

At-a-glance

Redefining the gender identity spectrum in longitudinal studies: adolescent response patterns after adopting the two-step measure of sex and gender

Thepikaa Varatharajan, MPH (1,2); Angelica Amores, MSc (1); Karen A. Patte, PhD (3); Margaret de Groh, PhD (2); Ying Jiang, MD, MSc (2); Scott T. Leatherdale, PhD (1)

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Abstract

Ongoing, large-scale longitudinal studies and surveillance systems are moving beyond historical single-item sex or gender measures to better capture gender identity. We examined patterns in adolescents' responses over a two-year period (2020–2021 to 2021–2022 school years) after the COMPASS study adopted a two-step measure of gender identity. Descriptive analyses revealed that, over time, 3.5% and 5.5% of high school students ($n = 11\,618$) selected a different response for sex and gender, respectively. Our findings show that by implementing an inclusive measure that recognizes sex and gender as distinct constructs can improve the identification of all gender identities without compromising data quality.

Keywords: *adolescents, Canadian, gender identity, longitudinal analysis, population health, two-step measure, sex, surveillance systems*

Introduction

The scarcity of reliable and comprehensive epidemiological data on Canadians' gender identity has hindered the understanding of health disparities among cisgender, transgender and gender-diverse individuals.^{1,2} This is primarily because large-scale population-based health surveys assess gender identity using a single question (e.g. "Are you male or female"). Using a measure of sex as a proxy for measuring gender identity conflates concepts of sex and gender and limits responses to traditional binary options.^{3,4} To improve inclusivity and address the existing data gaps, Statistics Canada adopted a new standard for measuring sex and gender.⁵ This initiative, along with the recent calls for national organizations, funding agencies and journal editors to conduct sex- and gender-based analyses,

has prompted researchers to improve data collection of individuals' sex and gender identity.^{1,2}

Specifically, ongoing large-scale population-based studies and surveillance systems are encouraged to improve their assessment of sex and gender identity.^{2,6} School-based studies such as the Canadian Student Alcohol and Drugs Survey⁷ and the COMPASS (Cannabis, Obesity, Mental health, Physical Activity, Sedentary behaviour and Smoking) study⁸ have adopted a valid and cognitively feasible two-step gender identity measure to assess and differentiate between sex assigned at birth (SAB; Step 1) and gender identity (Step 2).^{6,9} Distinguishing SAB from gender identity has been shown to improve the accuracy of identifying cisgender, transgender and gender-diverse people; to increase population-level prevalence estimates of

Highlights

- Historical single-item measures often do not differentiate between sex and gender and/or provide only binary response options (e.g. "male" and "female").
- This study examined patterns in adolescents' responses regarding their sex and gender after an ongoing longitudinal study adopted a two-step measure of gender identity.
- We found that over a two-year period, 3.5% of adolescents selected a different response for sex (e.g. "female" to "male") and 5.5% selected a different response for gender (e.g. "female" to "boy").
- Collecting more inclusive data on gender identity in population-based longitudinal studies can fill data gaps, identify gender-related health disparities and strengthen the health and well-being of all Canadians.

all gender identities; and to improve knowledge of health disparities among people with different gender identities.^{2,3,9–13}

While evidence supports adopting an inclusive measure of gender identity,^{9–13}

Author references:

1. School of Public Health Sciences, University of Waterloo, Waterloo, Ontario, Canada
2. Centre for Surveillance and Applied Research, Health Promotion and Chronic Disease Prevention Branch, Public Health Agency of Canada, Ottawa, Ontario, Canada
3. Department of Health Sciences, Brock University, St. Catharines, Ontario, Canada

Correspondence: Thepikaa Varatharajan, School of Public Health Sciences, University of Waterloo, 200 University Avenue West, Waterloo, ON N2L 3G1; Email: t8varath@uwaterloo.ca

modifying relevant questions in longitudinal surveys could result in inconsistencies in coding gender identity, affecting the assessment of trends or changes over time.¹⁴ To our knowledge, no study has explored the prospective effects of changing a key demographic variable in an ongoing longitudinal study. Therefore, the goal of this study was to examine patterns in adolescents' responses to sex and gender identification questions after switching from a one-step to a two-step gender identity measure.

