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### Résumé de l'article

**Contexte :** Des données canadiennes portent à croire que les candidats noirs peuvent avoir moins de succès que d'autres groupes lorsqu'ils postulent à une faculté de médecine. Nous avons cherché à décrire de manière exhaustive l'identité raciale et/ou ethnique, l'identité de genre, l'orientation sexuelle et les capacités des candidats à une seule faculté de médecine canadienne. Nous avons également cherché à établir un lien entre la réussite à chaque étape de la candidature et le sexe et l'identité raciale du candidat ou de la candidate.

**Méthodes :** Les candidats de la promotion 2024 à une faculté de médecine canadienne ont été invités à répondre à une enquête démographique. Les chances d'atteindre chaque étape de la candidature (entrevue offerte, place offerte et inscription) ont été déterminées pour chaque groupe démographique.

**Résultats :** Il y a eu 595 participants (taux de réponse de 32,4 %). Les caractéristiques démographiques des candidats à l'admission et des étudiants admis étaient similaires. Il n'y avait pas de différence entre les candidats blancs et les candidats autochtones, noirs et de couleur (PANDC) en ce qui concerne les offres d'entrevue ou les admissions. Les hommes cisgenres étaient surreprésentés dans les entrevues par rapport aux femmes cisgenres (OR 0,64; 95%CI 0,43-0,95 ; p=0,03) mais pas dans les admissions. Les femmes cisgenres appartenant au groupe des PANDC ont reçu plus d'offres d'entrevue que les autres groupes (OR 2,74, 95%CI 1,20-6,25 ; p=0,02).

**Conclusions :** Les différences les plus marquées dans la réussite des candidats à l'admission parmi les différents groupes démographiques étaient quant aux offres d'entrevue.



## The association between applicant gender and racial or ethnic identity and success in the admissions process at a Canadian medical school: a prospective cohort study

Association entre le sexe et l'identité raciale ou ethnique et la réussite au processus d'admission dans une faculté de médecine canadienne : étude de cohorte prospective

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### Abstract

**Background:** Canadian data suggests that Black candidates may be less successful than other groups when applying to medical school. We sought to comprehensively describe the racial and/or ethnic identity, gender identity, sexual orientation, and ability of applicants to a single Canadian medical school. We also examined for an association between success at each application stage and applicant gender and racial identity.

**Methods:** Class of 2024 applicants to a single Canadian medical school were invited to complete a demographics survey. The odds of achieving each application stage (offered an interview, offered a position, and matriculating) were determined for each demographic group.

**Results:** There were 595 participants (32.4% response rate). The demographics of the applicant pool and matriculating class were similar. There was no difference in interview offers or matriculation between BIPOC and white candidates. Cisgender men were overrepresented in interviews compared to cisgender women (OR 0.64; 95%CI 0.43-0.95;  $p = 0.03$ ) but not in matriculation. BIPOC cisgender women received more interview invitations compared to other groups (OR 2.74, 95%CI 1.20-6.25;  $p = 0.02$ ).

**Conclusions:** Differences in applicant success for differing demographic groups were most pronounced being offered an interview.

### Résumé

**Contexte :** Des données canadiennes portent à croire que les candidats noirs peuvent avoir moins de succès que d'autres groupes lorsqu'ils postulent à une faculté de médecine. Nous avons cherché à décrire de manière exhaustive l'identité raciale et/ou ethnique, l'identité de genre, l'orientation sexuelle et les capacités des candidats à une seule faculté de médecine canadienne. Nous avons également cherché à établir un lien entre la réussite à chaque étape de la candidature et le sexe et l'identité raciale du candidat ou de la candidate.

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**Conclusions :** Les différences les plus marquées dans la réussite des candidats à l'admission parmi les différents groupes démographiques étaient quant aux offres d'entrevue.

