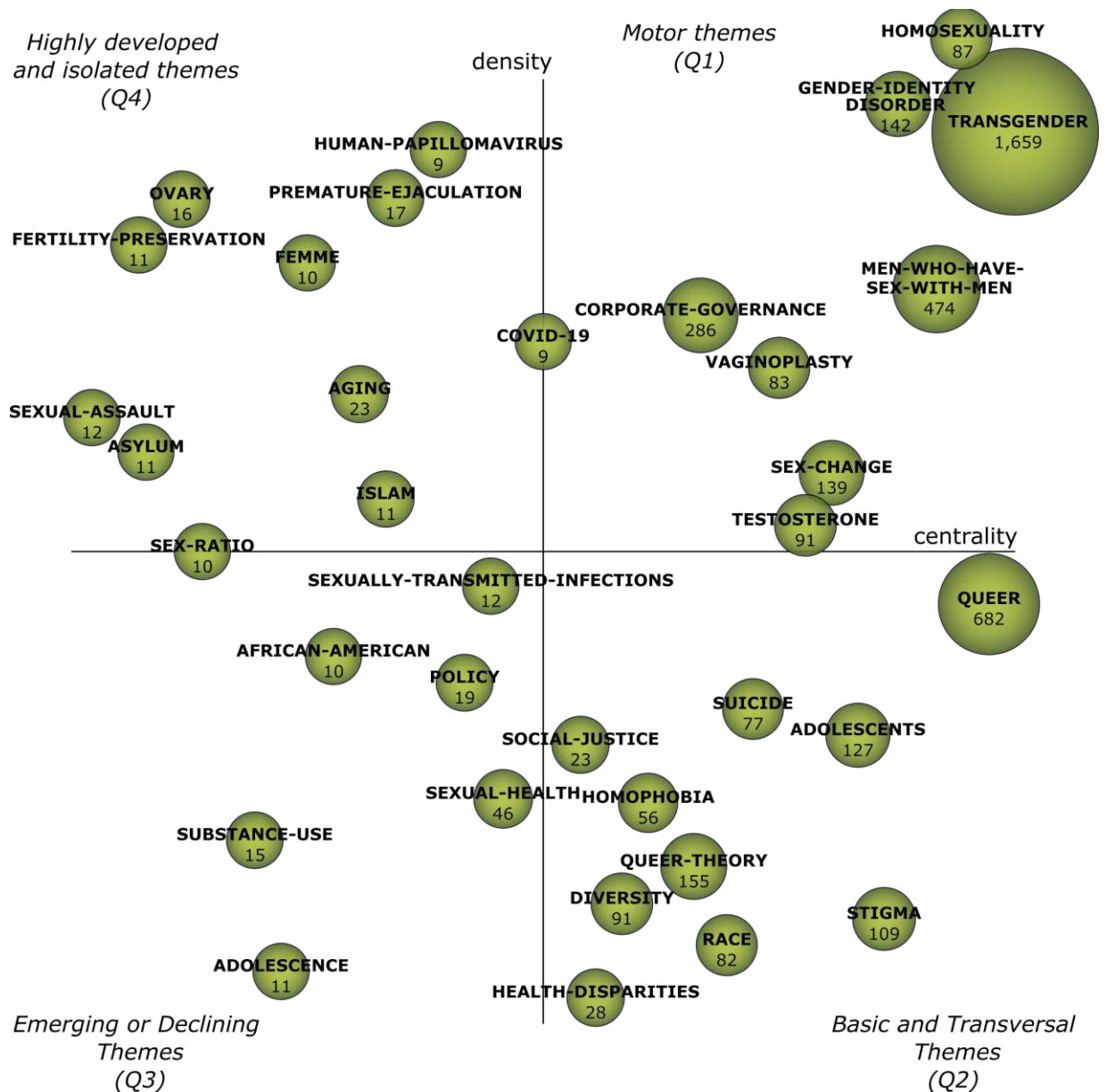


Figure 3. Strategic diagram.

The most relevant clusters are the motor themes (Q1), which are basically composed of expanded issues of transsexuality, gender, homosexuality and transgender, and the basic and transversal themes (Q2), that relate directly to motor themes, are composed of discussions about diversity, prejudice (stigma, homophobia, race, suicide) and queer, whose discussions about gender identity and sexual orientation impact the way different societies deal with transgender issues. The quadrant 3 (Q3) (emerging or declining themes) contains diversified themes, permeating discussions on sexual health, sexually transmitted infection, substance use and issues related to the police. The highly developed and isolated themes (Q4) involve studies on fertility preservation, ovary, premature ejaculation, Islam, aging, and issues of sexual violence and asylum for transgender peoples.

3.1. Motor Themes and Thematic Network Structure of transgender theme

The thematic structure of the motor themes is presented in Figure 4, clarifying the relationships between the most relevant clusters and related themes. In addition, the “queer” cluster is also presented, because despite not being a motor theme, it has a significant number of associated studies. This structure allows us to understand the scope of discussions about the transgender population and the multiple issues that cross this field of study.

