

BMJ Open Excess costs of transgender and gender-diverse people with gender incongruence and gender dysphoria compared with people from the general population in Germany: a secondary analysis using data from a randomised controlled trial and a representative telephone survey

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ABSTRACT

Objectives For transgender and gender-diverse (TGD) people, it is known that there is a lack of healthcare professionals with experience in trans healthcare. This may result in either inadequate provision of healthcare or in an increased seeking of adequate trans healthcare. Little is known about healthcare services utilisation and resulting costs in treatment-seeking TGD people with gender incongruence or gender dysphoria (GIC/GD). Therefore, the aim of this study was to determine the excess costs associated with GIC/GD in Germany.

Design In a secondary analysis, baseline data of a randomised controlled trial with a sample of TGD people with GIC/GD were combined with data of a telephone survey conducted in a representative sample of the general German population. The data sets were matched using entropy balancing. Self-reported healthcare services utilisation was valued by standardised unit costs for the German healthcare system, and absenteeism from work and unemployment were valued with the gross hourly wage of persons in manufacturing and services sectors.

Settings TGD people with GIC/GD living at least 50 km outside Hamburg in the federal state Bremen, Mecklenburg-Western Pomerania, Lower Saxony or Schleswig Holstein and the German general adult population.

Participants Treatment-seeking TGD people with GIC/GD (n=167) and people of the general German population (n=2811).

Primary and secondary outcome measures 6-month excess healthcare costs and indirect costs from a societal perspective were calculated for the year 2020 using two-part models with logit specification for the first part and a generalised linear model with gamma family and log link function for the second part.

Results The total 6-month excess costs associated with GIC/GD from a societal perspective were estimated

STRENGTHS AND LIMITATIONS OF THIS STUDY

- ⇒ Data for healthcare service utilisation and absenteeism from work for a group of people with the rare clinical conditions gender incongruence or gender dysphoria (GIC/GD) were available.
- ⇒ Through a large data set on people from the general population and by entropy balancing, it was possible to adjust for differences in sociodemographic and clinical characteristics.
- ⇒ By applying two-part models with logit specification for the first part and a generalised linear model with gamma family and log link function for the second part, it was possible to take the skewness of cost data into account.
- ⇒ Not the entire spectrum of healthcare service utilisation relevant for transgender and gender-diverse (TGD) people with GIC/GD could be covered, as data on medication use, utilisation of medical aids, medical counselling, group therapy/individual therapy and transportation were not available.
- ⇒ It is also possible that TGD people with GIC/GD were part of the general population sample, as they were not asked about their gender identity and expression, nor about a potential GIC/GD.

to be €672 (95% CI: €–3315 to €4657; p=0.741) per person. The direct excess healthcare costs were estimated to be €2 (€–1115 to €1119; p=0.977) and the indirect excess costs due to absenteeism from work and unemployment were €669 (€–3031 to €4370; p=0.723) per person. The total excess costs associated with GIC/GD in trans men, trans women and non-binary people were estimated to be €–5572 (€–12 232 to €1088), €4238 (€–1694 to €10 170) and €3041 (€–4268 to €10 351) per person (all with p>0.05), respectively.

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Conclusions The total 6-month costs in TGD people with GIC/GD did not differ statistically significantly from the costs in the general German population. Indirect excess costs due to absenteeism from work accounted for the largest part of the excess costs associated with GIC/GD, yet with wide 95% CIs. Potential causes of absenteeism from work, such as experienced or expected discrimination, need to be identified and addressed so that TGD people can experience a healthy work environment.

Trial registration number NCT04290286.

INTRODUCTION

People whose gender identity and expression and the sex assigned at birth do not match can be referred to as transgender and gender diverse (TGD).¹ If TGD people are treatment-seeking, the clinical diagnoses gender incongruence (GIC) or gender dysphoria (GD) can be assigned according to the International Classification of Diseases, 11th revision (ICD-11) and the Diagnostic and Statistical Manual of Mental Disorders, 5th edition (DSM-5), respectively.^{2,3} The proportion of the population that should be considered TGD and was seeking or received gender-affirming medical treatment (GAMT) was estimated to be 9.2 per 100 000 population. For TGD people with GIC/GD, the proportion of the population was estimated to be 6.8 per 100 000 population by a meta-analysis of multiple countries.⁴ However, the proportion of TGD people with GIC/GD in the German population may be higher or lower, as the estimate of the meta-analysis was very heterogeneous. GIC/GD can be classified as relatively rare clinical conditions, yet proportion estimates were heterogeneous depending on the underlying definition, and data that are more recent indicate higher proportions of GIC/GD.^{4,5}

With regard to access to care, TGD people with GIC/GD regularly face barriers in Germany. Adequate trans healthcare related to transition is often only available in metropolitan areas with university medical centres.⁶ As a result, people in rural areas often have limited access to trans healthcare, which contributes to poorer health.⁷ After all, the waiting time for accessing trans healthcare is often exceeding 12 months, imposing further mental and physical health risks.^{8,9} With regard to the health impact, the prevalence of mental disorders is higher among TGD people compared with cis people or the general population,^{10–12} and GIC/GD is associated with elevated psychopathology.^{13,14} Besides mental disorders and psychopathology, a high prevalence of sexually transmitted infections has been documented in TGD populations.¹⁴ Moreover, distress and impairment resulting from GIC/GD and coexisting mental health problems may lead to poor health and well-being as well as unemployment or precarious employment. Furthermore, TGD people are exposed to minority stress such as stigma, discrimination and abuse, which are supposed to contribute to this.^{15–17}