## Introduction

Black and Indigenous physicians are underrepresented in Canada.<sup>1,2</sup> Because this underrepresentation may be due to interpersonal and systemic racism,<sup>3</sup> many undergraduate medical education programs have created application<sup>4</sup> and pre-application programs<sup>5</sup> to support admission of candidates from underrepresented backgrounds. Data from Quebec suggest that underrepresentation of Black medical students occurs during selection while underrepresentation of Indigenous students may be attributable to pre-application factors.<sup>6</sup> The Associations of Faculties of Medicine of Canada (AFMC) found no difference in success between female and male candidates, though there is variation across medical schools.<sup>7</sup> Unfortunately, the AFMC does not examine other protected identities,<sup>8</sup> including race, ethnicity, and gender identity, which are likely underrepresented among practicing physicians.<sup>9</sup> Further, critical feminist approaches<sup>10</sup> require examination of how those with intersecting identities, such as Black women,<sup>11</sup> experience the medical school application process. Our study question was: how does the proportion of applicants with different abilities, sexual orientations, and gender and racial identities change at each stage of application at a single medical school?

## Methods

### Study design

This manuscript reports results from a prospective cohort of applicants to the University of Calgary Cumming School of Medicine (CSM) undergraduate medical education Class of 2024 (application cycle 2020-2021; REB20-0077). Participants were consented, anonymous, voluntary, and uncompensated. This study is reported according to the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines.<sup>12</sup>

### Setting & population

We invited all applicants to participate via e-mail from the Office of MD Admissions after submitting their application. There were no exclusion criteria for this study, but applicants must be Canadian citizens or have permanent resident status. The CSM does not reserve positions for any demographic groups but there are separate streams for Black and Indigenous applicants. Applicants who self-identify as Black have their file reviewed and interview conducted by two members of Black, Indigenous and People of Color (BIPOC) communities. In the Canadian Indigenous Applicant Process, established in consultation with regional Indigenous leaders in recognition of the

significant systemic barriers faced by Indigenous applicants and the need for physicians in Indigenous communities, there is an adjustment applied to the file review score for Indigenous applicants.

### Measures

Demographic data were defined by the Canadian Charter of Rights and Freedoms: gender identity, sexual orientation, ability, race, ethnicity, and Indigenous status<sup>13</sup> (Appendix A). The survey was pilot tested for usability and clarity.

The outcome was final application status: offered an interview, offered a position in the Class of 2024, and accepted their offer of admission (Figure 1). Application status was linked to self-reported gender identity and race and/or ethnicity using AFMC numbers.

We aggregated respondents to avoid identifiability. BIPOC was used to represent a heterogeneous group of people who are marginalized by their race and/or ethnicity.<sup>14</sup> Similarly, 'gender diverse' includes transgender, gender diverse, non-binary genders, Two Spirit, or genders that were not listed. We operationally defined visible and minority in the survey question as "a visible minority group means that someone seeing you for the first time could discriminate against you based on your appearance" and non-visible minority as "a non-visible minority group means that you may belong to a group that experiences discrimination but a person seeing you for the first time may not easily notice that you belong to this group" (Appendix A). Reference groups were chosen based on who holds privilege in society.<sup>15</sup> The AFMC and CSM collect self-reported 'gender' data using the terms female and male, and we have used these terms when referring to data from these sources.

We excluded applicants who did not answer any questions. Select demographic categories were not statistically analyzed and are included to describe participants (e.g., applicant ability and disability). Analysis included intersecting race and/or ethnicity and gender identities, referring to Dr. Kimberlé Crenshaw's conceptualization of how people with multiple identities experience unique forms of 'intersecting' discrimination.<sup>16</sup>

We used logistic regression to estimate odds of success per application stage by demographic. Intersectional identities were included as an interaction term. To assess non-response bias, we compared participant demographics to data from the matriculating Class of 2024, where available.<sup>17</sup> Data analysis was performed in Stata (version 14; College Station TX).

