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Body size and weight, and the nutrition and activity behaviors of sexual and gender minority youth: Findings and implications from New Zealand

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1 ***Body size and weight, and the nutrition and activity behaviors of sexual and***
2 ***gender minority youth: Findings and implications from New Zealand***

3 **Abstract**

4 ***Objective***

5 To describe the body size and weight, and the nutrition and activity behaviors of sexual and gender
6 minority (SGM) students, and compare them with those of exclusively opposite-sex-attracted
7 cisgender students. Male and female SGM students were also compared.

8 ***Design***

9 Data were from a nationally representative health survey.

10 ***Setting***

11 Secondary schools in New Zealand, 2012.

12 ***Subjects***

13 A total of 7,769 students, 9% were SGM individuals.

14 ***Results***

15 Overall, weight control behaviors, poor nutrition and inactivity were common and, in many cases,
16 more so for SGM students. Specifically, male SGM students were significantly more likely to have
17 tried to lose weight (aOR=1.95; 95% CI 1.47, 2.59), engage in unhealthy weight control
18 (aOR=2.17; 95% CI 1.48, 3.19), consume fast food and takeaways (aOR=2.89; 95% CI 2.01, 4.15),
19 and be physically inactive (aOR=2.54; 95% CI 1.65, 3.92), and were less likely to participate in a
20 school sports team (aOR=0.57; 95% CI 0.44, 0.75), compared with other males. Female SGM
21 students were significantly more likely to engage in unhealthy weight control (aOR=1.58; 95% CI
22 1.20, 2.08), be overweight or obese (aOR=1.24; 95% CI 1.01, 1.53), and consume fast food and
23 takeaways (aOR=2.19; 95% CI 1.59, 3.03), and were less likely to participate in a school sports
24 team (aOR=0.62; 95% CI 0.50, 0.76), compared with other females. Generally, female SGM
25 students were more negatively affected than comparable males, except they were less likely to
26 consume fast food and takeaways frequently (aOR 0.62; 95% CI 0.40, 0.96).

27 ***Conclusions***

28 SGM students reported increased weight control behaviors, poor nutrition and inactivity.
29 Professionals, including public health nutritionists, must recognize and help to address the
30 challenges facing sexual and gender minorities.

31 **Keywords:** Adolescent; LGBT; exercise; eating disorders; obesity

32 **Introduction**

33 *Health research and LGBT people*

34 Historically there has been a lack of research focused on the health and wellbeing of sexual and
35 gender minority (SGM) individuals, such as lesbian, gay, bisexual and transgender (LGBT) people
36 and those questioning their sexuality or gender⁽¹⁾. Between 1989 and 2011, for example, projects
37 focused on LGBT health comprised only 0.5% (n=628) of all studies funded by the primary agency
38 of the United States (USA) government responsible for health research (the National Institutes of
39 Health)⁽²⁾. Of these, only 9.7% of funded LGBT projects (n=61) explicitly included people under 18
40 years of age⁽²⁾. Furthermore, most international studies (of both adults and young people) in the
41 field of LGBT health have relied upon convenience-based samples^(3; 4; 5), or population-based
42 surveys that are limited in size or geographic scope⁽⁵⁾. However, the available population-based data
43 suggest numerous disparities between SGM youth and their peers who are heterosexual and
44 experience congruence between their gender identity and natal sex (for brevity - heterosexual
45 cisgender youth). Such disparities are particularly apparent in the area of youth mental health. For
46 instance, there is now robust international evidence that sexual minority youth are at an elevated
47 risk of depressive symptoms or depressive disorder⁽⁶⁾, with risk particularly elevated among females
48 as compared with males⁽⁶⁾. The population-based studies of gender diverse adults and young people
49 published to date have also consistently documented a high prevalence of adverse health
50 outcomes⁽⁷⁾. From a theoretical standpoint, Meyer's minority stress model has been widely cited to
51 explain the high rates of health issues experienced by SGM individuals⁽⁸⁾. According to the model,
52 the mistreatment and resulting distress that LGBT people experience increase their risk for a range
53 of negative health outcomes^(9; 10; 11).

54 *Body size and weight, and the nutrition and activity behaviors of LGBT youth*

55 One area of disparity in health that has had relatively little investigation concerns body size, weight,
56 nutrition, and physical activity for LGBT young people. A systematic review of research (to July
57 2017) exploring weight control behaviors, eating habits, body mass index (BMI), and physical
58 activity amongst sexual minority youth⁽¹²⁾ highlighted that little research in the field has been
59 conducted outside of the USA, and that only one cited study included transgender individuals⁽¹³⁾.
60 Also apparent were several key differences or variations between male and female sexual minority
61 youth⁽¹²⁾. For example, the majority of studies (15 out of 17) reported no differences in BMI
62 between sexual minority and heterosexual males⁽¹²⁾, whereas, in line with earlier work focused on
63 adults, sexual minority females were shown to be at greater risk of being overweight or obese than
64 heterosexual females^(11; 12; 14).