However, not much is known about the economic impact of being TGD on employment. In the context of schools, TGD adolescents are known to be absent from school more often due to truancy, feeling unsafe or

skipping school to use alcohol or drugs than cis adolescents, with ORs of absence from school ranging from 1.55 to 3.33.^{18,19} Unemployment rates in TGD people with GIC/GD seeking or receiving GAMT in European countries were shown to be higher than in the corresponding general population.^{20–23} A study on the sociodemographic characteristics of TGD people with GIC/GD receiving gender-affirming hormone treatment in Germany found an unemployment rate of 14%.²⁰ Compared with the unemployment rate in Germany of the year 2017 (5.7%), the unemployment rate found in this study was more than two times higher.²⁴ However, compared with the unemployment rates of individuals with mental disorders, such as mood disorders, personality disorders or schizophrenia in Germany (28.9%), which were determined in an excess cost analysis of mental disorders, the proportion of unemployed TGD people with GIC/GD was again comparatively low.²⁵ Nevertheless, we hypothesised that TGD people with GIC/GD are more often absent from work or even unemployed compared with cis people. As described above, distress and impairment resulting from GIC/GD and coexisting mental health problems may lead to unemployment or precarious employment. Furthermore, due to experiences related to minority stress that were encountered by TGD people, GIC/GD among TGD people may be associated with higher costs related to unemployment and absenteeism to society compared with people from the general population.^{26,27}

With respect to the association of minority stress and access to healthcare services, TGD people frequently face barriers, such as fear of stigma, lack of trans-informed healthcare professionals, as well as difficulty in identifying sources of information about GIC/GD, yet with varying relevance in different countries and cultures.²⁸ Healthcare professionals may be perceived as unsupportive or even hostile towards TGD people in some cases, and provision of medical services might be inadequate. Furthermore, it is known that healthcare professionals with experience in trans healthcare are scarce.²⁹ This may result in either inadequate provision of healthcare or an increased seeking for adequate trans healthcare, such as GAMT. In general, however, psychiatric and somatic outpatient medical services offered to TGD people are not expected to be qualitatively different from those services for cis people.²⁸

To the best of our knowledge, no studies have been conducted analysing the association between GIC/GD among TGD people and healthcare service utilisation. Discrimination experiences are known to have a negative effect on the utilisation of primary care physicians, psychiatrists, psychologists and psychiatrists as well as on the utilisation of psychiatric hospital and nursing care.^{30–33} For this reason, and based on the observation of a lack of healthcare professionals with experience in trans healthcare, we hypothesised that TGD people with GIC/GD are less likely to use somatic outpatient healthcare services. Whereby utilisation of psychiatric outpatient medical services is expected to be equivalent if potential

coexisting mental health problems are not taken into account. Furthermore, seeking GAMT is expected to let TGD people with GIC/GD use healthcare services more frequently and thereby cause excess healthcare costs.

Not much is generally known about the potential differences in healthcare service utilisation between TGD populations and cis populations and, to the best of our knowledge, no information exists on the healthcare costs in treatment-seeking TGD people with GIC/GD. In health economic research, the healthcare costs of persons with a specific disease or clinical condition are compared with those of persons without this disease or condition and otherwise identical sociodemographic and clinical characteristics.^{25 34–36} In order to distinguish samples only by disease or clinical condition and not by sociodemographic characteristics, matching or balancing methods such as propensity score matching³⁷ or entropy balancing³⁸ are commonly used.³⁹ On this basis, excess healthcare costs can be calculated, representing the economic impact solely attributable to the specific disease or clinical condition. Therefore, the aim of this study was to determine the healthcare service utilisation and the associated healthcare costs as well as indirect costs in treatment-seeking TGD people with GIC/GD, and in people from the general population in Germany and thus, to determine the excess healthcare costs associated with GIC/GD.

METHODS

Sample of TGD people with GIC/GD

Data on TGD people with GIC/GD were obtained from a baseline sample of a randomised controlled trial (RCT) evaluating the effectiveness and cost-effectiveness of the i²TransHealth internet-based healthcare programme compared with a waiting list for treatment-seeking TGD people in northern German primary care (trial registration number: NCT04290286).^{40 41} Recruitment took place, among others, via local TGD-related organisations, a previously established network of primary care physicians and psychiatrists as well as via social media.⁴¹