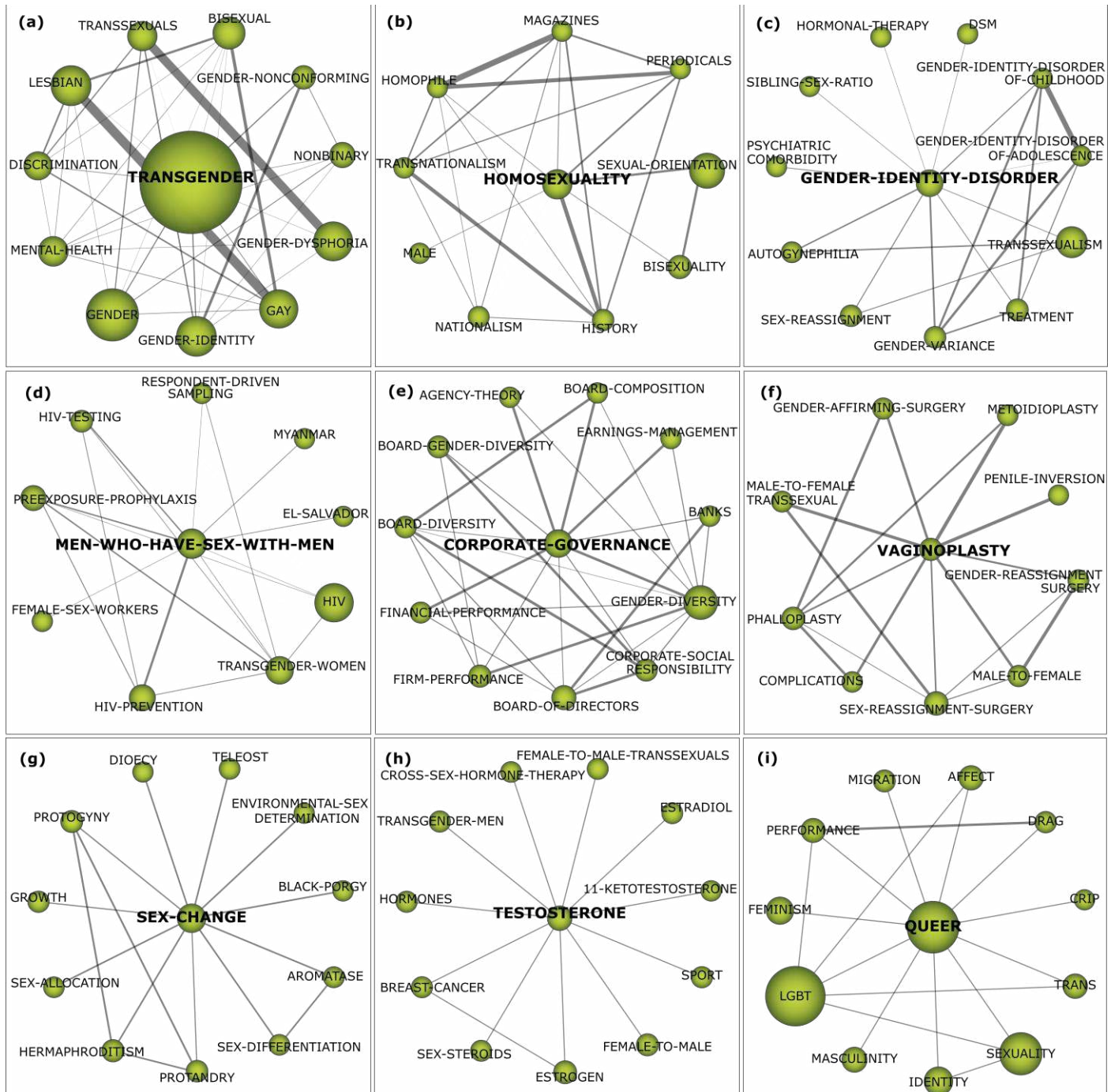


Figure 4. Thematic structures of the motor themes and the queer theme. (a) Transgender; (b) Homosexuality; (c) Gender Identity Disorder; (d) Men who have sex with men; (e) Corporate Governance; (f) Vaginoplasty; (g) Sex change; (h) Testosterone; (i) Queer.

3.1.1. Transgender

The 'TRANSGENDER' cluster (see Figure 4a) is a motor theme with high density and centrality because it covers other terms related to the trans population. The term refers to people who self-identify with the other sex, altering their appearance and behavior in order to conform the internal perception and external appearance [25]. Besides, it is a generic term, which embraces all individuals whose gender identification diverges from traditional notions attributed to their biological sex [26]. When an individual has a gender identification and expression congruent with their biological sex, it is said to be cisgender [8].

This cluster relates to 'TRANSSEXUALS': people who use hormones or undergo surgical procedures for sex reassignment, either male to female (MTF) or female to male (FTM) [25]; 'BISEXUAL': individuals with sexual and emotional attraction to people of any biological sex, regardless of gender [27]; 'LESBIAN' (woman who has sexual and emotional attraction to people of the same sex), 'GAY' (man who has sexual and emotional attraction to people of the same sex), and transvestite (people who assume the appearance commonly identified as the opposite sex) [25].

The transgender theme is also related to 'GENDER', which is a social construction about what it means to be a woman or a man. Gender is based on the female and male categories, which are socially related to dichotomous gender divisions [26]. This cluster also relates to 'GENDER-IDENTITY', which refers to the individual self-perception of female, male, or identities between or outside these categories. From this perspective, gender roles are also discussed, which are social and cultural constructs about expectations, duties and characteristics for each gender.

Also included are discussions about 'NONBINARY' and 'GENDER NONCONFORMING', because the narratives about transgender identities are created through heteronormative gender experiences, that carry social, cultural and medical factors and understandings about what is accepted in society [3]. In this sense, the psychological suffering of transgender individuals is common, because they are not accepted and understood in society. However, when this suffering is attached to non conforming between gender identification and the gender attributed at birth, it is possible to think about 'GENDER-DYSPHORIA' [8].

The central theme also presents relations between 'MENTAL-HEALTH' of transgender individuals and 'DISCRIMINATION', because this population has high rates of suffering and psychiatric disorders (such as personality, mood and post-traumatic stress disorders), which may be directly or indirectly related to the trauma and social discrimination experienced [28]. Furthermore, bullying and violence contribute to the disparities in access to health care in this population, which impacts their health, well-being and quality of life over time [29].

3.1.2. Homosexuality

The 'HOMOSEXUALITY' cluster (see Figure 4b) becomes central, as it concerns sexual attraction or sexual behaviors exclusively or almost exclusively with people of the same sex [30]. Such theme include aspects related to 'SEXUAL-ORIENTATION', which refers to the existence or lack of sexual attraction of one person towards another [26]. Sexual orientation depends on the individual's own gender identity and their object of sexual desire [4]. In addition, another theme discussed in this cluster is 'SIBLING SEX RATIO', which includes studies on the influence of birth order on sexuality and gender identity. Most related studies show that birth order considerably influences sexual orientation, with samples indicating that homosexual and transsexual individuals have a posterior order of birth [31, 30, 32].