65 Body size and weight are affected by a young person's diet, but the few studies that have explored
66 differences in dietary intake by sexual orientation have primarily assessed fruit and vegetable
67 consumption⁽¹⁵⁾. Whilst female sexual minority youth in the USA report higher BMI than their
68 heterosexual peers⁽¹¹⁾, results from the Youth Risk Behavior Survey (YRBS) highlighted that sexual
69 minority youth as a group were more likely to meet recommendations for fruits and vegetables
70 compared with heterosexual youth⁽¹⁶⁾. This finding may reflect that, irrespective of sexuality, very
71 few students in this study (<7%) actually consumed '5+ fruits & vegetables' daily⁽¹⁶⁾. Another study
72 from the USA⁽¹⁷⁾ found no significant differences in fruit and vegetable consumption between
73 lesbian, bisexual and sexuality-questioning female college students and their heterosexual peers,
74 whilst noting that sexual minority students were significantly heavier. This may be explained in part
75 by the fast food consumption behaviors of sexual minority youth, another understudied area.
76 Indeed, one large longitudinal US study found that female sexual minority youth consumed
77 significantly *more* fast food than heterosexual females, whilst male sexual minority youth
78 consumed significantly *less* fast food than heterosexual males⁽¹⁸⁾. Another factor that may influence
79 the nutrition of LGBT young people is participation in family meals. Generally speaking, young
80 people who eat with their family five or more times per week are likely to consume more fruit and
81 vegetables and have better eating habits than those who do not^(19; 20). Research indicates that SGM
82 youth are less likely to get along with their family^(21; 22), which could reduce the likelihood of shared
83 family meals.

84 BMI is also affected by physical activity and other weight control behaviors, and the BMI
85 differences noted in relation to SGM young people may reflect disparities in such behaviors. For
86 instance, sexual minority young people report less physical activity and sporting engagement^(12; 23)
87 than heterosexual controls. Results from a study of over 12,000 12–22-year-olds (the Growing Up
88 Today Study [GUTS]) indicated that sexual minority participants were significantly less likely to
89 engage in physical activity and participate in team sports than heterosexual youth⁽²³⁾. Some young
90 people also engage in unhealthy methods of weight control, including restrictive dieting, purging
91 and using diet pills^(10; 12). The large-scale YRBS in the USA indicated an elevated risk of unhealthy
92 weight control behaviors amongst male and female sexual minority youth, relative to their
93 heterosexual peers⁽¹⁰⁾. However, a gender pattern has emerged across studies in this area. Whereas
94 sexual minority males show a consistently elevated risk of unhealthy weight control methods in
95 comparison with heterosexual males, there is a less consistent pattern of differences in these
96 behaviors between sexual minority and heterosexual females⁽¹²⁾.

97

98

99 *Developmental factors and LGBT youth*

100 Research exploring the challenges relevant to the health of LGBT youth is needed, as studies
101 conducted among LGBT adults cannot always be generalized. As such, it is important to consider
102 how sexual orientation and gender identity are defined, since this requires an appreciation of several
103 factors, including developmental considerations. In relation to sexuality, most high school students
104 in a range of Western countries report that they have not had sexual intercourse⁽²⁴⁾; in New Zealand
105 (NZ), fewer than one-quarter of high school students reported ever having had sex⁽²⁵⁾. It is therefore
106 unsuitable to use sexual behavior as the main means of determining an adolescent's sexual
107 orientation. After reviewing school-based health surveys, Saewyc and colleagues instead suggested
108 that, if a health and wellbeing survey could only include one item about sexuality, this should ask
109 about sexual attraction⁽²⁶⁾. Contrary to this recommendation, those researching LGBT young
110 people's weight control behaviors, eating habits, BMI or physical activity have not routinely used
111 sexual attraction as a measure in studies that included a heterosexual referent group. Instead, they
112 have often used sexual identity and/or sexual behavior to determine sexuality^(10; 27; 28; 29; 30). Despite
113 this lack of consistency in defining sexuality, comparisons across studies remain possible as,
114 irrespective of how sexuality is established, same-sex attraction and sexual attraction to more than
115 one gender is highly correlated with sexual behavior that is not exclusively heterosexual and self-
116 identification as LGB⁽³¹⁾. To date, transgender and other gender minority individuals (i.e. those
117 youth whose gender identity and natal sex differ and those that do not identify with a male/female
118 binary) are largely excluded from population-based surveys. For example, in their 2016 review of
119 the health burden and needs of transgender populations internationally for a special issue of *The*
120 *Lancet*, Reisner and colleagues noted "...a dearth of research about transgender children,
121 adolescents, and young people"^(7, p. 422). Encouragingly, the period following publication of this
122 review has seen a rapid increase in population-based studies of gender diverse young people,
123 especially amongst research from North America in the field of mental health^(32; 33; 34; 35).