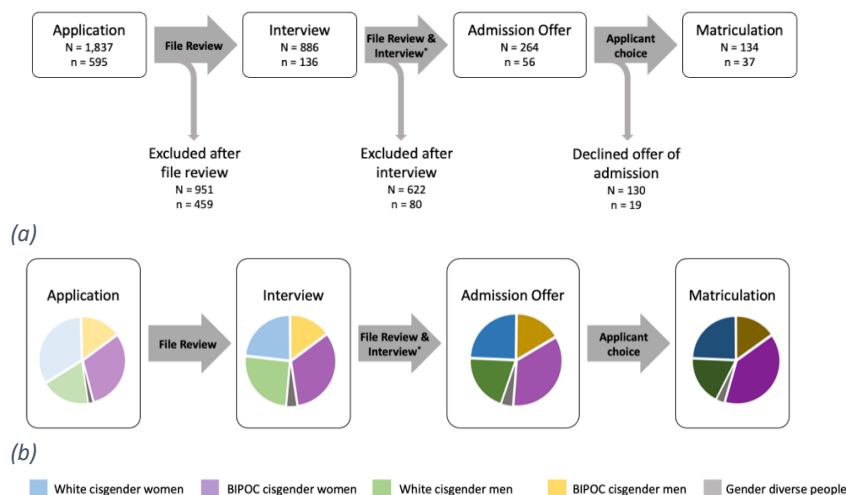


Figure 1. (a) Depiction of the application stages in the application process to the undergraduate medical education program at the Cumming School of Medicine, with the number of total applicants (N) and participants (n) at each step. (b) Demonstration of the proportion of candidates from overlapping race and gender identities at each stage of the application process. Terminology & data analysis

\*Admission offers are based on ranking of applicant total scores, which are 50% file review and 50% interview scores. Less than 0.5% of applicants who were offered an interview declined.

## Results

### Applicant demographics

There were 1,837 applications to the Class of 2024. Of 988 applicants who opened the survey (open rate 53.8%), 595 answered at least one question (response rate 32.4%) (Figure 1). Most identified as cisgender women ( $n = 382$ , 64.2%) and <5% identified as gender diverse ( $n = 10-25$ ) (Table 1). White ( $n = 329$ , 55.3%) and Asian ( $n = 168$ , 28.2%) were the most common racial and/or ethnic identities. There were 188 participants who reported at least one disability (31.6%) and 85 identified as members of the LGBTQ+ community (14.4%) (Appendix B). Altogether, 35.5% identified as a visible minority ( $n = 209$ ) and 18.1% as non-visible minorities ( $n = 105$ ).

Matriculating participants were similar to the matriculating Class of 2024 in gender (58% female, 42% male, other identities not measured) and race and/or ethnicity (8.1% Black and 6.7% Indigenous). Other demographics for the Class of 2024 are unknown.

Overall, the proportion of white cisgender women participants decreased from 33.5% of applicants to 23.5% of matriculants while BIPOC cisgender women increased from 31.0% to 38.2% (Figure 1b). White and BIPOC cisgender men participants were nearly exactly represented among applicants and matriculants (18.4% to 17.6% and 15.2% to 14.7%, respectively).

### Application status

**Offered an Interview.** There were 136 participants who were interviewed (22.9% of participants, 15.3% response

rate, Figure 1). Cisgender men were more often offered an interview compared to cisgender women (OR 0.64; 95%CI 0.43-0.95;  $p = 0.03$ ; Table 1b). There was no difference in odds of being offered an interview between BIPOC and white participants (OR 1.11 (0.75-1.64);  $p = 0.60$ ). White cisgender women were underrepresented among those interviewed relative to their proportion among applicants (23.1% from 33.5%) while white cisgender men were overrepresented (25.4% from 18.4%; Table 1b; Figure 1b). There was no association of BIPOC race and/or ethnicity and odds of receiving an interview but there was a high odds of receiving an interview for BIPOC cisgender women (OR 2.74, 95%CI 1.20-6.25;  $p = 0.02$ ; Table 1b).

**Offered Admission.** Fifty-six participants received admission offers (9.4% of participants;). There was no difference between cisgender women and men (OR 0.78; 95%CI 0.43-1.43;  $p=0.42$ ) or BIPOC and white participants (OR 1.11 95%CI 0.75-1.64;  $p=0.60$ ). There was no difference in the odds of being offered admission between cisgender women and cisgender men applicants, BIPOC and white applicants, and BIPOC and white cisgender women applicants (Table 1b).

**Accepted a position.** Thirty-seven participants matriculated in the Class of 2024 (6.2% of participants). There was no association between applicant gender identity or race and/or ethnicity and matriculation in the Class of 2024. There was no association between BIPOC and cisgender woman identities and the odds of matriculation.