When addressing the central issue of the cluster, it is known that cultural norms directly influence the way homosexuality is seen and how the subjects feel that they belong to their society and nation. Therefore, 'TRANSNATIONALISM' relates to the cluster, as it is a concept related to the critique of Western hegemony (that normalizes subjects from a whiteness and heteronormativity logic) which is present in world public policies, influencing the criteria for defining gender identities and sexual orientation [33].

These studies also address immigrants and how they are seen in their country of origin and in others. Relating to such construction, the studies address 'NATIONALISM', which concerns the particular way each nationality sees homosexuality and different gender identities, creating norms specific to their culture [34]. It is noticed that these themes are crossed by the fact that the pattern discussed by transnationalism directly influences the different nations, and even so, each one of them has its particularities and norms.

These themes influence the way the history of homosexuality is told in the different media, both in magazines and scientific publications. Thereby, it is explained how the themes 'HISTORY', 'MAGAZINES' and 'PERIODICAL' co-relate in this cluster. The incorporation and acceptance of the homosexual population is modified throughout history, being permeated by the fight for civil rights, the construction of public policies and business related to the marked aimed at this population [35]. The media that portray this construction, such as 'MAGAZINES' and 'PERIODICAL', which consist of publications of a commercial nature, and address issues on how homosexuals are portrayed and perceived in society, as well as, the way financial marketing is used to influence this population.

Therefore, 'PERIODICAL' has a function similar to that performed by 'MAGAZINES', because, through its open and continuous structure of presentation, organization and association of themes, it approaches the present, merging the timeline between past and future. It also uses stories, ideas, and insights as a resource that have implications for the conceptualization of sexuality through its own narrative. In this perspective, these medias have played an important role in shaping queer culture from the start, putting into circulation pictures of homosexual people, most of the times transcending borders and enabling the creation of new identification processes with such representations [36].

3.1.3. Gender identity disorder

The researches that make up the cluster 'GENDER IDENTITY DISORDER' (see Figure 4c) encompass issues about 'GENDER-IDENTITY-DISORDER-OF-CHILDHOOD' and in 'ADOLESCENCE'. It points out the growing number of children and adolescents seeking care in clinics for transgenders and the development of service methodologies based on the 'Dutch Approach', which began in the early 90's in the Netherlands, United States and Canada, considered pioneer countries in this subject. Disparities between the countries are also identified, regarding the care of these individuals and the impacts in short and medium term. Moreover, these discussions involve ethical issues about categorization, infertility and the appropriate time to start treatment [37].

This cluster has an intrinsic relation with 'GENDER-VARIANCE', which is used in different contexts to refer to an individual's desire to be of another gender. Researches discuss this variation in children and adolescents, as these are areas of growing scientific interest after the emergence of clinics and medical centers that focus on gender identities and their variations. As well as adults, children and adolescents can also present psychological suffering due to gender incongruence, what is called gender identity disorder in the fourth edition of the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and gender dysphoria in DSM-V [38].

Another important relation is with the term 'AUTOGYNEPHILIA', which is a male's paraphilic tendency to feel aroused when thinking of himself as a woman. This term, in addition to encompassing transvestism, refers to erotic situations or ideas that don't necessarily have a connection with women's clothing [39]. This tendency is found in transsexuals from male to female (MTF) heterosexuals and it is related to sexual orientation, as it is not present in transsexuals MTF homosexuals. Autogynephilia is associated with gender dysphoria, which can appear concomitantly or after the first [40].

In this sense, the fact that 'TRANSSEXUALISM' is not necessarily related to 'PSYCHIATRIC COMORBIDITY' is discussed [41], although many transsexuals have personality disorders [42], anxiety disorders, mood or disruptive disorders [43]. Furthermore, a study identifies that 'TREATMENT' with 'HORMONAL-THERAPY' can

have a positive effect on the mental health of transgender people [41] mainly because it reduces dissatisfaction with one's body and improves acceptance in the social context, what is also achieved with 'SEX-REASSIGNMENT' surgeries.

3.1.4. *Men who have sex with men*

The 'MEN WHO HAVE SEX WITH MEN' cluster (see Figure 4d) refers to cisgender men who have sex with other men. Relating to this central theme, there is 'TRANSGENDER-WOMEN', people born male and who identify with the female gender, and 'FEMALE-SEX-WORKERS', women who have commercial sex, seeing it as their profession. Because they have more partners, and consequently greater sexual activity, they are also more exposed to sexually transmitted diseases due to the possible practice of unprotected sex [44].

Such populations are subject to constant violation of rights, finding as an obstacle the lack of employment opportunities, financial poverty, worsening of physical and mental health status, more experiences of family rejection, psychological abuse caused by discrimination regarding gender identity and/or sexual orientation, associated to psychological illness such as: suicide attempts, high levels of depression and substance use problems among adolescents [45].

Adding to these particularities, there is also the difficulty to access health services and prevent sexually transmitted diseases. Thus, there is a close relation between the experiences of the population mentioned on this cluster and the axes 'HIV', 'HIV-TESTING', 'HIV-PREVENTION' and 'PREEXPOSURE PROPHYLAXIS'. In terms of prevention and epidemiological mapping, methodologies such as 'HIV-TESTING' and 'PREEXPOSURE PROPHYLAXIS' are included.

Studies related to these themes allow the conclusion that testing, correct administration of antiviral treatment, enabling low viral load, and encouraging the use of condoms, are effective and fundamental strategies for HIV prevention. Furthermore, 'PREEXPOSURE PROPHYLAXIS' is an additional harm reduction strategy for people at risk of developing the virus infection, being made available through three methods: PrEP pill, PrEP implant, PrEP injection [46]. For such a strategy to be effective, a care model is proposed, emphasizing and obeying the following points: definition of the population at risk, ensuring that these individuals are aware and willing to adopt such therapy, access to health care, and guaranteeing the continuity of treatment and care [47]. In addition, it is necessary to assess risk awareness, perceptions of risk-benefits, possible side effects, risk compensation and dosage [46].