Methods

Ethics approval

All COMPASS procedures were approved by the University of Waterloo Office of Research Ethics (ORE# 30118) and participating school boards.

Data source

We utilized two-year linked student-level data from Year 9 (Y9; 2020–2021) and Year 10 (Y10; 2021–2022) of the COMPASS study to examine patterns in adolescents' responses to questions about their sex and gender. COMPASS is a 12-year, prospective, hierarchical cohort study designed to collect self-reported health data annually from a sample of students (Grades 9–12; Secondary I–V in Quebec) and their secondary schools.⁸

A total of 11 746 students from 123 schools (Alberta, $n = 5$; British Columbia, $n = 11$; Ontario, $n = 50$; and Quebec, $n = 57$) participated in the study across the 2 years. An online survey was used to collect student-level data during the school year (September to June). Schools that permitted active-information passive-consent data collection protocols¹⁵ emailed a survey link to eligible students (i.e. all students attending participating schools who were not withdrawn from the study by their parent or guardian). Surveys were completed either during class time or at home. Detailed study methods are described elsewhere.^{15,16}

Measures

Sex/gender

Consistent with measures used in youth surveillance systems during data collection,^{7,17} students in Y9 were asked, “Are

you female or male?” Response options were “female,” “male,” “I describe my gender in a different way” or “I prefer not to say.” Given the unclear distinction between biological sex and social gender identity, we refer to this measure as assessing sex/gender.¹⁷

SAB and gender identity

In Y10, students were asked two questions: (1) “What sex were you assigned at birth?” (response options were “female,” “male” and “I prefer not to say”); and (2) “Which gender do you most identify with?” (response options were “girl/woman,”* “boy/man,”* “Two Spirit,” “non-binary person,” “I describe my gender differently” or “I prefer not to say”).

The measures used for Y10 students demonstrate validity for adolescents.^{3,12,18}

Data linkage

The standard COMPASS data linkage process involves generating a unique six-digit code for each student.¹⁹ This code is based on consistent responses to five specific questions asked at the beginning of the questionnaire (e.g. last letter of your full last name) plus the sex/gender question. Since sex/gender is an essential study measure, we removed it from the linkage process. To ensure that the new data linkage method was robust, we only included individuals who were linked consistently in both the old¹⁹ and new data linkage methods ($n = 11\,746$). Links found exclusively in the new linkage method ($n = 189$) were excluded to reduce potential false links.

Analysis

All analyses were conducted in SAS version 10.1 (SAS Institute Inc., Cary, NC, US).²⁰ Descriptive statistics were conducted to explore patterns of responses. We used McNemar tests to compare responses over time.

Students with missing responses to the Y9 sex/gender measure, the Y10 SAB measure and/or the Y10 gender identity measure ($n = 101$) were removed from the sample. Due to ethical considerations regarding Indigenous populations, we refrained from reporting on participants who identified as Two Spirit.

Results

Our sample comprised 11 618 students (aged 12–19 years, with the majority identifying as White). In Y9, 6523 reported their sex/gender as female and 4748 as male; 198 described their gender differently and 115 preferred not to say.

In Y10, 6722 students reported their SAB as female and 4809 as male; 87 preferred not to say. In response to the Y10 gender identity measure, 6358 students identified as a girl, 4748 as a boy and 180 as nonbinary; 181 described their gender differently; 151 preferred not to say (Figure 1).

Response patterns across time

The proportion of adolescents who selected “female” (56.1% vs. 57.9%; $p < 0.0001$) or “male” (41.2% vs. 41.4%; $p = 0.02$) increased over time (percentages in Table 1 have been summed). A significantly higher percentage selected “female” (55.8%) or “male” (40.6%) in Y9 than those who selected “girl” (54.7%) or “boy” (40.9%) in Y10 ($p < 0.0001$). The number of adolescents who selected a response option indicating gender diversity (i.e. “I describe my gender differently” or “nonbinary person”) also increased (1.7% to 3.4%; $p < 0.0001$). For instance, 1.6% selected “nonbinary person” in Y10, regardless of their response in Y9.