The i²TransHealth internet-based healthcare programme was developed to improve trans healthcare related to transition and consisted of an e-health intervention with clinical interventions that took place via video consultation and of training a network of primary care physicians and psychiatrists in remote areas, that is, at least 50 km outside Hamburg, where TGD people face challenges due to travel costs and time commitments.⁴⁰ TGD people were included in the RCT if they met the criteria for GIC according to the ICD-11³ or GD according to the DSM-5.² The diagnosis was based on an initial face-to-face interview with a study therapist that took place at the outpatient unit of the Institute for Sex Research, Sexual Medicine and Forensic Psychiatry, University Medical Center Hamburg-Eppendorf. Further inclusion criteria were being 18 years or older, living at least 50 km outside Hamburg in the federal state Bremen,

Mecklenburg-Western Pomerania, Lower Saxony or Schleswig Holstein. Exclusion criteria of the RCT were an indication for inpatient psychiatry treatment, suicidal tendencies, intellectual disorder of development, or acute addictive drug intoxication, and insufficient knowledge of German or English language. Of those assessed for eligibility, n=10 TGD people with GIC/GD were non-eligible due to existing inpatient treatment, severe depressive symptoms or ongoing GAMT. Furthermore, n=2 persons declined participation in the RCT.⁴¹

In total, n=174 TGD people with GIC/GD gave written informed consent and were included in the RCT from 2020 to 2022. Of all TGD people with GIC/GD, those persons with missing relevant information (n=7) were excluded. For the data set of the current sample, a total of n=167 TGD people with GIC/GD were included. After inclusion and baseline assessment, TGD people with GIC/GD either had direct access to the internet-based healthcare programme or were guaranteed access after a waiting period of 4 months. A detailed description of the effectiveness and cost-effectiveness analysis can be found elsewhere.^{40 41}

General population sample

Data on people from the general population were used from a representative telephone survey of the German adult population.⁴² Data collection took place from March to April 2014. Of all n=5005 people from the survey who gave oral informed consent, those persons with missing relevant information (n=125) were excluded. Of those, persons older than 60 (n=2069) were excluded from the data set of the current sample to achieve a better match with the sample of TGD people with GIC/GD. For the data set of the current sample, a total of n=2811 people from the general population were included. A detailed description of the representative telephone survey of the German adult population and the results with respect to the healthcare service utilisation and costs can be found elsewhere.⁴²

Healthcare service utilisation and calculation of costs

Healthcare service utilisation (eg, “Please indicate how many days you have been treated in the hospitals listed in the last six months.”, “Please indicate how often you have visited the following physician/psychotherapist in the last six months.”), absenteeism from work (“How many days have you had to be absent from your regular employment or self-employment in the last 6 months due to your own health problems?”), and unemployment (“Have you had a regular employment relationship in the last six months or have you been self-employed in the last six months?”) of TGD people with GIC/GD and people from the general population was assessed retrospectively for 6 months using adapted versions of the German Client Socio-Demographic and Service Receipt Inventory based on self-report.⁴³ Furthermore, TGD people with GIC/GD and people from the general population were asked about their age, sex assigned at birth, marital status,

school-leaving qualification, professional education and ICD, 10th revision (ICD-10) morbidities (“Please indicate which of the following diseases/disorders a physician/psychotherapist has ever diagnosed in you”; eg, post-traumatic stress disorder, somatoform disorder, eating disorder, disturbance of activity and attention, disorder of personality and behaviour). The ICD-10 was used for indication of morbidities, as the ICD-11 did not come into effect in Germany until the beginning of 2022. TGD people with GIC/GD were also asked about their gender identity. Gender identity statements were categorised into trans man/trans masculine, trans woman/trans feminine and non-binary gender.

Costs of healthcare services (hospital/day care/rehabilitation, outpatient medical and non-medical services, formal nursing care) were calculated by valuating quantities of utilisation with standardised unit costs for the German healthcare system.^{44 45} In terms of costs of hospital care, a distinction was made between somatic and psychiatric hospitals. The costs of outpatient medical services were also differentiated between somatic (eg, primary care physician, gynaecologist, urologist) and psychiatric services (psychiatrist, psychologist or psychotherapist). Since medication uptake was not surveyed in the general population sample, as recall bias was to be expected due to the nature of the telephone survey, no medication costs could be calculated. Costs of informal nursing care were calculated by valuating hours of care with the gross hourly wage of persons in the commercial sector ‘social care for older adults and disabled persons’ based on the gross labour cost database from the Federal Statistical Office of Germany.⁴⁶

By pursuing the human capital approach, costs of absenteeism from work were calculated by valuating days absent from work with the gross hourly wage of persons in manufacturing and services sectors.⁴⁶ As it was hypothesised that TGD people with GIC/GD are more often unemployed compared with cis people, costs of unemployment were also calculated. Thereby, unemployment was assumed as 100% absenteeism from work (130 days; given a working week consisting of 5 days and 26 weeks within 6 months⁴⁷) and costs of unemployment were also calculated by valuing days absent from work with the gross hourly wage of persons in manufacturing and services sectors.⁴⁶

Total costs were evaluated from a societal perspective and consisted of total healthcare costs and total indirect costs (costs of absenteeism from work and costs of unemployment). All unit costs used were inflated to 2020 price levels using the German consumer price index⁴⁸ and are shown in online supplemental table S1.