Therefore, effective surveillance allows to determine patterns of transmission of sexually transmitted diseases, enabling the identification of developing epidemiological trends. However, difficulties are identified in reaching the populations mentioned in this cluster through traditional research methods. A methodology that has been gaining ground is 'RESPONDENT-DRIVEN-SAMPLING', which uses samples from the participants' social media, and its main objective is work to calculate population-scale risk and the prevalence of diseases [48].

This method follows an ethnographic mapping and recruits participants named 'seeds', who invite members of their virtual communities, who can also recruit new participants, generating successive waves, although the number of recruits is determined through coupons, which are limited by the researcher. To be effective such methodology has some key elements: participants and their recruits should have a pre-existing relationship; the size of each participant's social media (the potential sampling frame) will influence; and the total number of recruitment coupons distributed to each participant is limited. Based on these elements, it is ideal to enroll a large enough number of participants to produce representative estimates of the entire population of interest [48, 49].

3.1.5. *Corporate Governance*

The 'CORPORATE GOVERNANCE' cluster (see Figure 4e) discusses 'BOARD-GENDER-DIVERSITY' in the corporate context, mainly in management and leadership

positions. A study conducted in Malaysia, that has a Code on Corporate Governance, proved that women positively associate the environmental, economical and social dimensions with their workplace, contributing with 'CORPORATE SOCIAL RESPONSIBILITY' [50].

Along the same lines, another study points out that the presence of women on corporate boards raises ranking for social issues, in addition to being positively associated with the company's reputation [51]. Likewise, a high degree of gender equality gives companies greater market valuation, better stock returns and greater productivity. Therefore, the implementation of gender equality corporate policies favors the best financial performance of companies, produces competitive advantages regarding the labor market and generates mutual benefits for employers and employees [52].

Similar perspectives are found in the literature, indicating the positive aspects of a more equal participation of women in corporations [53, 54], as improvements related to relational management [53], management quality and human rights protection [54]. However, it's important to take into consideration that, in some cases, women can be appointed to leadership positions under risky organizational conditions. Such context can lead to greater risks of failure, implying biases for evaluations [55].

The cluster does not present associations with themes such as 'TRANSGENDER' or 'TRANSSEXUAL', which can be explained by the incipient research on the inclusion of this group in the labor market. This is evidenced in a study that provides data on the labor market scenario for gays, lesbians and bisexuals, and points out that there is a gap in literature on transgender, queer and other gender groups [56].

3.1.6. *Vaginoplasty*

This cluster (see Figure 4f) discusses 'SEX-REASSIGNMENT-SURGERY', 'GENDER-REASSIGNMENT-SURGERY' and 'GENDER-AFFIRMING-SURGERY', which are different names given to the surgical procedure that aims to adapt the individual's body to their perception of gender belonging.

The theme is related to 'PHALLOPLASTY', 'PENILE-INVERSION' and 'METOIDIOPLASTY', which are different surgical methods for modification of sexual organs and adequacy of physical characteristics according to the individual's gender identity. 'METOIDIOPLASTY' is the surgery to create a male sex organ through the clitoris' hormonal increase and its subsequent detachment from the pubis to become a penis, which is coated with tissue from the vagina and labia minora. A urethroplasty is also performed to the tip of the clitoris. The scrotal sac is usually made from the labia majora and the use of silicone implants. 'PHALLOPLASTY' consists of building the penis through the transfer of tissues, muscles, blood vessels and nerves taken from other parts of the body [9]. In cases of transsexual 'FEMALE-TO-MALE' mastectomy also occurs, which is the removal of the breasts for masculinization of the chest wall [57].

The 'PENILE-INVERSION' surgery, on the other hand, is performed on men in the process of transitioning to the female sex, and consists of removing the inside of the penis, preserving the urethra, skin and nerves. The testicles are removed and the scrotal sac skin is preserved. A space is opened for the neovagina, which is lined internally with the penis' and scrotum skin. The rest of the scrotum skin is used to form the labia and the urinary tract is adapted. The glans is used for the clitoris' formation [9].

Moreover, the MTF surgeries often involve breast implantation and performance of feminizing surgery. In FTM transsexuals, a complete hysterectomy, which is total removal of the uterus, may also occur. Also, it is important to reflect on the fact that, in most countries, 'GENDER-AFFIRMING-SURGERY' are not covered by health services, what makes many transsexuals unable to perform or complete the transition [58].

As gender affirming surgeries are irreversible, it is essential that the Standards of Care (SOC) are clear and reliable. In that regard, the World Professional Association for Transgender Health (WPATH) reviews them periodically. The sixth version of this document included national SOC, with specifications from different countries. These standards of care include clinical guidelines on the procedure indication, timing and

technical details for sex reassignment surgery, according to each specificity. It establishes a gradual procedure, starting with psychological evaluation, with real life experiences according to gender identification and psychotherapy, the use of hormone therapy and culminates in the performance of the surgical procedure, which, as it is irreversible, should be the last step performed [9].

Several studies discuss the pros and cons of each surgical procedure, seeking knowledge and methods that ensure a better recovery and adaptation process for patients [59]. To achieve the best results from these procedures, it is necessary a multidisciplinary team made up of specialists in sexual medicine, plastic surgeons, gynecologists and urologists [9].

3.1.7. Sex change

The cluster 'SEX CHANGE' (see Figure 4g) is composed of a variety of studies that refer to both the 'ENVIRONMENTAL-SEX-DETERMINATION' and 'SEX-DIFFERENTIATION', as these occur naturally in several animals, such as fishes and other marine animals [60]. The 'HERMAPHRODITISM' of animals that have both sexes is discussed, 'PROTOGYNY' refers to animals in which the female sexual organs reach maturity faster than male organs [61] and 'PROTANDRY' refers to the animals in which the male sexual organs are the first to reach maturity.