124 *The current study*

125 In order to move towards health equality for SGM young people robust data are needed. Whilst
126 aspects of inequalities between LGBT and heterosexual cisgender individuals are well-documented
127 in the international literature, far less is known about such inequalities in NZ⁽³⁶⁾. A 2017 review of
128 research on LGBT health in NZ concluded that the focus has largely been on gay men's sexual
129 health, primarily in relation to HIV⁽³⁶⁾ – this is understandable given the sizeable challenges that
130 remain around HIV prevention and ensuring timely HIV diagnoses in NZ⁽³⁷⁾. Furthermore there has
131 been no population-based research conducted in Australasia to explore the weight control
132 behaviors, eating habits, BMI and the physical activity levels of LGBT youth compared with those

133 of their heterosexual cisgender peers⁽¹²⁾. Additionally, prior population-based research in this area
134 has not included gender minority youth under 18 years of age. To the best of our knowledge, only
135 two studies have included gender diverse young people, but this has been for research conducted
136 with college-aged students in the USA^(13; 38). Given the lack of local and gender-diverse-inclusive
137 research in this field, the aim of the current study was to determine, using robust, nationally
138 representative data, whether SGM secondary school students in NZ differ in regard to body size and
139 weight, nutrition and activity behaviors by sex compared to heterosexual cisgender students. We
140 studied a range of salient factors selected for their potential synergistic effects and their role as risk
141 factors for chronic health issues⁽³⁹⁾, such as BMI, because NZ has persistently high rates of
142 adolescents being overweight and obese⁽⁴⁰⁾. We investigated differences in outcomes between male
143 and female students, as prior work conducted with young people generally in NZ⁽⁴¹⁾ and
144 internationally has highlighted considerable sex variations in a range of these phenomena. We also
145 compared male and female SGM students, as a systematic review and meta-analysis in the field of
146 LGBT youth mental health has previously highlighted significant differences⁽⁶⁾. We hypothesized
147 that SGM students in NZ would have higher odds of adverse health outcomes than heterosexual
148 cisgender youth, in line with the almost exclusively USA-based research on these topics to date.

149 **Methods**

150 Youth'12 is a cross-sectional, self-administered questionnaire, conducted with a representative
151 sample of NZ secondary school students in 2012. In total, 125 schools were randomly selected to
152 participate. Of these, 91 schools (73%) took part and 8,500 students (68%) participated. The
153 University of Auckland Human Participants Ethics Committee granted ethical approval for the
154 study (ref 2011/206). Students completed the survey at school using multimedia, computer-assisted
155 self-interviewing technology on internet tablets⁽⁴²⁾. Questions were presented in English and te reo
156 Māori (the indigenous language of NZ) text, which was read out loud via a voice-over (students
157 could only hear the voice-over for their own survey on individualized headphones). To ensure
158 students' privacy, the survey was administered in locations such as their school hall or gymnasium,
159 seating was arranged to ensure sufficient distance between students, and no school staff were
160 present. Detailed descriptions of the survey methods are available elsewhere⁽²⁴⁾ (see also
161 <http://www.fmhs.auckland.ac.nz/faculty/ahrg/>).

162 **Measures**

163 *Demographic information:* At the beginning of the survey, participants were asked “What sex are
164 you?” (with the response options of “male” or “female” only) and their age in years. The number of
165 SGM participants by age group (e.g. 13 or younger, 14, 15, 16 and 17 or older) was small, therefore

166 age was categorized as above or below 16 years of age (in NZ students can leave school from the
167 age of 16). Students indicated their ethnic group(s) using the NZ Census standard 2001/2006
168 ethnicity questions⁽⁴³⁾. Those who chose more than one ethnicity were assigned a single ethnic
169 group, based on the Statistics NZ ethnicity prioritization method⁽⁴⁴⁾. Hence, for data analyses,
170 ethnicity was grouped as European, Māori, Pacific, Asian, and “Other” ethnicity. Socioeconomic
171 deprivation was measured using the NZ Deprivation Index (NZDep2006)⁽⁴⁵⁾ for the census area unit
172 in which the student lived. NZDep2006 combines eight dimensions of deprivation derived from the
173 NZ Census⁽⁴⁵⁾. For data analyses, students were grouped into one of three deprivation bands
174 indicating low (NZ Census deprivation deciles 1–3), medium (deciles 4–7), and high (deciles 8–10)
175 levels of deprivation.

176 Sexuality was determined by the question “Who are you sexually attracted to?” (response options:
177 “the opposite sex”, “the same sex”, “both sexes”, “I’m not sure”, “neither” and “I don’t understand
178 this question”). Whether a student was transgender was determined by the question “Do you think
179 you are transgender? This is a girl who feels like she should have been a boy, or a boy who feels
180 like he should have been a girl (e.g., Trans, Queen, Fa’afafine, Whakawahine, Tangata ira Tane,
181 Genderqueer)?” (response options: “yes”, “no”, “not sure” and “I don’t understand this question”).
182 Students were categorized as heterosexual cisgender if they reported being sexually attracted to the
183 opposite sex and that they were not transgender. Students were categorized as SGM youth if they
184 were sexually attracted to the same sex, both sexes, or not sure of their sexual attraction/s or if they
185 were transgender or not sure if they were transgender. The “not sure” students were thus
186 categorized as prior research indicates that their mental health and psycho-social needs are similar
187 to those of other SGM youth^(3; 21). Students were excluded if they did not answer the sexual
188 attraction question or the question asking if they were transgender, or if they responded “I don’t
189 understand this question” to either question.

