

Climate anxiety is associated with self-efficacy and behavioural engagement amongst adolescents: a cross sectional analysis

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Abstract

Background

Adolescents are increasingly aware of the threats of climate change and encouraged to take part in environmental actions. However, the current understanding of climate anxiety among adolescents is sparse. This study establishes the characteristics of adolescents who experience functional impairments induced by climate anxiety and who adopt pro-environment behaviours. It also characterizes the association between climate anxiety, feelings of self-efficacy and environmental actions.

Methods

2 379) from 113 schools in Quebec answered questions about climate anxiety, self-efficacy, behavioural engagement and several indicators of wellbeing. Data were analysed using poisson regressions adjusted for potential confounders (age, gender, school type, material deprivation, etc).

Results

More than one in ten adolescents (11%) reported that thinking about climate change makes it difficult to sleep or interferes with their ability to get work or assignments done. Only 35% of adolescents believed that they can do something to address the problem and 44% tried to reduce their behaviors that contribute to climate change. Adolescents who are boys and who are less anxious were less preoccupied and involved in the fight against climate change. Teenagers from less affluent families were more concerned, but not more engaged. Those with a good relationship with their family and strong school connectedness were both less concerned and more involved in the fight against climate change. Adolescents who felt they can do something about climate change were more likely to try to reduce behaviors that contribute to climate change.

Conclusion

The findings are useful to identify and support vulnerable groups that are more likely to experience functional impairments due to climate anxiety. The feeling of climate self-efficacy was not well developed among some groups of adolescents. Improving the youth's beliefs in their capacity to help address the climate change may be a key strategy to promote pro-environmental actions. As the threat of climate change increases, it will be important to follow the evolution of climate anxiety and engagement amongst adolescents.

Introduction

Adolescents are increasingly aware of the effects of climate change, conveyed through the news, social media and awareness campaigns. Rising global movements such as Fridays for the Future are mobilising adolescents to be political agents and prompt public actions in the fight against climate change. Environmental policies will have long-term impacts on their quality of life and livelihoods (1).

Research suggests that the threats of climate change, increased pressure to act and collective inaction can lead to anxiety and distress, even among people who have not personally experienced its direct impacts (2). Terms used to describe this phenomenon include eco anxiety, eco distress and climate anxiety (2, 3). The Royal College of Psychiatrists (4) adopted the term eco distress defined as “the wide range of emotions and thoughts young people may experience when they hear bad news about our planet and the environment”. Eco distress or climate anxiety are not considered to be a diagnosis or mental illness, but can affect mental health overtime (4). While this state can stimulate adaptive responses (for example, reducing one’s carbon footprint), it has the potential to cause functional impairment (2). For example, it can lead to changes in sleep patterns, motivation, energy to do things, ability to concentrate on homework or reading (5).

There is a consensus in the literature that the current understanding climate anxiety in children and adolescents is sparse, but some empirical evidence is beginning to emerge (2, 6). Hickman et al. (6) conducted a study on young people (aged 16–25 years) in ten countries (Australia, Brazil, Finland, France, India, Nigeria, Philippines, Portugal, the UK, and the USA). 59% of respondents were very or extremely worried and 84% were at least moderately worried. Climate anxiety and distress were correlated with perceived inadequate government response and associated with feelings of betrayal. To date, however, little is known about the psychological traits and markers of well-being that are associated to climate anxiety, although some evidence suggests that those with more general anxiety are more affected (1, 2, 7, 8).

Since 2020, the sanitary crisis stemming from COVID-19 tremendously affected the lives and wellbeing of adolescents. The proportion of moderately or severely anxious youth anxiety has increased (9). Sanitary measures such as confinement and online classes appears to have increased screen time among adolescents (10). The increase in environmental concerns in the media combined with changes in anxiety and screen use during the sanitary crisis may have contributed to eco-anxiety among youth.

According to Clayton (11), climate anxiety could serve as a source of motivation to encourage behavioral engagement with the issue of climate change. Alternatively, climate anxiety could serve as a source of eco-paralysis that inhibits people from taking effective action. The connection from perceived threat to climate action may be influenced by one’s assessments of their ability to cope with the threat, which could be described as climate self-efficacy (11). It is not clear whether adolescents currently believe that they can do something to address climate change and whether they can leverage it into environmental actions (12).

This study aims: 1) to establish the characteristics of adolescents who have impairments induced by climate anxiety and who adopt pro-environment behaviours, 2) to identify markers of well-being of

adolescents with climate anxiety and those who are involved in the fight against climate change, and 3) to characterize the association between the climate anxiety, feeling of self-efficacy and environmental actions.