Statistical analysis

In order to estimate the excess costs solely associated with GIC/GD, it is necessary to match the data sets of TGD people with GIC/GD and people from the general population with respect to sociodemographic and clinical characteristics. As healthcare services utilisation and

their associated costs are often confounded by sociodemographic and clinical characteristics, it is necessary to compensate for this. For this purpose, differences in sociodemographic and clinical characteristics in the data set of people from the general population were balanced based on the data set of TGD people with GIC/GD using entropy balancing.³⁸ Entropy balancing is “a data preprocessing method to achieve covariate balance in observational studies with binary treatments”.³⁸ Thereby, unit weights are calibrated relying on a maximum entropy reweighting scheme in order to satisfy a large set of conditions incorporating known moments of the samples. The entropy balancing model included the covariates age, sex assigned at birth, marital status (two categories), school-leaving qualification (five categories) and professional education (three categories), and the means and variances of those covariates were balanced between data sets. Thus, all included sociodemographic characteristics were considered as only confounding healthcare costs and costs of absenteeism and unemployment, as the cross-sectional nature of the data does not allow for causal inferences, even though mediation effects, for example, of a worse school-leaving qualification or being married/having a partner cannot be ruled out. However, employment status was not included as a covariate in the entropy balancing model, as it was hypothesised that TGD people with GIC/GD are more often absent from work or even unemployed compared with cis people, and therefore it was regarded as a mediator of costs of absenteeism and unemployment. Furthermore, morbidities according to the chapters II, IV, V and IX–XIII of the ICD-10 (two categories each) were included in the entropy balancing model. Again, morbidities were only considered as confounding healthcare costs and costs of absenteeism and unemployment, as no causal inferences can be drawn. Sociodemographic and clinical characteristics of the TGD people with GIC/GD and people from the general population before and after balancing are shown in table 1.

In order to account for the substantial zero costs as well as skewed distributions in the healthcare cost data, both a logit and a generalised linear model have to be applied. Thus, healthcare costs in TGD people with GIC/GD and in people from the general population were analysed using weighted two-part models with logit specification for the first part and a generalised linear model with gamma family and log link function for the second part with robust SEs. Thereby, weights derived by the entropy balancing were used to adjust for differences in sociodemographic and clinical characteristics. Excess healthcare costs associated with GIC/GD were estimated as average marginal effects between healthcare costs in TGD people with GIC/GD and in people from the general population.

In order to explore a potential difference in excess healthcare costs associated with GIC/GD by gender, a subgroup analysis was performed for TGD people with GIC/GD who identify as trans man/trans masculine, trans woman/trans feminine and whose gender

Table 1 Sociodemographic and clinical characteristics of the samples of transgender/gender diverse people with gender incongruence/gender dysphoria and people from the general population sample before and after balancing† (n=2978)

Sociodemographic and clinical characteristics	TGD people with GIC/GD (n=167)	People from the general population (n=2811)	
		Before balancing	After balancing
Age in years: mean (SE)	26.87 (0.78)	40.20 (0.23)***	26.84 (0.52)
Female sex assigned at birth: n (%)	92 (55.09)	1391 (49.50)	1546 (54.99)
Marital status: n (%)			
Single	109 (65.27)	1129 (40.16)***	1834 (65.25)
Married/having a partner	58 (34.73)	1682 (59.84)	977 (34.75)
School-leaving qualification: n (%)			
No school-leaving qualification	15 (8.98)	72 (2.57)***	255 (9.06)
Special-needs school (Sonderschule)	2 (1.20)	4 (0.16)	34 (1.20)
Secondary general school (Hauptschule)	15 (8.98)	796 (28.33)	253 (9.01)
Secondary school (Mittlerer Schulabschluss)	64 (38.32)	931 (33.13)	1076 (38.28)
Academic secondary school ((Fach-) Abitur)	71 (42.51)	1007 (35.81)	1193 (42.44)
Professional education: n (%)			
No completed education	91 (54.49)	374 (13.30)***	1531 (54.48)
Vocational training/technical college degree	62 (37.13)	1814 (64.53)	1043 (37.12)
University degree	14 (8.38)	623 (22.16)	236 (8.40)
Employment status: n (%)‡			
Full-time employed	46 (27.54)	1489 (52.97)***	710 (25.26)
Part-time employed	10 (5.99)	451 (16.06)	385 (13.69)
Marginally employed	13 (7.78)	155 (5.53)	231 (8.22)
Apprenticeship/retraining	24 (14.37)	89 (3.18)	287 (10.20)
Not in employment	65 (38.92)	560 (19.92)	1094 (38.91)
ICD-10 morbidities: n (%)			
Neoplasms	3 (1.80)	112 (3.99)	51 (1.80)
Endocrine, nutritional and metabolic diseases	19 (11.38)	595 (21.15)**	320 (11.38)
Mental and behavioural disorders	96 (57.49)	594 (21.12)***	1616 (57.49)
Diseases of the circulatory system	11 (6.59)	535 (19.04)***	185 (6.59)
Diseases of the respiratory system	39 (23.35)	478 (16.99)*	656 (23.35)
Diseases of the digestive system	23 (13.77)	445 (15.84)	387 (13.77)
Diseases of the skin and subcutaneous tissue	23 (13.77)	443 (15.76)	387 (13.77)
Diseases of the musculoskeletal system and connective tissue	9 (5.39)	556 (19.79)***	152 (5.39)

*p<0.05, **p<0.01, ***p<0.001.