Table 1. Demographics of medical school applicants, stratified by application status, and the odds of attaining each step in the application process

Demographics <sup>†</sup>	All Applicants n (%)	Interviewed n (%)	Offered Admission n (%)	Matriculated n (%)
<b>Gender</b>				
Cisgender women	382 (64.2)	75 (55.1)	29 (55.8)	21 (60.0)
Gender diverse	2-5%	2-5%	5-10%	5-10%
Cisgender men	199 (33.5)	55 (40.4)	19 (36.5)	12 (34.3)
OR <sup>*</sup>		0.64 (0.43-0.95)	0.78 (0.43-1.43)	0.90 (0.44-1.88)
p-value		0.03	0.42	0.79
<b>Race and/or Ethnicity</b>				
Black	42 (7.1)	5-10%	10-15%	10-15%
Indigenous	19 (3.2)	2-5%	2-5%	2-5%
Middle Eastern	38 (6.4)	5-10%	5-10%	10-15%
Asian	168 (28.2)	37 (25.0)	16 (29.1)	20-30%
Hispanic/Latinx	2-5%	Less than 2%	Less than 2%	Less than 2%
White	306 (53.5)	69 (51.5)	25 (50.0)	16 (47.1)
OR <sup>†</sup>		1.11 (0.75-1.64)	1.17 (0.65-2.08)	1.32 (0.66-2.63)
p-value		0.60	0.60	0.44
<b>Intersecting Identities of Gender and Race and/or Ethnicity<sup>‡</sup></b>				
White cisgender men	105 (18.4)	34 (25.4)	10 (20.0)	6 (17.6)
BIPOC cisgender men	87 (15.2)	20 (14.9)	8 (16.0)	5 (14.7)
White cisgender women	191 (33.5)	31 (23.1)	12 (24.0)	8 (23.5)
BIPOC cisgender women	177 (31.0)	44 (32.8)	17 (34.0)	13 (38.2)
White gender diverse students	Less than 2%	2-5%	5-10%	5-10%
BIPOC gender diverse students	Less than 2%	Less than 2%	Less than 2%	Less than 2%
Effect of BIPOC race/ethnicity [OR, 95% CI]		0.62 (0.33-1.19)	0.96 (0.36-2.55)	1.01 (0.30-3.42)
p-value		0.15	0.94	0.99
Effect of cisgender woman identity <sup>*</sup> [OR, 95% CI]		0.40 (0.23-0.71)	0.64 (0.27-1.53)	0.72 (0.24-2.14)
p-value		0.002	0.31	0.56
Interaction of BIPOC race/ethnicity and cisgender woman gender identity <sup>*</sup> [OR, 95% CI]		2.74 (1.20-6.25)	1.65 (0.48-5.71)	1.80 (0.39-8.25)
p-value		0.02	0.43	0.45

OR = odds ratio

<sup>\*</sup>Cisgender women compared to cisgender men (reference); due to the small number, gender diverse participants were not statistically analyzed.<sup>†</sup>Black, Indigenous, Middle Eastern, Asian, Hispanic, and Latinx participants ("BIPOC") were combined and compared to white participants (reference)

## Discussion

Unlike a similar Canadian study,<sup>6</sup> our study of applicants to a single medical school found that the abilities, sexual orientations, and gender and racial identities of matriculating students was similar to the applicant pool, suggesting that underrepresentation of certain groups in medical school classes may be due to other reasons such as pre-application factors rather than bias in the application process.

Race and/or ethnicity modified the association between applicant gender and offers of interview for cisgender women but not men. While the association between protected identities and admission to medical school was explored in this study, we did not assess all important demographic factors; important examples are the applicant's parents income and whether the applicant lives in a rural community.<sup>18</sup> Further research is needed to assess if and how pre-admission and application process

factors contribute to underrepresentation of women, gender diverse people, people with disabilities, members of the LGBTQ2S+ community, and BIPOC people among Canadian physicians.