Methods

Survey design and study population

The present study is based on data collected as part of the COMPASS longitudinal study (<https://uwaterloo.ca/compass-system/>). COMPASS is a multicentre study of adolescent health in Canada. Each year, youth in participating high schools are asked to complete a questionnaire about their lifestyle and behaviors. In the province of Quebec, school surveys have been conducted since the spring of 2017, in partnership with the school communities and the regional public health departments. Since 2020, the data collection is conducted online using Qualtrics XM (Seattle, WA, USA).

The current analysis is based on data collected between March and May 2022. The study population includes all students in the 5 years of the high school level (equivalent to Grades 7 to 11 in the USA and the rest of Canada) of 113 secondary schools in the province of Quebec, all localized in its eastern part. Of the 58 792 adolescents who were solicited, 48 289 (82.1%) answered the online questionnaire. Active parents' refusal rate was less than 0.56% (327 participants).

Measures

Measures of climate change anxiety were self-reported and taken from Clayton and Karazsia (Clayton & Karazsia, 2020; Mouguiama-Daouda et al., 2022). Two questions addressed youth concerns. The first question assessed cognitive-emotional impairment related to climate change. Using a 5-point scale, participants reported how often thinking about climate change makes it difficult for them to sleep. The second question was a measure of functional impairment. Using the same scale, participants reported the extent to which their concerns about climate change undermine their ability to work their potential. An indicator variable was constructed to combine the youth who responded sometimes, often, or almost always to either one of the two questions. These adolescents were considered to have more climate anxiety than those who never or rarely had these impairments. Two other questions dealt with behavioral engagement. One asked people how often they try to reduce their behaviors that contribute to climate change; the other asked how often they believe they can do something to help address the problem of climate change. The latter served as a measure of psychosocial self-efficacy which refers to one's perceived ability to engage in various situation-specific self-management tasks (13).

We identified adolescent characteristics and environmental factors that could influence climate anxiety based on the literature. Adolescent characteristics included age and gender. Because of the difficulties that youth have in reporting family income, we created a score of family affluence, inspired by the Family's Affluence Scale (14). The score was based on the adolescents' responses regarding 1) the

average amount of money the adolescents receive each week for personal spendings or savings; 2) skipping breakfast because there is nothing to eat at home; 3) going to bed hungry at night because there is not enough money to buy food; 4) having the feeling that their family and themselves are less financially comfortable than the average student in their class; 5) having their own bedroom; 6) the number of people in their household; and 7) being worried about their family being able to pay bills and expenses. Composite scores were dichotomized into more or less affluent. Adolescents from the last two quintiles were considered to be less affluent.

We included 4 measures of well-being; (i) the presence of moderate or severe anxiety; (ii) adaptation to the pandemic; (iii) school connectedness; and (iv) being able to talk about their problems with family.

Anxiety symptoms were measured using the 7-item Generalized Anxiety Disorder scale (15). Students were asked how often they experienced each symptom in the last 2 weeks. The level of anxiety is considered to be moderate to severe when the score is greater than or equal to 10 out of 21. People scoring 9 or less are considered to have low levels of anxiety.

The participants' adaptation to the pandemic was measured using a set of 5 questions to report their worries about the current circumstances; their personal health; their family members' health; and their stress level (16). Composite scores were dichotomized into less well adapted vs better adapted.

School connectedness reflects the youth's sense of closeness to people at school and attachment school environment. It was collected by utilizing a modified version of the National Longitudinal Study of Adolescent Health School Connectedness scale (17, 18). The items within this scale attempt to tap into global school connectedness by capturing the belonging, liking/enjoyment, closeness, fair treatment, and safety felt by the child (19). Composite scores were dichotomized into strong school connectedness vs weak school connectedness.

Participants used a 5-point Likert scale to rate the extent to which they can talk about their problems with their family. Respondents were divided into two groups: those who somewhat agreed versus those who somewhat disagreed or were neutral.

School characteristics included the type of school attended (public vs private), and the location (urban vs rural).

Statistical Analyses

This study is based on a cross-sectional design. Descriptive statistics were calculated using survey sampling weights. The three binary outcomes were 1) concerns about climate change that interfere with sleep or ability to work, 2) the belief that they can do something to help address the problem of climate change, and 3) trying to reduce behaviors that contribute to climate change. We performed poisson regressions to examine associations between the binary outcomes and the participants' characteristics as well as indicators of wellbeing. We used robust estimators to account for overdispersion. We also

examined associations between climate anxiety (interference with sleep or ability to work), self-efficacy (the belief that they can do something to address the problem) and behavioural engagement (trying to reduce behaviours). The poisson regressions were adjusted for potential confounders (age, gender, school type, family affluence, and location) to estimate risk ratios. Robust estimators accounted for school clustering. The margins command in Stata was used to obtain estimated proportions (20). All analyses were performed with STATA version 17.