†The entropy balancing model included the covariates age, sex assigned at birth, marital status, school-leaving qualification, professional education, and morbidities according to the chapters II, IV, V and IX–XIII of the ICD-10.

‡Not applicable is not shown.

GD, gender dysphoria; GIC, gender incongruence; ICD-10, International Statistical Classification of Diseases and Related Health Problems 10th Revision; TGD, transgender and gender diverse.

was categorised as non-binary. Furthermore, in order to explore a potential difference in excess healthcare costs associated with GIC/GD by younger or older ages, a subgroup analysis was conducted by age groups (aged 18–24 and aged 25–60), whereby the group was halved on the basis of the median age, and by sex assigned at birth (male and female). For each subgroup analysis, new

weights were derived by entropy balancing based on the data set of the respective subgroup.

Sensitivity analyses were performed on the basis of weights from different entropy balancing models in order to check the robustness of the assumptions made with regard to sociodemographic and clinical characteristics that were considered as only confounding healthcare

costs and costs of absenteeism and unemployment. Thereby, one sensitivity analysis was based on weights derived from an entropy balancing model that additionally included the covariate employment status. Further sensitivity analyses were based on weights derived from an entropy balancing model that only included the covariates age and sex assigned at birth, as well as from entropy balancing models that excluded all morbidities or only the morbidities according to chapter V of the ICD-10.

All data analyses were performed using Stata/MP V.17.0 (StataCorp). Entropy balancing was performed using the Stata package 'ebalance'⁴⁹ and two-part models were computed using the Stata package 'tpm'.⁵⁰ All statistics were two-sided with a significance level of $p < 0.05$.

Patient and public involvement

The RCT evaluating i²TransHealth was built on participatory healthcare research by exploring TGD people's needs and concerns in relation to interdisciplinary trans healthcare.^{40 41 51} Moreover, TGD people support groups were involved in the recruitment of study participants.

RESULTS

Sample characteristics

TGD people with GIC/GD ($n=167$) and people from the general population sample ($n=2811$) differed in age, marital status, school-leaving qualification, education and employment status (all with $p < 0.001$) before applying the entropy balancing weights. TGD people with GIC/GD were more often not in employment compared with people from the general population sample (39% vs 20%). No statistically significant difference in sex assigned at birth was observed ($p=0.165$; [table 1](#)). With respect to clinical characteristics, the samples differed statistically significantly in the prevalence of all ICD-10 morbidities, except for neoplasms, diseases of the digestive system, and diseases of the skin and subcutaneous tissue. Of all TGD people with GIC/GD, 43% identified as trans man/trans masculine ($n=72$), 34% identified as trans woman/trans feminine ($n=56$) and 23% were with non-binary gender identity ($n=39$).

After entropy balancing, the sample of TGD people with GIC/GD was similar to the sample of people from the general population with respect to sociodemographic and clinical characteristics. The sociodemographic characteristics of the samples after entropy balancing are presented in [table 1](#). The mean age was 27 years. The majority was with female sex assigned at birth (55%), had a secondary school qualification or academic secondary school qualification (81%), was unemployed (39%) and had not completed vocational training nor technical college/university education (54%). The prevalence of mental and behavioural disorders was 57%.

Excess healthcare costs

In the two-part model, the mean 6-month total costs from a societal perspective in TGD people with GIC/GD were

estimated to be €18775 (SE €1547) and were €18103 (SE €1320) in people from the general population ([table 2](#)). Thus, the 6-month total excess costs associated with GIC/GD were €672 (95% CI: €-3315 to €4657). The 6-month excess direct costs associated with GIC/GD were €2 (€-1115 to €1119) per person. The excess costs of absenteeism and unemployment associated with GIC/GD were estimated to be €669 (€-3031 to €4370) per person, which were mainly driven by excess costs of absenteeism (€657; €-141 to €1456). Differences in total healthcare costs and costs of absenteeism and unemployment were not statistically significantly different between TGD people with GIC/GD and people from the general population.

TGD people with GIC/GD had statistically significantly lower costs in the categories of somatic medical outpatient services (€-68; €-113 to €-24) and informal nursing care (€-428; €-781 to €-24) with $p=0.003$ and $p=0.021$, respectively. The costs in the categories psychiatric and somatic hospital, day care and rehabilitation, psychiatric medical outpatient services and outpatient non-medical services in TGD people with GIC/GD were not statistically significantly different from the costs in people from the general population ([table 2](#)).

Subgroup and sensitivity analyses

The mean total 6-month excess costs associated with GIC/GD in trans men/trans masculine people, trans women/trans feminine people and non-binary people were estimated to be €-5572 (€-12232 to €1088), €4238 (€-1694 to €10170) and €3041 (€-4268 to €10351) per person, respectively. Differences in total costs from a societal perspective between trans men/trans masculine people, trans women/trans feminine people, non-binary people with GIC/GD and people from the general population were not statistically significant ([table 3](#)).