190 *Weight control, unhealthy weight control and BMI:* Students were categorized as having “Tried to
191 lose weight” if they answered “Yes” to the question “In the last 12 months have you ever tried to
192 lose weight?”. Students who had tried to lose weight were categorized as using “Unhealthy weight
193 control” if they answered “Yes” to one or more of the following weight loss strategies in the past 12
194 months: 1. “I fasted or did not eat for more than a day”, 2. “I skipped one or more meals a day”, 3.
195 “I smoked cigarettes”, 4. “I took diet pills or other pills” or 5. “I made myself vomit”. These five
196 items were used as prior research identifies them as ‘red flags’ for unhealthy weight control⁽⁴⁶⁾ and
197 there is growing concern about weight control behaviors among NZ young people⁽⁴⁰⁾. Trained
198 research staff measured each student’s height and weight individually behind privacy screens, using
199 portable digital scales and stadiometers. Students wore light clothing and no shoes. These

200 measurements were used to calculate BMI as weight (kg)/height (m) squared. BMI categories (i.e.
201 underweight, healthy weight, overweight and obese) were determined using the age- and sex-
202 specific BMI cut-offs established by Cole and Lobstein⁽⁴⁷⁾.

203 *Diet, physical activity and participation in sports teams:* Students were categorized as consuming
204 “frequent fast food and takeaways” if they reported eating from “A fast food place (e.g.
205 McDonald's, KFC, Burger King, Subway, Pizza Hut)” or “Other takeaways or fast-food shops (e.g.
206 fish and chips, Chinese takeaways) [typically corner-shop low-cost and high-fat establishments in
207 NZ]” more than four times per week. Fruit and vegetable consumption was assessed by a series of
208 questions about the frequency of consumption of “fruit”, “potatoes, kumara [indigenous sweet
209 potatoes], taro [a tropical root vegetable], etc.,” and “vegetables (not including potatoes, kumara,
210 taro)”. Students were categorized as meeting the recommendation for “5+ fruits & vegetables” per
211 day if they reported consuming, as recommended by the NZ Ministry of Health⁽⁴⁸⁾, fruit twice a day
212 or more often, and vegetables or potatoes, kumara, or taro three times a day or more often. They
213 were categorized as eating “Family meals together” if they responded “five or more times” to the
214 question “During the past 7 days, how many times did all, or most, of your family living in your
215 house eat a meal together?”. Physical activity levels, including daily physical activity and also
216 whether a student was physically inactive, was assessed with a single question: “During the past 7
217 days, on how many days were you physically active for a total of at least 60 minutes per day? (add
218 up all the time you spend in any kind of physical activity that increases your heart rate and makes
219 you breathe hard some of the time)”, with responses ranging from 0 to 7 days. Students who
220 responded “7 days” were categorized as engaging in “daily physical activity”; those who responded
221 “0 days” were categorized as “physically inactive”. “Participation in a school sports team” was
222 defined as an affirmative response to the question “Do you belong to any school sports teams?”

223 *Sample*

224 Overall, 8,500 students participated in Youth’12, with more female than male participants (due to
225 more single-sex female schools than single-sex male schools taking part). Students were excluded
226 from the current study (n=731) if they: did not answer the question “What sex are you?” (n=3); did
227 not understand the sexual attraction question (n=178); did not understand the question asking if they
228 were transgender (n=137); or did not respond to either of these questions (i.e. the remainder).
229 Therefore, the total sample for the current study was 7,769 students.

230 *Analyses*

231 Students were recruited using a two-stage clustered sample design, with unequal probabilities of
232 selection. In all analyses the data were, therefore, weighted by the inverse probability of selection,

233 and the variance of estimates was adjusted to allow for correlated data from the same schools. The
234 χ^2 test was used to test differences between SGM students and heterosexual cisgender students on
235 three categorical variables: age category (≤ 15 and ≥ 16 years), ethnicity group, and level of
236 deprivation (based on NZDep2006). Results were categorized by sex as there are considerable
237 differences in weight control behaviors, BMI, eating habits, and physical activity levels between
238 male and female youth. Total numbers and weighted percentages were calculated for the selected
239 outcomes, which were all determined a priori. Adjusted multiple logistic regression models were
240 used to investigate the associations for male and female SGM students in comparison with male and
241 female heterosexual cisgender students for the selected outcomes. Male and female SGM students
242 were also compared using adjusted multiple logistic regression models. Possible confounders were
243 included in the adjusted models, as prior work has reinforced key differences for youth, particularly
244 in terms of BMI, ethnicity and levels of deprivation⁽⁴⁹⁾. Hence, for “Tried to lose weight” and
245 “Unhealthy weight control”, age, ethnicity, socio-economic deprivation and BMI were included in
246 the adjusted models. For all other outcomes, age, ethnicity and socio-economic deprivation were
247 included. All analyses were carried out using Stata (Version 14).