These studies, despite not having direct connection with transgender issues, are the basis for discussions about the possibility of sex change in humans. In many animal species, 'SEX CHANGE' is understood as a survival strategy [62], as in the fish species 'TELEOST' and 'BLACK PORGY'.

In addition to discussions on hermaphrodite animals, this cluster also includes studies on the species 'DIOECY', in which the female and male gametes (egg and sperm in animal species), are produced by different individuals, as in human beings. Even in these species, stressors can induce sex change [63] in some subspecies. These studies are related to issues of 'GROWTH', because it is during this process that the progression of sexuality occurs; and 'AROMATASE', which is an enzyme responsible for a step in estrogen biosynthesis, hormone responsible for the individual's female characteristics and acts as a regulator of the reproductive cycle. Studies indicate the use of inhibitors of this enzyme in order to suppress physical changes and understand the issues about transsexuality [64].

Studies that discuss sex change in humans refer to possible procedures and treatments to achieve congruence between sex and gender [8, 65]. However, author states that sex change in humans would be better described as gender change or gender affirmation, since individuals maintain their chromosomal sexual biology (XX or XY), but change their physiology and their gender expression [8]. The hormonal treatments and procedures used to perform gender affirming surgery are better described in 'Vaginoplasty' and 'Testosterone' clusters.

3.1.8. Testosterone

The cluster 'TESTOSTERONE' (see Figure 4h) relates to 'HORMONES', 'ESTRADIOL' (an estrogen formulation), 'ESTROGEN', 'SEX-STEROIDS' and 'CROSS-SEX-HORMONE-THERAPY' due to the concepts of therapy/transition in transgender people. Estrogen and testosterone are female and male hormones, respectively, used in a controlled manner as hormonal therapy. The goal of cross-sex hormone treatment is to suppress endogenous sex hormone levels in order to reduce related sexual characteristics and replace those levels with the sex hormone corresponding to the affirmed sex [66].

The need for hormonal treatment is related to the individual's dissatisfaction with their physical appearance, which is not in accordance with their gender identification. Thus, hormonal treatment allows for the beginning of a change in physical appearance, to make the body more gender-congruent. In male to female transsexuals, breast enlargement is induced with the use of estrogens and antiandrogens, which also reduces male pattern hair growth. In female to male transsexuals, on the other hand, 'TESTOSTERONE' stimulates virilization and hair growth in a male pattern, and limits menstruation [58].

In this sense, the term is also associated with 'TRANSGENDER-MEN', 'FEMALE-TO-MALE' and 'FEMALE-TO-MALE-TRANSSEXUALS', that portray the process of gender readjustment. The intervention of hormonal treatment is a crucial issue for the emotional and mental health care of transgender subjects [67]. In 'TRANSGENDER-MEN', the use of estrogen does not guarantee satisfactory breast formation, implicating in surgical augmentation with the placement of silicon implants. In 'FEMALE-TO-MALE' the responses to hormone therapy are more positive, because there is increase in muscle, significant beard growth and voice change [9]. So, in addition to the hormonal treatment aforementioned [66], there are also, in some cases, the possibility and need for surgical therapies [68].

However, it is important to expand knowledge about the risks involved in these treatments, because, although the literature is limited, there are case reports of 'BREAST-CANCER' in transgender population [69]. It is necessary to explore the hormonal implications of the treatments carried out by trans people, in order to understand the interaction between hormone therapy and breast cancer in this population, as there is evidence that, in cisgender women, estrogen is related to the development of the disease [70].

3.1.9. *Queer*

The cluster 'QUEER' (see Figure 4i) refers to a comprehensive term, considered an umbrella term, pointing out its relation with 'SEXUALITY' by including terms that refer to sexual orientation or non-binary gender identities, such as 'LGBT', 'TRANS' and 'DRAG'. The beginning of the reflection on this theme took place in the 18th century, with Mariano Aguilera's case, from New Spain, which already raised questions about the meanings of androgyny, and how these shape the discourses and roles of health and legal professionals about queer bodies [1]. In the beginning of the 20th century, the 'QUEER' term was used as a synonym for 'weird' referring in a derogatory way to homosexual people. Around the 2000's, the term took on a new connotation, similar to 'crazy' [27].

Currently, this word, full of symbols and meanings, has emerged in academies, with roots in humanities and 'FEMINISM', as a critique of binary identities and the fixed categorization of individuals [27]. The term Queer, despite not having a clear definition, has been used in order to destabilize and demystify rigid identity categories, highlighting the existence of complex sexualities, that are continually constructed [71]. In this context, queer theory analyses gender and sexual diversity through the concept of difference [3].

This cluster is also related to 'IDENTITY', which is a factor of great relevance in discussions about the trans population. The constitution of "identity" requires the construction of similarity with a group, with a psychological, political or sociocultural attribute or characteristic. Identity is constructed and reproduced through discourse. In addition, it is necessary to think about the construction of social and collective identity, which comprises the feeling of belonging to social groups. However, there's a marked perception in society about gender identities, that creates social comparison and has its basis in hegemonic sociopsychological practices, that intensify the marginalization of the transgender population [72].

The queer discussion also encompasses the difficulties faced by this group in various everyday situations, such as in cases of 'MIGRATION' and asylum requests in other countries. Although sexual orientation is widely accepted as a justification for asylum in several countries, the lack of documents makes it difficult to prove that the person really is who they claim to be. This need to apply for asylum suggests fear of persecution in the country of origin due to non-heterosexuality [71].

3.2. Scientific Evolution Structure Analysis

Using SciMAT, a map of scientific evolution (Figure 5) on transgender and associated themes was created. The map was divided in four analysis subperiods, in order to discuss the most important clusters and the multiple transversalities with related themes. The size of the clusters is proportionally related to the amount of papers associated with the theme.