The mean total 6-month excess costs associated with GIC/GD in TGD people aged 18–24 and aged 25–60 were estimated to be €-2252 (€-12731 to €8227), and €6363 (€1501 to €11226) per person, respectively. The mean total 6-month excess costs associated with GIC/GD in TGD people with male and female sex assigned at birth were estimated to be €3726 (€-1403 to €885) and €-2905 (€-9341 to €3532) per person, respectively. Differences in total costs from a societal perspective between TGD people with GIC/GD aged 18–24 and aged 25–60, with male and female sex assigned at birth, and people from the general population were not statistically significant (online supplemental table S2).

In the sensitivity analysis based on weights derived from the entropy balancing model that additionally included the covariate employment status, the 6-month total excess costs associated with GIC/GD were €451 (€-3566 to €4467). The 6-month excess direct costs associated with GIC/GD were €-197 (€-1447 to €1054) per person. In the sensitivity analysis based on weights derived from an entropy balancing model that excluded the morbidities according to the chapter V of the ICD-10, the 6-month

Table 2 Mean day/contacts, costs and excess healthcare costs of gender incongruence and gender dysphoria (6 months, in €, 2020)

Cost category	TGD people with GIC/GD (n=167)		People from the general population (n=2811)				
	Mean days/ contacts (SE)	Mean costs in € (SE)	Mean days/ contacts (SE)	Mean costs in € (SE)	Excess costs in € (SE)†	95% CI	P value
Hospital/day care/rehabilitation	3.66 (1.08)	1262 (388)	1.97 (0.85)	835 (319)	427 (502)	-558 to 1412	0.395
Psychiatric hospital/day care	1.95 (0.77)	597 (243)	0.97 (0.45)	292 (131)	305 (277)	-236 to 848	0.269
Somatic hospital/day care/ rehabilitation	1.72 (0.79)	665 (310)	1.00 (0.34)	544 (182)	121 (360)	-585 to 827	0.737
Outpatient medical services	8.68 (0.81)	412 (51)	8.87 (0.79)	392 (47)	20 (70)	-117 to 156	0.781
Psychiatric medical services	3.30 (0.57)	249 (46)	2.19 (0.53)	162 (39)	87 (60)	-30 to 206	0.145
Somatic medical services	5.38 (0.47)	162 (14)	6.68 (0.45)*	230 (18)	-68 (23)	-113 to -24	0.003
Outpatient non-medical services	1.69 (0.47)	49 (15)	3.01 (0.55)	72 (15)	-23 (21)	-64 to 18	0.275
Nursing care	4.75 (2.10)*	100 (43)	25.66 (8.77)*	522 (178)	-422 (183)	-787 to -69	0.020
Formal nursing care	0.26 (0.15)	9 (4)	0.11 (0.09)	3 (4)	6 (5)	-3 to 16	0.189
Informal nursing care	4.49 (2.09)*	91 (42)	25.55 (8.77)*	519 (178)	-428 (183)	-781 to -62	0.021
Absenteeism/unemployment	57.13 (4.85)	16951 (1420)	53.98 (4.13)	16282 (1244)	669 (1888)	-3031 to 4370	0.723
Absenteeism	6.53 (1.40)*	1690 (369)	3.43 (0.57)*	1033 (173)	657 (407)	-141 to 1456	0.107
Unemployment	50.60 (4.91)	15261 (1480)	50.56 (4.41)	15249 (1329)	12 (1989)	-3886 to 3911	0.995
Total healthcare costs	-	1824 (402)	-	1822 (403)	2 (570)	-1115 to 1119	0.997
Total costs (plus indirect costs)	-	18775 (1547)	-	18103 (1320)	672 (2034)	-3315 to 4657	0.741

*p<0.05.

†Excess healthcare costs were calculated by a weighted two-part model with logit specification for the first part and a generalised linear model with gamma family and log link function for the second part with robust SEs. Weights were derived from the entropy balancing model that included the covariates age, sex assigned at birth, marital status, school-leaving qualification, professional education and morbidities according to the chapters II, IV, V, and IX-XIII of the ICD-10.

GD, gender dysphoria; GIC, gender incongruence; ICD-10, International Statistical Classification of Diseases and Related Health Problems 10th Revision; TGD, transgender and gender diverse.

Table 3 Excess healthcare costs of gender incongruence and gender dysphoria (6 months, in €, 2020): subgroup analysis by gender identity