The generalizability of our results is unknown. CSM is a 3-year program while most other Canadian medical schools are 4-year programs and CSM admits a higher proportion of female and older applicants.<sup>7</sup> Though our data are limited by a low response rate, potential for response bias, and a single year of data, our methods can help administrators examine for bias in their application process. Over- or under-representation in the proportion of applicants from a specific group may prompt an examination of file scoring, interview questions, and/or interview scoring. For example, our institution now removes applicant gender identifiers from the applicant's file prior to file review to reduce the influence of reviewer gender bias on scoring. Further, understanding the demographics of applicants who decline an offer of

admission may alert administrators to the perceived cultural safety of their institution.

These methods may guide further research to understand how the medical school admissions process is experienced by applicants with disabilities, who are women or gender diverse, members of the LGBTQ2S+ community, or identify as BIPOC. In the interim, medical school admissions teams could review their application materials and interview to ensure they are using inclusive language and create a welcoming culture for all students.<sup>20,21</sup>

Our results and others suggest that the proportion of Black and gender diverse people in medicine is increasing in Canada.<sup>7,9</sup> To ensure a safe work and training environment for these students, medical schools should also address the environment and culture of the medical school. For example, though between 5-10% of applicants and matriculants identified as gender diverse, the AFMC portal and many medical school admissions processes only allow students to select binary female/male sex in their demographic information<sup>19</sup> – potentially misidentifying one in ten students.

This study did not find evidence of discrimination against BIPOC students, cisgender women and BIPOC cisgender women in our school's medical school admissions process. This suggests that the underrepresentation of these groups among our medical matriculants may be due to pre-application or other factors.

**Conflicts of Interest:** Dr. Rabiya Jalil and Dr. Remo Panaccione hold leadership positions in the University of Calgary Cumming School of Medicine Office of MD Admissions. There are no financial conflicts of interest for any authors.

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# Appendices

## Appendix A. Survey instrument.

Q1 Please enter your AMCAS number (American Medical College Application Services).

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The following information is being collected to understand the characteristics and diversity of people who apply to medical school.

This information **will not be used** to make admissions decisions.

This information **will not be accessed by anyone** at the Cumming School of Medicine until July 2021, after the final medical school class has been selected. The data will be linked to the status of your application only (e.g., admitted, offered an interview, not admitted). Your name and other personal information **will not be linked to these data**.

Q5 How old are you?

▼ Under 20 (1) ... Prefer not to answer (10)

Q6 Which of the following most closely represents your gender

- ☐ Cisgender man (A doctor identified you as 'male' at birth and you identify as a man now) (1)
- ☐ Cisgender woman (A doctor identified you as 'female' at birth and you identify as a woman now) (2)
- ☐ Transgender man (A doctor identified you as 'female' at birth and you identify as a man now) (3)
- ☐ Transgender woman (A doctor identified you as 'male' at birth and you identify as a woman now) (4)
- ☐ Non-binary gender (You identify as another gender besides man and woman) Please describe: (5)
- 
- ☐ Gender diverse (Your gender identity is not well described by conventional genders) Please describe: (6)
- 
- ☐ A gender not listed above. Please describe: (7) \_\_\_\_\_
- ☐ Unsure. Please describe: (8) \_\_\_\_\_
- ☐ Prefer not to answer (9)

Q7 Which of the following most closely represents your race and/or ethnicity? Please select all that apply.

- ☐ Black. Please describe: (1) \_\_\_\_\_
- ☐ Caucasian/white (2)
- ☐ First Nations (status). Please describe: (3) \_\_\_\_\_
- ☐ First Nations (non-status). Please describe: (4) \_\_\_\_\_
- ☐ Inuit. Please describe: (5) \_\_\_\_\_
- ☐ Métis. (6)
- ☐ Middle Eastern. Please describe: (7) \_\_\_\_\_
- ☐ Asian. Please describe: (8) \_\_\_\_\_
- ☐ Hispanic (9)
- ☐ Latinx. Please describe: (10) \_\_\_\_\_
- ☐ A race and/or ethnicity that is not listed above: (11)  
\_\_\_\_\_

Q8 Are you a member of the LGBTQI2S+ community? (Referring to lesbian, gay, bisexual, transgender, queer, intersex, two-spirited, and other types of sexual orientation diversity community?)