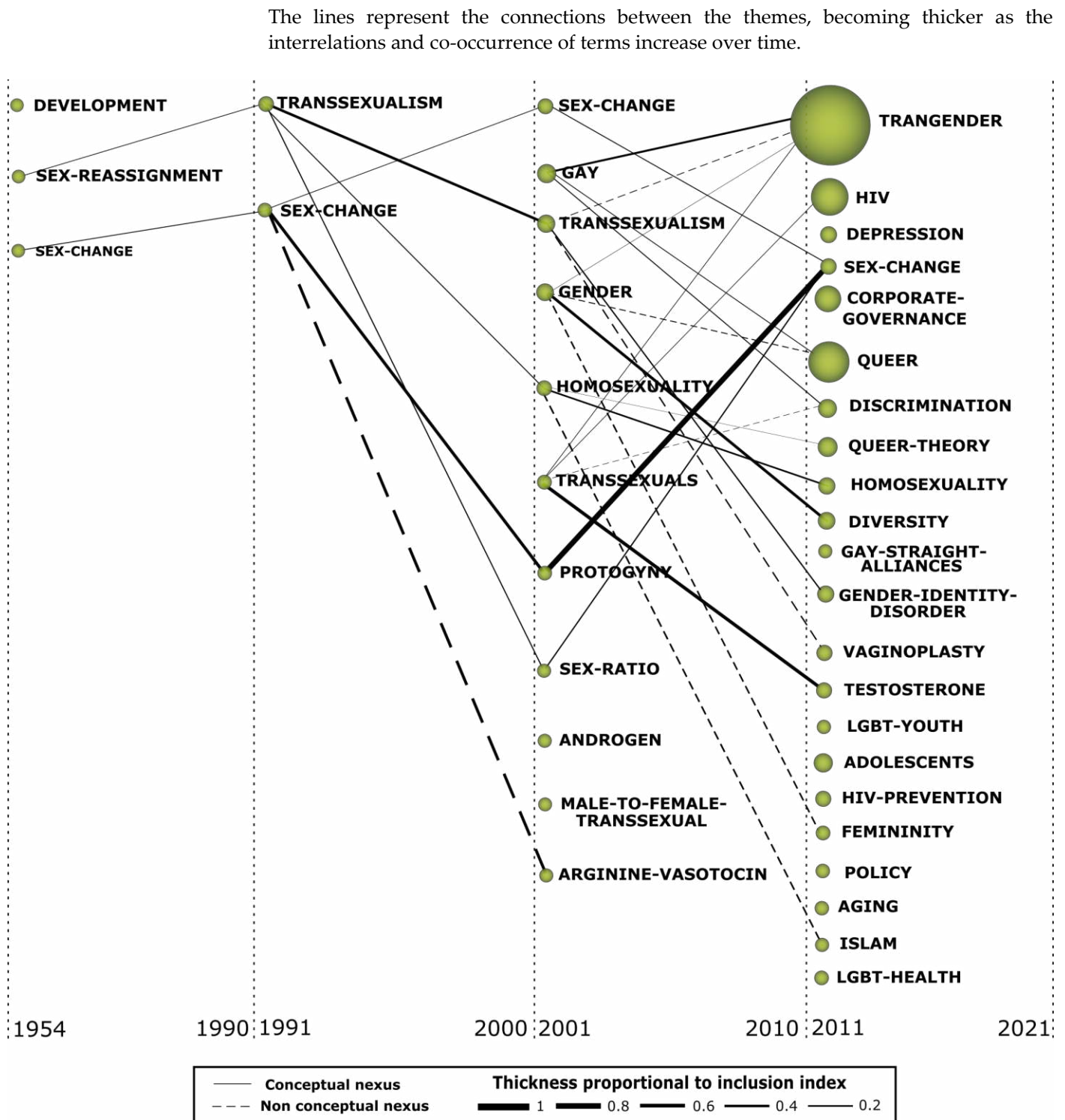


Figure 5. Thematic evolution structure.

Thematic evolution allows the analysis of the significant increase in scientific productions. In the first (1954-1990) and second subperiods (1991-2000) (Figure 5), the scientific production was incipient and revolved around issues of sex change and reassignment, and transsexualism. From the 2000s onwards, the existence of a large number of papers that bring discussions on more diverse and comprehensive themes can be seen. Thereby, the third subperiod (2001-2010) includes gender, homossexuality, sex ratio and protogyny issues, and in the fourth subperiod (2011-2021) discussions about gender identity disorder, transgenter, queer, diversity and LGBT health related issues (e.g., HIV and discrimination) arise.

3.2.1. Analysis and discussion of the first subperiod (1954-1990)

The first studies on the subject date back to 1954. However, those studies [73, 74, 75] cite researches from 1925, such as the book by Magnus Hirschfeld, in which the term transvestism was used for the first time, and Caudwell in 1949, who used the term transsexual for the first time [76]. In this subperiod, the main clusters refer to sex ratio and sex reassignment, with studies that analyze the performance of surgery [77, 78], discuss cases of transsexualism [79, 80], such as Christine Jorgensen, in 1950, who was the first to gain notoriety and raise discussions about gender roles [81] and the social and economical aspects of transsexualism [82].

Transvestism and transsexualism were understood as psychiatric disorders [74, 75, 83, 84]. It was considered that the transvestite had the desire to play the role of the opposite sex and be accepted by society as part of the group. The transsexual was the individual with an intense desire to assume the physical, mental and sexual characteristics of the opposite sex, including the modification of the anatomical structure [73, 85]. Transsexualism was understood as the evolution of transvestism, that is, when the ego no longer feels pleasure in transvestism and starts to desire the process of transsexualism [86]. In this period exams and tests were carried out in order to identify possible genetic factors influencing transvestism and transsexualism [87, 88].