Cost category	Trans men/trans masculine people with GIC/GD (n=72)	Trans women/trans feminine people with GIC/GD (n=56)	Non-binary people with GIC/GD (n=39)
	Excess costs in € (SE) [†]	Excess costs in € (SE) [†]	Excess costs in € (SE) [†]
Hospital/day care/rehabilitation	689 (659)	418 (786)	390 (921)
Psychiatric hospital/day care	402 (294)	-12 (325)	763 (839)
Somatic hospital/day care/rehabilitation	287 (553)	430 (688)	-373 (292)
Outpatient medical services	-123 (100)	93 (81)	249 (174)
Psychiatric medical services	-53 (89)	152 (70)*	261 (156)
Somatic medical services	-70 (27)**	-59 (21)**	-12 (51)
Outpatient non-medical services	-43 (26)	-36 (19)	51 (57)
Nursing care	-747 (404)	-216 (85)*	-235 (261)
Formal nursing care	5 (7)	-3 (12)	11 (11)
Informal nursing care	-752 (405)	-213 (84)*	-246 (260)
Absenteeism/unemployment	-5348 (3097)	3979 (2746)	2586 (3406)
Absenteeism	1184 (624)	301 (448)	639 (1026)
Unemployment	-6532 (3483)	3678 (2839)	1947 (3566)
Total costs	-224 (805)	259 (867)	456 (993)
Total costs (plus indirect costs)	-5572 (3398)	4238 (3027)	3041 (3730)

*p<0.05, **p<0.01

[†]Excess healthcare costs were calculated by weighted two-part models with logit specification for the first part and a generalised linear model with gamma family and log link function for the second part with robust SEs. Weights were derived from entropy balancing models that included the covariates age, sex assigned at birth, marital status, school-leaving qualification, professional education and morbidities according to the chapters II, IV, V and IX-XIII of the ICD-10.

GD, gender dysphoria; GIC, gender incongruence; ICD-10, International Classification of Diseases, 10th revision.

total excess costs and excess direct costs associated with GIC/GD were €2197 (€-1269 to €5664) and €-917 (€-1447 to €1054) per person, respectively (online supplemental table S3).

DISCUSSION

The aim of this study was to determine the excess costs associated with GIC/GD in Germany. There was no evidence of economic burden of GIC/GD from a societal perspective, with 6-month excess costs of €672 associated with GIC/GD with wide 95% CIs (€-3315 to €4657). The largest share of the excess healthcare costs was attributable to costs due to absenteeism from work. This finding supports our hypothesis that TGD people with GIC/GD are more often absent from work compared with cis people. Thus, absenteeism from work of TGD people with GIC/GD might actually be related to mental health vulnerability and low resilience.²⁶ Among all TGD respondents from the large-scale but also non-representative EU-LGBTI II Survey and an Australian community survey, 35% and 33% reported feeling or being discriminated against at work, respectively.^{29 52} According to the non-representative 2015 US Transgender Survey, about one-third of all TGD respondents reported gender identity-related mistreatment at work or being fired or denied a promotion within 1 year.⁵³ Of all those TGD respondents with a job, more than two-thirds reported avoidance of gender identity-related discrimination by, for example, hiding their gender identity or quitting their job. Absenteeism from work could possibly add to the avoidant coping strategies by disengaging from the gender identity-related discrimination at work.⁵⁴ Ultimately, further qualitative analyses are needed in order to strengthen the potential relation of absenteeism from work, mental health vulnerability and low resilience. Furthermore, waiting for care may increase mental health vulnerability. In Germany, the approximate waiting time for GAMT was about 6–12 months in 2022.⁵⁵ A long waiting time for GAMT is known to affect both physical and psychosocial health as well as healthcare service utilisation among treatment-seeking TGD people.⁸ Yet, as the current study was a secondary analysis of baseline data of an RCT, after randomisation and baseline assessment, either the TGD people with GIC/GD had direct access to an internet-based healthcare programme to improve trans healthcare related to transition, or they were guaranteed access after a waiting period of 4 months. Therefore, waiting for care should have only increased mental health vulnerability, if at all. In addition, the current study did not find an association between being TGD and absenteeism from work because of mental health vulnerability, as the samples of TGD people with GIC/GD and people from the general population were aligned with respect to mental and behavioural disorders. Furthermore, the unemployment rate of TGD people with GIC/GD compared with people from the general population, however, was both 39% after alignment of the

sociodemographic and clinical characteristics. Hence, we cannot substantiate our hypothesis that TGD people with GIC/GD are also more often unemployed compared with cis people. In a Danish cohort study, however, an age-adjusted and sex-adjusted relative risk ratio of unemployment of 4.4 was determined in TGD people compared with people from the general population.⁵⁶ This higher unemployment rate among TGD people was also confirmed by a systematic review of studies on employment and TGD.⁵⁷ A Belgian secondary analysis of clinical and survey data identified unemployment rates of 14% and 29% of TGD people, respectively.⁵⁸

For somatic outpatient healthcare services, it has been found that TGD people with GIC/GD have statistically significantly lower costs compared with people from the general population, indicating lower utilisation. Although this finding supports our hypothesis that TGD people with GIC/GD use somatic outpatient healthcare services less often, no conclusions can be drawn about the association between minority stress and access to healthcare services. In general, TGD people frequently reported gender identity-related negative experiences with respect to healthcare service providers, such as verbal harassment or refusal of treatment.⁵³ Therefore, TGD people may avoid or refuse utilisation of healthcare services, at least somatic outpatient healthcare services. According to the 2015 US Transgender Survey, about one-third of all TGD respondents refused to see a primary care physician due to fear of mistreatment within 1 year.⁵³ Nevertheless, it must be pointed out that data from surveys must be regarded as biased due to their lack of representativeness and can therefore only be interpreted to a limited extent. However, clinical samples often underestimate TGD-related outcomes, as not all TGD people seek GAMT.⁵¹