Results

Descriptive statistics

We performed a complete case analysis based on 42 379 respondents across 113 schools of Quebec. About 5,910 cases (12.2%) were omitted from analyses due to some missing data. Variables with the most missing data included the scores for generalized anxiety (8.8%), adaptation to COVID-19 (7.5%), and school connectedness (6.5%).

Table 1 presents summary statistics for the analytic sample. About half of adolescents were female, and 14 years or less. The majority of schools were public (84%) and urban (72%). About a third of adolescents experienced moderate to severe anxiety. 60% of adolescents believed that they can talk to their family about their problems while only 48% felt more strongly connected to their school. The detailed distribution of response regarding climate anxiety and behavioral engagement is presented in the Supplementary File 1.

Eleven percent of adolescents reported that thinking about climate change makes it difficult to sleep or interferes with their ability to get work or assignments done. Approximately 44% of adolescents try to change their behaviours that contribute to climate change either sometimes, often or almost always. Just over a third of respondents (35%) believe that they can do something to help address the problem of climate change, either sometimes, often or almost always.

Table 1
Descriptive statistics of adolescents from the COMPASS
Quebec study in 2022

	Total
Variables	N(%)
Age of adolescent (years)	
14 or less	22698 (54%)
15 or more	19682 (46%)
Gender	
Male	19257 (45%)
Female	21002 (50%)
Other than male or female	2122 (5%)
Family affluence	
More affluent	26742 (63%)
Less affluent	15638 (37%)
School location	
Rural	11751 (28%)
Urban	30629 (72%)
School type	
Public	35797 (84%)
Private	6583 (16%)
Anxiety level	
Low	30329 (72%)
Moderate to severe	12051 (28%)
Degree of adaptation to the pandemic	
Better adapted	18342 (43%)
Less well adapted	24038 (57%)
Can talk to family about problems	
Disagree or neutral	16873 (40%)
Agree	25507 (60%)

	Total
School connectedness	
Weak	21856 (52%)
Strong	20524 (48%)
Difficulty sleeping	
Never or rarely	38636 (91%)
Sometimes, often or almost always	3743 (9%)
Interference with ability to work	
Never or rarely	39779 (94%)
Sometimes, often or almost always	2554 (6%)
Difficulty sleeping or interference with work	
Never or rarely	37623 (89%)
Sometimes, often or almost always	4757 (11%)
Try to change behaviors	
Never or rarely	23652 (56%)
Sometimes, often or almost always	18728 (44%)
Believe that they can do something	
Never or rarely	27511 (65%)
Sometimes, often or almost always	14869 (35%)

Environmental concerns interfering with the lives of adolescents

Table 2. shows the adjusted proportions of climate anxiety according to the adolescents' characteristics. Figure 1 illustrates that climate anxiety is not associated with the adolescents' age group, type of school, or school location. In comparison to boys, girls and those who do not identify with being either a male or a female were more likely to experience difficulty sleeping or interference with work (respectively, RR = 1.53; CI95[1.43; 1.64] and RR = 2.80; CI95[2.53; 3.09]). Those who come from less affluent families experienced more climate anxiety than others (RR = 1.49; CI95[1.40; 1.58]).

Table 2
Climate anxiety according to the adolescents' characteristics

Characteristics	Difficulty to sleep (1)	Interference with work (2)	Difficulty to sleep or interference with work (1 or 2)
Age			
14 years old or less	8.9%	6.1%	11.7%
15 years old or older	8.6%	6.1%	10.8%
Gender			
Male	6.4%	4.6%	8.4%
Female	10.0%	6.5%	12.8%
Other than male or female**	18.9%	15.4%	23.4%
Family affluence			
More affluent	7.4%	4.9%	9.5%
Less affluent	11.1%	8.0%	14.1%
School type			
Public	8.9%	6.3%	11.5%
Private	8.3%	5.1%	10.1%
School location			
Rural	8.5%	6.1%	11%
Urban	8.9%	6.1%	11.4%
Anxiety Level			
Low	6.5%	4.1%	8.5%
Moderate or severe	13.5%	10.1%	16.8%
Pandemic adaptation level			
Better adapted	5.2%	3.6%	6.8%
Less well adapted	11.2%	7.6%	14.2%
Can talk about problems with family			

Characteristics	Difficulty to sleep (1)	Interference with work (2)	Difficulty to sleep or interference with work (1 or 2)
Age			
Agree or strongly agree	8.0%	5.3%	10.3%
Disagree or neutral	9.7%	7.1%	12.5%
School connectedness			
Strong	7.5%	4.5%	9.6%
Weak	9.8%	7.3%	12.6%
* Adjusted proportions for possible confounders.			
** Respondents who reported identifying themselves as non-binary, two-spirited, describe their gender differently, or prefer not to answer.			