However, despite considering the use of clothing of the opposite sex as a symptom, some studies questioned the fact that this was the only basis for the diagnosis of an emotional and behavioral disorder, defending that this 'symptom' was the symbolic fulfillment of the subject's wishes, which would explain a disharmony of physical and mental sexuality [73, 81]. The incipience of studies on the so-called transsexualism syndrome is pointed out, given that, despite being little versed by doctors, was known by psychologists, who used the term 'psycho-sexual inversion' to refer to these cases [89].

In 1972, Sweden took an important step in guaranteeing the rights of this population by passing the first legislation in the world regulating the legal and surgical procedures for sex reassignment [90]. In this perspective, in 1980 transsexualism was included in the list of "Gender Identity Disorders" from the Diagnostic and Statistical Manual of Mental Disorders (DSM-III). In 1990, the desire to dress or become the opposite sex was still understood as a syndrome [91], and as such, related to a process of non-compliance with classical gender issues.

3.2.2. Analysis and discussion of the second subperiod (1991-2000)

During this subperiod, discussions about sex change persist, added to studies on transsexualism. Studies on genetic aspects of sexual orientation take place [92], parental aspects associated to transsexualism [93], studies that highlight the psychological factors related to sexual orientation [94], associated illness processes [95, 96] and the impact of heterossexist traditional culture on identity construction processes [97]. Some studies refer to gender identity disorders [39], while others use the term gender dysphoria [98,99], which refers to the suffering generated by the difference between gender identity and biological sex. In 1994, with the publication of the DSM-IV, the term "gender identity disorder" started being used as a substitute for transsexualism.

The gender identity disorder theme came to be understood as universal, raising discussions about its role in the social and cultural constructions of power and gender, exemplifying with the manifestations on the theme in religious and mythological cults. The existence of a hegemonic gender ideology was highlighted, which would speak about a supremacy of the male over the female [96]. Accordingly, the social and cultural factors turned heterosexuality compulsory and highlighted the gender inequality [100].

In 1999, the increase of scientific interest on the transsexual theme was pointed out, which was understood as a phenomenon, and the change in the negative attitude of professionals towards sex reassignment surgery [93]. Discussions arise about affirmative

environments for sexual minorities [101, 102], showing concern with the inclusion and protection of these individuals.

3.2.3. Analysis and discussion of the third subperiod (2001-2010)

In 2001 studies about policies and programs to attend the LGBT community emerged, especially because this population was considered to be in a vulnerability situation with increased risk to develop mental disorders and abuse of drugs [103, 104, 105]. The trans issues became focal points of the academic and popular thinking [106], with an expressive increase in the number of publications.

During this subperiod, sex change discussions persist. Furthermore, there is an important discussion about the relation between sex role and gender identity. Sex role is understood as behavior, attitude and personality traits designed as masculine or feminine in different societies. However, to analyse the transsexual sex role, it is necessary to take into account the heteronormative social pressures to which they are subject, and that end up generating mixed roles, between the gender they identify with and the one society imposes on them [107].

The researches denote greater thematic coverage and deepening of issues discussed. There is studies on the perspective of families on the transsexual, evidencing to the family rituals that perpetuate heterosexism [108] and pointing that the heteroideology carries a prejudice baggage that has brutal consequences to the individuals that do not identify with the gender related to their biological sex [109]. There is also discussion about sex reassignment surgeries [110], gender diversity in the labor context [111], political participation and social inclusion of transgenders [112], guarantee of international human rights [113, 114], psychosexual development of children and adolescents with symptoms of Gender Identity Disorder [115], the intrinsic relation between gender and sexuality [116] and changing formal documents according to gender identity [117].

3.2.4. Analysis and discussion of the fourth subperiod (2011-2021)

The concentration of documents in this subperiod reflects the increased interest in the subject, compared to previous subperiods. Discussions on sex change remain constant in the four evolutionary subperiods, related directly to the discussions about sex reassignment surgery. DSM-5, released in 2013, replaced the term 'gender identity disorder' with 'gender dysphoria' (DSM-5).

The discourses start considering an expanded gender spectrum, taking into account the nuances beyond female or male [118]. There is a differentiation between gender identity and gender expression. In 2014, Ontario Human Rights Commission, defined gender identity as the individual's internal experience and the sense of belonging to a certain gender, which can be the same or different from their birth sex. Gender expression, on the other hand, is how the individual presents themselves to the society, including behaviors, appearance, name, voice and body language [118].

There is great concern with diversity in different contexts, such as schools [119], labor contexts [120], and prisons [121]. These discussions are relevant because, a lot of times, organizations have institutionalized cisnormativity, which makes the trans individual vulnerable to marginalization and discrimination [119]. The importance of psychological support for parents of children and adolescents of different genders is also discussed, so they can strengthen the processes of communication and acceptance of their children [122].

The term transgender, seen as an umbrella for embracing different identities, is discussed and criticized. It is considered that this unification generates complex mechanisms that make legal recognition difficult, especially for transsexuals [123]. During this period a large number of studies on HIV emerged, reflecting the exponential increase in the number of people infected by the virus in 2010. Although the number of infected transsexuals is lower than in the general population, they report greater psychological distress and higher levels of discrimination when compared to cisgenders [124]. Beyond

that, discrimination can generate processes of physical and psychological illness and lead the individual to social vulnerability [125].

The term queer, used to refer to sexual and gender minorities, becomes part of a queer theory, which is based on the challenge of deconstructing binary categories of identity and questioning the stability of the self. Therefore, the queer theory allows for the opening of fluid and multiple self, gender and sexual experiences [27].

4. Discussion

Despite speculation about the causes of transgenderism, no conclusive biological, social or psychological factors are identified [25]. However, to believe in the need for a cause that justifies non-binary gender identities is re-understand them as process of illness, forcing the subject to flee from the heteronormative rule.

In the clusters analysis, it is noteworthy the fact that the cluster 'Corporate Governance' has no relation with transgender, transsexuals, queer or its derivatives terms, highlighting that, although there is a large number of papers concerned with gender diversity in organizations, this diversity is still conceived under the dichotomy of female and male and based on biological sex.