248 **Results**

249 In total, 91.0% of students were heterosexual cisgender (n=7069) and 9.0% were SGM students
250 (n=700). SGM students were older ($p=0.011$), less likely to be NZ European ($p<0.001$), and more
251 likely to experience high levels of socio-economic deprivation ($p<0.001$) than their heterosexual
252 cisgender peers. Of the SGM students, 318 (4.1% of the overall total and 45.4% of the minority
253 students) were either not sure of their sexual attractions or not sure whether or not they were
254 transgender (see Table 1).

255 *Insert Table 1 around here*

256 Table 2 provides the numbers and weighted percentages, as well as the adjusted odds ratios (with
257 95% confidence intervals), for the selected outcomes, comparing SGM males with heterosexual
258 cisgender males. Over half of the SGM male participants had tried to lose weight, of which
259 approximately a third had engaged in unhealthy weight control behaviors. Numbers were small (i.e.
260 <50) for several variables. SGM male students were significantly more likely to have tried to lose
261 weight, have engaged in unhealthy weight control, have frequently consumed fast food and
262 takeaways, and be physically inactive, in comparison with heterosexual cisgender male students.
263 They were also significantly less likely to have participated in a school sports team. There were no
264 significant differences between SGM males and heterosexual cisgender males in terms of BMI, 5+
265 fruit and vegetable consumption, family meals together and daily physical activity.

266

Insert Table 2 around here

267 Table 3 compares the body size and weight, nutrition and activity behaviors of SGM females with
268 those of heterosexual cisgender females. Again, numbers were small (i.e. <50) for some variables.
269 Almost half of the SGM female participants were overweight or obese, and, of the SGM females
270 who had tried to lose weight, over half had engaged in unhealthy weight control behaviors. SGM
271 female students were significantly more likely to have engaged in unhealthy weight control, be
272 overweight or obese, and have frequently consumed fast food, in comparison with their
273 heterosexual cisgender female peers. They were also significantly less likely to participate in a
274 school sports team. There were no significant differences between SGM females and heterosexual
275 cisgender females in relation to trying to lose weight, 5+ fruit and vegetable consumption, family
276 meals together, daily physical activity and physical inactivity.

277

Insert Table 3 around here

278 Comparing male and female SGM students highlighted a general trend, such that females
279 experience higher odds of health and wellbeing issues. Female SGM students were significantly
280 more likely to have tried to lose weight, and to have engaged in unhealthy weight control, relative
281 to their male counterparts. They were also less likely to have eaten 5+ fruit and vegetables per day
282 and to have engaged in daily physical activity. Sexual minority males were more likely to have
283 frequently consumed fast food and takeaways than sexual minority females (see Table 4).

284

Insert Table 4 around here

285 **Discussion**

286 *Principal results*

287 SGM youth in this nationally representative sample from NZ have higher odds of adverse health
288 outcomes related to weight control behaviors, poor diet, and lower levels of physical activity than
289 other students. When male and female SGM students were compared to their heterosexual cisgender
290 peers, they were significantly more likely to engage in unhealthy weight control and frequently
291 consume fast food and takeaways. They were also significantly less likely to participate in school
292 sports teams.

293 *Comparisons to prior international research*

294 The results of this study align with the findings of prior research in two key ways. First, in line with
295 most earlier studies, our study indicates that there were no significant differences in BMI between
296 young SGM and heterosexual cisgender males in NZ⁽¹²⁾, whereas young female SGM individuals

297 were at greater odds of being overweight or obese than their heterosexual cisgender peers, again in
298 line with previous work^(11; 12; 14). Second, in line with GUTS, the current results indicate that SGM
299 participants were significantly less likely to engage in school sports teams than heterosexual
300 cisgender youth⁽²³⁾. In the current study there were no differences in fruit and vegetable
301 consumption, which is consistent with findings from research conducted with university students in
302 the USA⁽¹⁷⁾, but contrasts with results from the YRBS that suggest that sexual minority students are
303 more likely to meet recommendations for fruit and vegetable consumption⁽¹⁶⁾. The latter
304 discrepancy likely reflects differences in measuring fruit and vegetable consumption between the
305 two studies from the USA.

306 Although little has been published in relation to fast food consumption for SGM youth, the current
307 results differ to those from GUTS⁽¹⁸⁾, as both male and female SGM youth were *more* likely to
308 consume fast food than their heterosexual peers. SGM males were also significantly more likely to
309 consume fast food than SGM females. These findings highlight a need for future work to explore
310 targeted interventions to reduce fast food consumption by SGM young people, especially males.

311 In relation to weight control behaviors, earlier research indicates that sexual minority males appear
312 to be at considerable risk of disordered eating behaviors, with the results for comparable females
313 less clear⁽¹²⁾. While our findings indicate that SGM males are more likely to engage in unhealthy
314 weight control behaviors, they show that SGM females are also more likely to engage in these
315 behaviors compared with other females, and compared with SGM males.