TGD people with GIC/GD had also statistically significantly lower costs of informal nursing care compared with people from the general population. This finding gives an indication of a reduced need for help due to health problems of TGD people with GIC/GD from family members, friends and acquaintances for tasks that you usually do yourself. Yet, it does not become apparent why the condition of being TGD and being diagnosed with GIC or having GD alone is associated with a lower utilisation of informal nursing care compared with people from the general population who have the same clinical characteristics. In general, TGD people regularly experienced gender identity-related forms of rejection from their family members, and support by family members may be reduced or even absent.⁵³

Using weights derived from an entropy balancing model that excluded the morbidities according to chapter V of the ICD-10 considerably increased the excess costs associated with GIC/GD. Thus, mental and behavioural disorders could indeed have a mediating effect on healthcare costs and costs of absenteeism and unemployment of TGD people with GIC/GD, and using morbidities according to chapter V of the ICD-10 as covariate in the entropy balancing model in the current analysis may

have underestimated the true excess costs associated with GIC/GD. However, as of the cross-sectional nature of the data, causal inferences of the association between mental and behavioural disorders and GIC/GD are hardly to be drawn, and their temporal precedence is unclear, as GIC/GD and mental and behavioural disorders have not yet been concurrently measured.⁵⁹

In the absence of other studies analysing the association between being TGD, GIC/GD and healthcare service utilisation, comparison of the excess healthcare costs associated with GIC/GD found in the current study is not possible. A comparison of the excess healthcare costs associated with GIC/GD with, for example, the excess healthcare costs associated with mental disorders with different levels of mental disorder severities showed considerably higher direct excess healthcare costs (€511 to €10 485) and indirect excess costs (€5612 to €21 399) with increasing severity.²⁵ Thus, the direct excess healthcare costs (€2) and the indirect excess costs (€2586) associated with GIC/GD were even lower than those excess costs associated with a mental disorder with mild disease severity. Despite the ongoing debate on defining GIC as a condition related to sexual health in the ICD-11 or GD as a mental disorder in the DSM-5, comparing excess healthcare costs associated with GIC/GD with those associated with mental disorders was considered appropriate, as psychological distress and impairment may result from GIC/GD.^{60–62}

The excess healthcare costs associated with GIC/GD found in the current study should not be generalised beyond TGD people with GIC/GD living in northern Germany, as inclusion in the RCT was limited to the federal state Bremen, Mecklenburg-Western Pomerania, Lower Saxony and Schleswig Holstein. Generalisability is further limited to adults under the age of 60, as only TGD people with GIC/GD aged 18–60 were available for the analysis.

Strengths and limitations

This was the first study determining the healthcare service utilisation and the associated excess healthcare costs associated with GIC/GD in Germany. Thereby, one major strength of this analysis is the availability of data for healthcare service utilisation and absenteeism from work for a group of people with the rare clinical conditions GIC/GD. Furthermore, a large data set on people from the general population was available, and by entropy balancing, it was possible to adjust for differences in sociodemographic and clinical characteristics between TGD people with GIC/GD and people from the general population. By using weighted two-part models with logit specification for the first part and a generalised linear model with gamma family and log link function for the second part for the calculation of excess healthcare costs, it was taken into account that the cost data had a large number of zero values and highly skewed.

This study also has some limitations that have to be considered. As data on medication use, utilisation of

medical aids, medical counselling, group therapy, and transportation were not available in both data sets, not the entire spectrum of healthcare service utilisation relevant for TGD people with GIC/GD could be covered. Furthermore, TGD people with an indication for inpatient psychiatry treatment, suicidal tendencies, intellectual disorder of development, or acute addictive drug intoxication were excluded from the sample. Thereby, the true total excess healthcare costs associated with GIC/GD might have been higher than the excess healthcare costs determined in the current analysis. Furthermore, people from the general population sample were not asked about their gender identity and expression, nor about a potential GIC/GD. Thereby, it is also possible that TGD people with GIC/GD were part of the general population sample, potentially leading to lower excess healthcare costs. However, as the proportion of the population that should be considered TGD with a related clinical diagnosis was estimated to be low, such an impact is rather unlikely.⁴ Last, healthcare cost analyses have not been corrected for multiple comparisons. The statistics, particularly those of excess healthcare costs, should therefore be interpreted in an explorative manner.

Conclusions

The excess healthcare costs were estimated to be €2, but wide 95% CIs indicated no evidence of difference from the general population (€–1115 to €1119). Absenteeism from work accounted for the largest part of the total excess healthcare costs, yet also with wide 95% CIs. In further studies, it needs to be identified and subsequently, if necessary, addressed whether experienced or expected discrimination is a direct cause of absenteeism from work. Experiencing a healthy work environment without being stigmatised as TGD is probably necessary for lower absenteeism from work. Health policy should focus on improving gender identity-related experiences with healthcare service providers, especially in remote areas. Furthermore, mental health vulnerability and low resilience of TGD people with GIC/GD should be addressed, including to improve absenteeism from work.

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