Thus, trans people face difficulties to get a formal job, and when they start the transsexualization process while being employed, have great chances of being fired. In addition, they are often expelled from their families of origin, are unable to secure custody of their children and are deprived of access to services for the gender they identify with. In this sense, government agencies proliferate discriminatory practices by preventing transgender girls and women from using women's toilets, and vice versa, in the most diverse public spaces [8]. Thus, basic human rights such as getting married, having children, using a public bathroom, working or having access to health and education services, pose challenges for the transgender population. This reflects society's perceptions and social representations of transgender people.

On the other hand, the cluster 'Sex change' highlights this theme as a natural survival strategy for many animals species, which for transsexual individuals can mean the experience of violence, discrimination, transphobia and even death. Hence, discriminatory practices place trans people in a vulnerable situation, leaving them at the mercy of harassment, violence, expressions of hatred and injustice, whether in families, in the work context, in health or education institutions or in the community [8].

It is important to remember that the ground zero of the fights for LGBT rights in the world was the Stonewall riot on June 28, 1969. The rebellion takes its name for having taken place in the Stonewall Inn Bar, in New York, that hosted a large number of homosexual people and where there were often violent police raids and humiliating searches. On that day, the fight against abuses started a revolt that lasted several days and was the basis for the contemporary fight for the guarantee of rights [126].

In addition, historical evolution allows for an understanding of paradigm shifts related to transgender issues. In the first subperiod described (1954-1990), the terms used - transvestism and transsexualism - had a connotation of disease and were conditions understood as psychiatric disorders [74, 75, 83, 84]. The next subperiod (1991-2000), brought an evolution in relation to the theme, which came to be referred to as "transgender disorder", with the publication of the DSM-IV, which, however, still implied a connotation of disease. At that time, there was an increase in scientific interest in the subject and discussions about sexual minorities emerged [101, 102].

In the third subperiod (2001-2010), studies are developed on the policies and programs aimed at the LGBT population [103, 104] and the scope of issues related to the theme is expanded, including issues such as gender reassignment, work context, psychosexual development and social and political participation. Finally, the last subperiod (2011 until March 13, 2021) is perceived as being the one with the greatest increase in interest in the theme, also associated with the replacement of the term "gender

identity disorder” by “gender dysphoria” in DSM-V, which brings a place for this population, outside a concept associated with illness.

In addition, the acronyms that refer to this population also varied over time, in order to include the diversity related to human sexuality; for example, one of the first acronyms used in Brazil was LGS (lesbians, gays and supporters). Currently, some social movements use the acronym LGBT (lesbians, gays, bisexuals and transsexuals), while United Nations uses LGBTI, to include intersex. Acronyms such as LGBTTTQIQA are also used, or even the english term LGBTQQICAPF2K+, that bring greater diversity by including transgender, two-spirit, queer, questioning, asexual, ally, no gender, pansexual, polysexual, and kink [127].

This continuous change of acronyms also occurred due to the non-agreement of the various movements related to this population about the letters that should or should not appear in it. The LGBT acronym, which continues to be widely used, is often also added with the symbol +, to refer to other individuals who belong to the group.

In line with the evolution of studies on the theme of gender and sexuality, treatments and therapies related to gender affirmation were also developed. In addition to hormonal therapies, which are also presented as fundamental means of emotional care for transgender subjects [41], there is also the possibility of surgical therapies [68]. In this sense, considering the importance of care related to sex reassignment surgery, there is a process marked by stages, with the procedure being the last one, due to its irreversible nature [9]. This process, although important, can often be long and exhausting, intensifying the suffering of the subject submitted to it.

The incongruence between biological sex and gender selfidentification can produce feelings of loneliness and psychological problems [128]. In addition, significant psychological distress can culminate in mental disorders, suicidal ideation and suicide attempts [8]. The prevalence of depressive disorder, anxiety and feelings of loneliness in trans people is significantly higher than in general population, in addition to a higher number of suicide attempts [128].

The binary understanding of male and female interferes in political and legal decisions related to the recognition of transsexual identity. Therefore, the issues of transsexuality refer to a human right, and that is why it is essential to have a clear distinction between gender identity and anatomical sex [129]. The body, understood as the shell that supports the subject, in addition to showing the world who they are, participates in the creation of their identity and subjectivity [25].

5. Conclusions

The issues related to non-binary gender identities, that do not fit the classic feminine or masculine, continue to oscillate between pathologization and acceptance, mainly because it is based on the patriarchal and heteronormative society. In this context, at the same time as the struggle for equality of rights takes place, the right to assert difference is sought. Thus, it is necessary to understand the uniqueness of the object of analysis and the normative and cultural dimension that mark the construction of knowledge.

In this perspective, as society builds masculinities and femininities aimed at a specific sex, it reinforces the construction of gender meanings, which are based on heterosexuality and the binary logic of man and woman as the only possibilities for experiencing sexuality. Therefore, it is necessary to analyze transgender issues through discourses, social practices and social representations about this population, in order to understand the roots of stigma and the factors that act as maintainers and reinforcers of discriminatory practices. It is essential to problematize transgender issues, understanding them as sociopolitical and culturally constructed.

The limitations of this study refer to the fact that the first references on the transgender theme were not included in this bibliography due to the filter used, which included only articles in English from the Web of Science database. In addition, the term ‘sex change’ included several articles that do not explicitly refer to the transgender theme, but were

chose to integrate this research for discussing the naturalness of the sex change process in various animals, in contrast to sex change, or gender change, as some authors argue, in human beings, which is still a taboo and causes a look of estrangement in society.

Furthermore, transgenderism is a broad term, and despite the large number of related articles, through the structure of thematic evolution it is possible to identify a gap in studies regarding the inclusion of transgender people in the work context and conducting future research that addresses this issue is a suggestion, so important for this population that struggles to guarantee their rights as a human being. The incipience of research on this population in the prison context is also evident, which represents an important field for the development of new research.

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