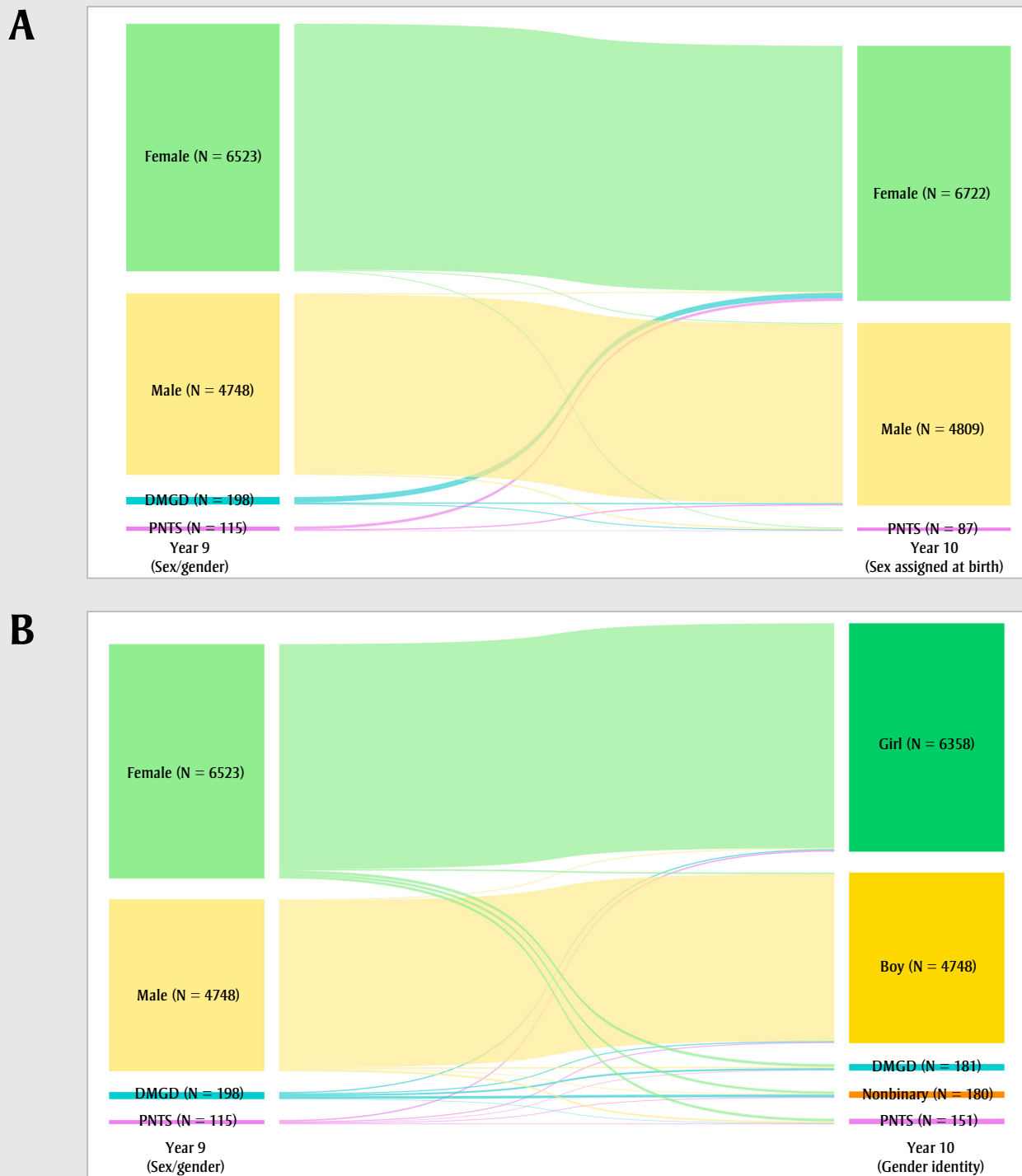
When we compared the Y9 sex/gender responses to the Y10 SAB responses, we found that 11 212 (96.5%) adolescents selected the same response, while 406 (3.5%) selected a different response (e.g. “female”, “describe my gender differently” or “prefer not to say” to “male”) (Table 1). When we compared the Y9 sex/gender responses to the Y10 gender identity responses, we found that 10 979 adolescents (94.5%) selected a response where their sex likened to their gender identity (e.g. “female” to “girl”), while 639 (5.5%) selected a different response (e.g. “female”, “describe my gender differently” or “prefer not to say” to “boy”).