316 ***Implications***

317 Minority stress theory is useful in understanding the health issues reported in this study. For
318 instance, stress-related coping behaviors can include consoling dietary behaviors and certain
319 sedentary activities⁽¹¹⁾, which may lead to weight gain and obesity. There is some support for the
320 minority stress theory in our data, given the increased challenges reported by SGM students. For
321 example, it has been hypothesized that female SGM individuals may be more likely to be
322 overweight than their male counterparts because of gender differences in managing minority-related
323 stress. Specifically, females are thought to be more likely than males to adopt specific coping
324 behaviors linked with weight gain (e.g. disinhibited eating)⁽¹¹⁾.

325 There are a range of compelling socio-cultural factors that may also help to explain the current
326 findings. Numerous studies suggest that gendered cultural standards have a powerful effect on
327 weight- and shape-related health indicators⁽⁵⁰⁾. Although SGM individuals are frequently gender-
328 role non-conforming⁽⁵⁰⁾, the strong cultural forces linked to masculinity and femininity can help to
329 explain certain patterns when SGM people are compared with heterosexual cisgender people. For

330 instance, the findings from the current study do not appear to support the assumption that SGM
331 youth assigned female sex at birth are unaffected by the powerful social discourses surrounding
332 how girls should look, even if they are gender diverse. Equally, although some SGM youth assigned
333 male sex at birth may identify as girls and women, the results suggest that their early socialization,
334 in which they were ostensibly treated as boys, may have been protective against some of the
335 problematic discourses surrounding the weight and size of girls' and women's bodies. These
336 findings suggest that efforts to address harmful expectations around appearance must include a
337 focus on children.

338 Relatedly, some unhealthy weight control amongst SGM males may be a result of these males
339 attempting to meet certain socio-cultural ideals of attractiveness. For example, in a study with
340 adults, gay men were more likely to idealize a thinner body shape than heterosexual men⁽⁵¹⁾. The
341 pressure to meet this ideal may mean that young sexual minority males are more likely to employ
342 body management practices, including those that are unhealthy, that result in a lower BMI.
343 Youth'12 data currently do not allow for a full exploration of problematic body management
344 practices outside of BMI (e.g., compulsive exercising for weight gain or muscle bulking) related to
345 meeting the masculine ideal to be muscular. However, prior work suggests that male sexual
346 minority individuals can over-conform to cultural norms in an attempt to become more physically
347 powerful and muscular, and thus 'fit in' within cis-heteronormative society⁽⁵²⁾. Hence, public health
348 nutritionists will need to consider that weight control issues may manifest in various ways among
349 SGM males.

350 Ironically, because SGM females are expected to be non-conforming in relation to their gender,
351 athletic ability is often considered to be a stereotypical trait, particularly for lesbians^(53; 54).
352 However, the current results indicate that female SGM students were less likely to participate in a
353 school sports team. This lack of sports involvement may be a result of SGM females actively
354 avoiding sports as a means of staying 'closeted'⁽²³⁾, and because team sports are frequently an
355 unwelcoming context for "...socializing and reinforcing homophobia [and presumably biphobia and
356 transphobia] due to Western cultural expectations related to athleticism, gender norms, and sexual
357 orientation" (p. 2)⁽²³⁾. The current results also support prior international findings that male SGM
358 students systematically report lower engagement in school sporting activities⁽²³⁾.

359 Physical activity is important for all youth as adolescence is a crucial life stage for establishing
360 health-promoting behaviors that contribute to current and future well-being. However, evidence
361 suggests that adolescence is a time of substantial declines in physical activity, and that physical
362 activity and inactivity track from adolescence to adulthood⁽⁵⁵⁾. Mitigating declines in activity is
363 important for this age group overall and for SGM youth in particular, due to greater demonstrated

364 need. Addressing these issues during adolescence represents a life-stage-dependent opportunity for
365 substantial gains in individuals' current and future health. Public health nutritionists and other
366 professionals should strive toward making team sports environments more supportive of SGM
367 students, for example by helping to establish non-gendered sports teams, providing uniforms that
368 are inclusive of SGM youth, and ensuring that changing room environments are safe for all.

369 *Strengths and limitations*

370 The current study has several strengths. First, data are drawn from a large nationally representative
371 sample of NZ secondary school students, including SGM youth. This is in contrast to convenience-
372 based studies, in which samples are recruited on the basis of sexuality or gender identity. Second,
373 Youth'12 was subject to extensive pilot and field testing before the survey was conducted. Third,
374 student BMI was measured objectively, rather than by self-reported height and weight.