- ☐ Yes. Please describe: (1) \_\_\_\_\_
- ☐ Unsure. Please describe: (2) \_\_\_\_\_
- ☐ No (3)



☐ Prefer not to answer. (4)

Q9 How do you define your ability or disability status? We are interested in this identification regardless of whether you typically request accommodations for this disability. Please select all that apply.

☐

A sensory impairment (e.g., vision or hearing). Please describe: (1)

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☐

A learning disability (e.g., attention deficit hyperactivity disorder, dyslexia). Please describe: (2)

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☐

A long-term medical illness (e.g., epilepsy, cystic fibrosis). Please describe: (3)

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☐

A mobility impairment. Please describe: (4) \_\_\_\_\_

☐

A mental health disorder. Please describe: (5) \_\_\_\_\_

☐

A temporary impairment due to illness or injury (e.g., a broken ankle). Please describe: (6)

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☐

A disability, other ability, or impairment not listed above. Please describe: (7)

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☐

I do not identify with a disability, other ability, or impairment. (8)

☐

Prefer not to answer. (9)

Q10 Do you consider yourself a member of a visible minority group? A visible minority group means that someone seeing you for the first time could discriminate against you based on your appearance.

☐ Yes. Please describe: (1) \_\_\_\_\_

☐ Maybe. Please describe: (2) \_\_\_\_\_

☐ No (3)

☐ Prefer not to answer. (4)

Q11 Do you consider yourself a member of a non-visible minority group? A non-visible minority group means that you may belong to a group that experiences discrimination but a person seeing you for the first time may not easily notice that you belong to this group.

☐ Yes. Please describe: (1) \_\_\_\_\_

☐ Maybe. Please describe: (2) \_\_\_\_\_

☐ No (3)

☐ Prefer not to answer. (4)

## Appendix B. Table.

Demographics of applicants to the Cumming School of Medicine undergraduate medical education program Class of 2024, stratified by application status, and the odds of attaining each step in application for students who are members in the LGBTQ2S+ community and with disabilities compared to those from privileged demographic groups.

Demographics <sup>†</sup>	All Applicants <i>n</i> (%)	Interviewed <i>n</i> (%)	Offered Admission <i>n</i> (%)	Matriculated <i>n</i> (%)
<b>LGBTQ2S+ Community</b>				
Yes	85 (14.4)	27 (20.1)	15-20% <sup>¶</sup>	10-15% <sup>¶</sup>
No	487 (82.7)	103 (76.9)	38 (74.5)	28 (82.4)
<b>Abilities</b>				
Sensory Impairment	23 (3.9)	5-10% <sup>¶</sup>	2-5% <sup>¶</sup>	5-10% <sup>¶</sup>
Mobility Impairment	2-5% <sup>¶</sup>	Less than 2% <sup>¶</sup>	Less than 2% <sup>¶</sup>	Less than 2% <sup>¶</sup>
Learning Disability	34 (5.7)	5-10% <sup>¶</sup>	5-10% <sup>¶</sup>	5-10% <sup>¶</sup>
Chronic Illness	27 (4.5)	5-10% <sup>¶</sup>	5-10% <sup>¶</sup>	2-5% <sup>¶</sup>
Mental Illness	75 (12.6)	16 (10.8)	5-10% <sup>¶</sup>	5-10% <sup>¶</sup>
Temporary Illness	2-5% <sup>¶</sup>	2-5% <sup>¶</sup>	2-5% <sup>¶</sup>	2-5% <sup>¶</sup>
Other Ability	17 (2.9)	2-5% <sup>¶</sup>	2-5% <sup>¶</sup>	2-5% <sup>¶</sup>
No Disability	407 (68.4)	90 (60.8)	31 (56.4)	22 (59.5)

OR = odds ratio

LGBTQ2S+ = identify as members of the lesbian, gay, bisexual, pansexual, transgender, queer, Two-Spirit, 'plus' (referring to the additional sexual orientations and identities that are not captured in this acronym) community

<sup>†</sup>One participant skipped the gender identity question, 22 did not provide their race or sexual orientation (3.7%), and 41 did not provide their ability (6.9%).

<sup>¶</sup>We did not report the absolute number of participants when there were fewer than 15 individuals in each group in order to protect the identity of these participants.