Adolescents' current gender identity

Based on the Y10 SAB and gender identity responses, we categorized the participating students as cisgender girls ($n = 6331$); cisgender boys ($n = 4688$); transgender

* For simplicity, the response options have been abbreviated to “girl” and “boy.”

FIGURE 1
Adolescents' (12–19 years) response patterns to sex/gender, sex assigned at birth and gender identity questions, from Y9 (2020–2021) to Y10 (2021–2022), COMPASS study, n = 11 618, Canada



Abbreviations: DMGD, describe my gender differently; PNTS, prefer not to say; Y9, Year 9; Y10, Year 10.

Notes: Figure 1A depicts the proportion of students responding in Y9 (2020–2021) to sex/gender (“Are you female or male?” with response options “female,” “male,” “I describe my gender differently” [DMGD] or “I prefer not to say” [PNTS]) and in Y10 (2021–2022) to sex assigned at birth (“What sex were you assigned at birth?” with response options “female,” “male” and “I prefer not to say” [PNTS]). Figure 1B depicts the proportion of students responding in Y9 (2020–2021) to sex/gender (“Are you female or male?” with response options “female,” “male,” “I describe my gender in a different way” [DMGD] or “I prefer not to say” [PNTS]) and in Y10 (2021–2022) to gender identity (“Which gender do you most identify with?” with response options “girl/woman” [shown as “girl”], “boy/man” [shown as “boy”], “Two Spirit” [not reported for ethical considerations regarding Indigenous populations], “nonbinary person,” “I describe my gender differently” [DMGD] or “I prefer not to say” [PNTS]). The Figure 1B bars for Y10 gender identity responses “girl” and “boy” are slightly darker in colour to differentiate them from Y9 sex/gender responses “female” and “male.” The size of the coloured bars represents the proportion of students within each category, with thicker bars representing a higher proportion of students.

TABLE 1
Sex and gender identity measure responses by adolescents (12–19 years) in Y9 (2020–2021) and Y10 (2021–2022)
of the COMPASS study, n = 11 618, Canada

Year 9 responses		Year 10 responses	Frequency, n	Proportion, %
Sex/gender to sex assigned at birth				
Female	Female		6479	55.8
Female	Male		23	0.2
Female	PNTS		21	0.2
Male	Male		4722	40.6
Male	Female		28	0.2
Male	PNTS		32	0.3
DMGD	Female		144	1.2
DMGD	Male		31	0.3
DMGD	PNTS		23	0.2
PNTS	Female		71	0.6
PNTS	Male		33	0.3
PNTS	PNTS		11	0.1
Sex/gender to gender identity				
Female	Girl		6260	53.9
Female	Boy		41	0.4
Female	DMGD		79	0.7
Female	Nonbinary		69	0.6
Female	PNTS		74	0.6
Male	Boy		4651	40.0
Male	Girl		26	0.2
Male	DMGD		38	0.3
Male	Nonbinary		19	0.2
Male	PNTS		48	0.4
DMGD	DMGD		50	0.4
DMGD	Boy		29	0.2
DMGD	Girl		34	0.3
DMGD	Nonbinary		74	0.6
DMGD	PNTS		11	0.1
PNTS	PNTS		18	0.2
PNTS	Girl		38	0.3
PNTS	Boy		27	0.2
PNTS	DMGD		14	0.1
PNTS	Nonbinary		18	0.2

Abbreviations: DMGD, describe my gender differently; PNTS, prefer not to say; Y9, Year 9; Y10, Year 10.

and gender-diverse adolescents (n = 385); and prefer not to answer (n = 214). We determined that there were 321 transgender and gender-diverse adolescents directly, based on their gender identity responses (nonbinary, n = 156; “I describe my gender differently,” n = 165), and 64 indirectly, based on the incongruence between their self-reported SAB and gender identity.