375 Limitations must also be considered. First, self-report was used for all items other than BMI,
376 introducing the potential for bias. Second, the small numbers of SGM students endorsing some
377 outcomes (e.g. being underweight and daily physical activity) resulted in a risk of a type 2 error (i.e.
378 we may have been under-powered to detect some differences). Third, because students could select
379 their sex as only male or female for the item "What sex are you?" and the question about whether a
380 student was transgender was a separate item we cannot, therefore, be sure how gender minority
381 students interpreted these questions. Did they respond to the first question based on their natal sex
382 (i.e. sex assigned at birth)? Or based on their gender identity at the time of the survey? Thus, there
383 is a chance that some gender minority students reported their assigned sex as their current gender
384 identity. Moreover, many gender minority youth have a gender identity outside the male/female
385 binary. The item designed to capture sexual attractions has similar limitations. For example, a
386 transgender student whose natal sex was female, gender identity is male, and is attracted to males,
387 may state an attraction to the same sex. Although we surveyed students about whether they were
388 transgender, we did not ask participants whether or not they were intersex (i.e. born with variations
389 in sex characteristics that do not fit the typical definitions for male or female bodies). Despite these
390 challenges, our data demonstrate robust differences that would most likely be strengthened by the
391 use of more definitive items on sex, gender and sexual identity.

392 **Conclusion**

393 To the best of our knowledge there have been no prior published nationally representative studies of
394 SGM youth outside of the United States in relation to BMI, weight control behaviors, nutrition and
395 activity levels. In NZ, compared with their peers, SGM students have higher odds of adverse health
396 outcomes related to weight control behaviors, a poor diet, and low levels of physical activity.

397 Female SGM students appear to have particularly high needs. Health professionals, including public
398 health nutritionists, must recognize and help work towards addressing the challenges facing sexual
399 and gender minorities.

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Table 1. Demographics of male and female students (sexual & gender minority students compared to heterosexual cisgender students)

	Males		Females	
	Sexual & Gender Minority n (%)	Heterosexual & Cisgender n (%)	Sexual & Gender Minority n (%)	Heterosexual & Cisgender n (%)
Total	266	3,239	434	3,830
Age				
≤15	165 (62.0%)	2,108 (65.0%)	255 (58.6%)	2,423 (63.4%)
≥16	99 (38.0%)	1,129 (35.0%)	179 (41.4%)	1,402 (36.6%)
Ethnicity				
European	108 (41.1%)	1,584 (48.9%)	175 (40.2%)	1,975 (51.5%)
Māori	58 (21.5%)	656 (20.4%)	80 (18.4%)	744 (19.4%)
Pacific	56 (21.4%)	368 (11.5%)	73 (16.9%)	500 (13.2%)
Asian	30 (11.5%)	422 (13.1%)	72 (16.8%)	389 (10.2%)
Other	12 (4.5%)	202 (6.2%)	34 (7.7%)	221 (5.8%)
NZDep2006				
Low	67 (26.4%)	1,055 (33.2%)	137 (32.1%)	1,338 (35.3%)
Medium	83 (32.0%)	1,219 (38.1%)	116 (26.8%)	1,375 (36.3%)
High	109 (41.6%)	924 (28.8%)	176 (41.1%)	1,088 (28.5%)

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n are unweighted while % are weighted

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Table 2. Associations between body size and weight, nutrition and activity behaviors, comparing male sexual & gender minority students with male heterosexual cisgender students

	Sexual & Gender Minority Males	Heterosexual & Cisgender Males
Tried to lose weight n (%)	150 (56.8%)	1,298 (40.4%)
<i>aOR (95% CI)†</i>	<i>1.95*** (1.47-2.59)</i>	<i>Ref</i>
Unhealthy weight control (of those students who had tried to lose weight) n (%)	53 (36.5%)	275 (21.2%)
<i>aOR (95% CI)†</i>	<i>2.17*** (1.48-3.19)</i>	<i>Ref</i>
BMI		
Underweight n (%)	12 (4.6%)	101 (3.1%)
Healthy weight n (%)	136 (51.6%)	2,041 (63.3%)
Overweight or obese n (%)	117 (43.8%)	1,081 (33.6%)
BMI Underweight		
<i>aOR (95% CI)‡</i>	<i>1.84 (0.99-3.42)</i>	<i>Ref</i>
BMI Overweight or obese		
<i>aOR (95% C)‡</i>	<i>1.40 (0.99-1.98)</i>	<i>Ref</i>
Frequent fast food & takeaways n (%)	60 (23.0%)	244 (7.7%)
<i>aOR (95% CI)‡</i>	<i>2.89*** (2.01-4.15)</i>	<i>Ref</i>
5+ fruit & vegetables n (%)	90 (34.0%)	906 (28.4%)
<i>aOR (95% CI)‡</i>	<i>1.25 (0.96-1.62)</i>	<i>Ref</i>
Family meals together n (%)	161 (61.4%)	2,115 (65.5%)
<i>aOR (95% CI)‡</i>	<i>0.91 (0.71-1.18)</i>	<i>Ref</i>
Daily physical activity n (%)	40 (14.8%)	425 (13.3%)
<i>aOR (95% CI)‡</i>	<i>1.18 (0.82-1.69)</i>	<i>Ref</i>
Physically inactive n (%)	50 (19.0%)	293 (9.2%)
<i>aOR (95% CI)‡</i>	<i>2.54*** (1.65-3.92)</i>	<i>Ref</i>
Participation in school sports team n (%)	129 (49.7%)	2,047 (63.8%)
<i>aOR (95% CI)‡</i>	<i>0.57*** (0.44-0.75)</i>	<i>Ref</i>

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n are unweighted while % are weighted; †aOR = adjusted Odds Ratio, adjusted for age, ethnicity, NZDep2006 & BMI; ‡ aOR = adjusted Odds Ratio, adjusted for age, ethnicity & NZDep2006; * p<0.05; ** p<0.01; ***p<0.001

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Table 3. Associations between body size and weight, nutrition and activity behaviors, comparing female sexual & gender minority students with female heterosexual cisgender students

	Sexual & Gender Minority Females	Heterosexual & Cisgender Females
Tried to lose weight n (%)	312 (72.3%)	2,642 (69.0%)
<i>aOR (95% CI)†</i>	<i>1.07 (0.82-1.40)</i>	<i>Ref</i>
Unhealthy weight control (of those students who had tried to lose weight) n (%)	161 (51.9%)	1,068 (40.6%)
<i>aOR (95% CI)†</i>	<i>1.58** (1.20-2.08)</i>	<i>Ref</i>
BMI		
Underweight n (%)	14 (3.4%)	111 (3.0%)
Healthy weight n (%)	227 (54.0%)	2,267 (60.4%)
Overweight or obese n (%)	179 (42.7%)	1,375 (36.7%)
BMI Underweight		
<i>aOR (95% CI)‡</i>	<i>1.18 (0.55-2.54)</i>	<i>Ref</i>
BMI Overweight or obese		
<i>aOR (95% C)‡</i>	<i>1.24* (1.01-1.53)</i>	<i>Ref</i>
Frequent fast food & takeaways n (%)	62 (14.6%)	246 (6.4%)
<i>aOR (95% CI)‡</i>	<i>2.19*** (1.59-3.03)</i>	<i>Ref</i>
5+ fruit & vegetables n (%)	116 (26.8%)	1,156 (30.4%)
<i>aOR (95% CI)‡</i>	<i>0.82 (0.65-1.03)</i>	<i>Ref</i>
Family meals together n (%)	238 (55.0%)	2,288 (59.8%)
<i>aOR (95% CI)‡</i>	<i>0.85 (0.70-1.04)</i>	<i>Ref</i>
Daily physical activity n (%)	23 (5.3%)	236 (6.3%)
<i>aOR (95% CI)‡</i>	<i>0.89 (0.54-1.45)</i>	<i>Ref</i>
Physically inactive n (%)	84 (19.3%)	569 (15.0%)
<i>aOR (95% CI)‡</i>	<i>1.22 (0.93-1.61)</i>	<i>Ref</i>
Participation in school sports team n (%)	185 (43.0%)	2,226 (58.3%)
<i>aOR (95% CI)‡</i>	<i>0.62*** (0.50-0.76)</i>	<i>Ref</i>

n are unweighted while % are weighted; †aOR = adjusted Odds Ratio, adjusted for age, ethnicity, NZDep2006 & BMI; ‡aOR = adjusted Odds Ratio, adjusted for age, ethnicity & NZDep2006; * p<0.05; ** p<0.01; ***p<0.001

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Table 4. Associations between body size and weight, nutrition and activity behaviors, comparing male and female sexual & gender minority students

	Sexual & Gender Minority Males	Sexual & Gender Minority Females
Tried to lose weight		
<i>aOR (95% CI)†</i>	<i>Ref</i>	<i>1.99** (1.36-2.93)</i>
Unhealthy weight control (of those students who had tried to lose weight)		
<i>aOR (95% CI)†</i>	<i>Ref</i>	<i>1.85** (1.25-2.73)</i>
BMI		
BMI Underweight		
<i>aOR (95% CI)‡</i>	<i>Ref</i>	<i>0.66 (0.25-1.76)</i>
BMI Overweight or obese		
<i>aOR (95% C)‡</i>	<i>Ref</i>	<i>1.02 (0.70-1.50)</i>
Frequent fast food & takeaways		
<i>aOR (95% CI)‡</i>	<i>Ref</i>	<i>0.62*(0.40-0.96)</i>
5+ fruit & vegetables		
<i>aOR (95% CI)‡</i>	<i>Ref</i>	<i>0.70* (0.51-0.96)</i>
Family meals together		
<i>aOR (95% CI)‡</i>	<i>Ref</i>	<i>0.76 (0.56-1.02)</i>
Daily physical activity		
<i>aOR (95% CI)‡</i>	<i>Ref</i>	<i>0.33*** (0.19-0.57)</i>
Physically inactive		
<i>aOR (95% CI)‡</i>	<i>Ref</i>	<i>0.95 (0.58-1.54)</i>
Participation in school sports team		
<i>aOR (95% CI)‡</i>	<i>Ref</i>	<i>0.80 (0.55-1.17)</i>

n are unweighted while % are weighted; †aOR = adjusted Odds Ratio, adjusted for age, ethnicity, NZDep2006 & BMI; ‡aOR = adjusted Odds Ratio, adjusted for age, ethnicity & NZDep2006; * p<0.05; ** p<0.01; ***p<0.001

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