Discussion

The goal of this study was to examine whether adopting a more inclusive measure

of gender identity in the ongoing COMPASS study influenced patterns in the participating students’ responses to sex and gender identity over time. Our results indicate that the response patterns for each construct remained largely comparable, with only small proportions of participants choosing different responses. Therefore, expanding the gender identity measure in a population-based longitudinal survey can provide additional insights without compromising data quality.

There may be several reasons why participants changed their responses. Compared to the sex/gender measure, the wording, intent and order of each two-step measure question may have been easier for the surveyed adolescents to understand.^{13,21} This may also explain why the majority of the sample had overlapping responses for sex/gender in Y9 and SAB in Y10. Asking about SAB first may provide context to the question about gender identity, particularly for cisgender adolescents who, unlike their transgender and gender-diverse peers,

may be unaccustomed to thinking of gender as an identity.^{11,22} The additional response options offered in Y10 could have also helped respondents choose an answer that best describes their gender identity.¹⁰ For instance, among participants, approximately 0.6% selected “I describe my gender differently” in Y9 and then opted to select “nonbinary” in Y10.

Evidence from prior research indicates that gender identity is a fluid construct that follows no specific pattern.^{23,24} Although we cannot be certain how participants interpreted the Y9 sex/gender measure (i.e. they may have responded referring to either their sex or their gender), it is plausible that some modified their responses because of changes in their gender identity (i.e. the respondents may have been exploring or questioning their gender identity).¹² Katz-Wise et al.²³ found that 28.9% of transgender and gender-diverse adolescents (N = 183; aged 14–17 years) changed their gender identity after 1.5 years, with an equal number transitioning toward a binary and a nonbinary gender identity. Thus, it is important for longitudinal studies to repeatedly collect SAB and gender identity data, as doing so allows participants to accurately update their gender identity and informs researchers about the fluidity of participants’ gender identity.^{2,12} If a longitudinal study has inconsistent measures at different time points, Bailey et al. recommended reporting the most recent data, thereby preventing measurement error and the misapplication of research findings.²

Strengths and limitations

This study benefits from utilizing data from COMPASS, Canada’s largest ongoing, school-based study (2012–2027). COMPASS employs a prospective study design and can achieve a large sample size.

Nevertheless, our study has limitations. First, COMPASS is not designed to be representative, although the use of whole-school samples and the positive response rates strengthens generalizability. Second, self-reported measures are subject to social desirability bias. However, the use of passive-consent procedures and anonymous IDs has been shown to reduce selection bias and encourage open, honest responses.¹⁵

Conclusion

Gender identity is an important social determinant of health that influences

health outcomes, behaviours and service use, particularly among transgender and gender-diverse people.¹³ As adolescence is a key period during which gender identity is explored, it is important that health surveys targeting secondary school students differentiate between SAB and gender identity using validated and reliable measures.¹² Adopting a measure that is inclusive of gender identity in longitudinal studies will improve representation for all gender identities, particularly transgender and gender-diverse individuals, and highlight their unique needs to policy makers, school personnel and other decision makers who depend on reliable data from population-based health surveys.

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Conflicts of interest

MdG is a former Associate Editor-in-Chief of the *HPCDP* Journal and STL is a former Associate Scientific Editor. Both recused themselves from the review process for this article.

The authors declare that they have no conflicts of interest.

Authors’ contributions and statement

TV: Conceptualization, methodology, formal analysis, data curation, writing—original draft, writing—review and editing.

AA: Conceptualization, methodology, data curation, writing—review and editing.

KAP: Supervision, data curation, funding acquisition, resources, writing—review and editing.

MdG: Supervision, conceptualization, methodology, resources, writing—review and editing.

YJ: Supervision, conceptualization, methodology, resources, writing—review and editing.

STL: Supervision, data curation, funding acquisition, resources, conceptualization, methodology, investigation, writing—review and editing.

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