INSERT Fig. 1. Association between adolescents' characteristics and climate anxiety* - Adjusted Risk Ratios

*Variable combining responses to the two questions about the impact of environmental concerns (prevents sleep or interferes with work).

**Respondents who reported identifying themselves as non-binary, two-spirited, describe their gender differently, or prefer not to answer.

The relationships between climate anxiety and markers of well-being are illustrated in Fig. 2. Overall, climate anxiety interferes less in the lives of adolescents who are well-adjusted or have a good relationship with their environment. Difficulty sleeping or interference with the ability to do chores was more common among adolescents who are more anxious (RR = 1.98; CI95[1.86 ; 2.12]) or less well adapted to the pandemic (RR = 2.09; CI95[1.97; 2.22]). In contrast, the risk of climate anxiety was lower among adolescents who can talk to their family about their problems (RR = 0.82; CI95 [0.78; 0.87]) and feel more strongly connected to their school (RR = 0.76; IC95[0.71; 0.81]).

INSERT Fig. 2. Associations between climate anxiety and markers of well-being* - Adjusted risk ratios

*Variable combining responses to the two questions about the impact of environmental concerns (prevents sleep or interferes with work).

Environmental engagement

Adolescents aged 15 years and older are more likely to believe that they can contribute to reduce climate change (RR = 1.19; CI95[1.14; 1.24]) and to try to change their behaviors (RR = 1.17; CI95[1.12; 1.21]),

compared to those who are 14 years and younger (Table 3 and Fig. 3). Self-efficacy and behavior change related to climate change were more common among girls (Respectively RR = 1.23; CI95[1.20; 1.27] and RR = 1.17; CI95[1.14; 1.22]) and youth who are not male or female (RR = 1.26; CI95[1.19; 1.34] and RR = 1.22; CI95[1.15; 1.29]), compared to boys. Adolescents who attend a private school were also more likely to believe that they can contribute to the fight against climate change and to try to change (respectively RR = 1.19; CI95[1.06; 1.35] and RR = 1.15; CI95[1.02 ;1,28]) compared to adolescents who attend a public school. Attending a school in an urban area increased the chances that an adolescent tries to reduce their behaviors that contribute to climate change (RR = 1.12; CI95[1.02; 1.23]), but this was not associated with the belief that one can do something to help address the problem. Family affluence was not associated with environmental engagement.

Table 3
Self-efficacy and engagement according to the adolescents' characteristics

Characteristics	Believe they can do something to help	Try to reduce behaviours that contribute
Age		
14 years old or less	31.7%	40.2%
15 years old or older	37.7%	46.8%
Gender		
Male	30.5%	39.4%
Female	37.7%	46.3%
Not male or female**	38.6%	48.1%
Family affluence		
More affluent	34.7%	43.4%
Less affluent	33.8%	42.6%
School type		
Public	33.4%	42.2%
Private	40.0%	48.4%
School location		
Rural	32.7%	39.7%
Urban	35.1%	44.5%
Anxiety Level		
Low	33.9%	41.8%
Moderate or severe	35.8%	46.9%
Pandemic adaptation level		
Better adapted	30.0%	37.7%
Less well adapted	37.9%	47.6%
Can talk about problems with family		
Agree or strongly agree	36.2%	43.4%
Disagree or neutral	31.8%	42.8%

Characteristics	Believe they can do something to help	Try to reduce behaviours that contribute
Age		
School connectedness		
Strong	39.1%	46.1%
Weak	30.2%	40.7%
* Adjusted proportions for all other confounders.		
** Respondents who reported identifying themselves as non-binary, two-spirited, describe their gender differently, or prefer not to answer.		

INSERT Fig. 3. Characteristics associated with engagement - Adjusted risk ratios

The markers of well-being are similar between those who are trying to change and those who believe they can contribute to the fight against climate change (Fig. 4). More anxious adolescents are more likely to believe they can do something and try to change their behaviors (RR = 1.06; CI95[1.02; 1.10] and RR = 1.12; CI95[1.09; 1.16]). Feelings of self-efficacy and attempts to change their behavior are more pronounced in youth who have a stronger sense of connectedness to their school (respectively, RR = 1.30; CI95 [1.27; 1.33] and RR = 1.13; CI95 [1.11; 1.16]). Adolescents who feel that they can talk to their family about their problems were more likely to believe they could do something about it (RR = 1.14; CI95 [1.11; 1.17]) but they were not more likely to try to change their behaviors.

INSERT Fig. 4. Association between adolescents' environmental implication and markers of well-being- Adjusted risk ratios

Among adolescents with less climate anxiety, 31% believe they can do something to help address the problem of climate change and 40% are trying to reduce their behaviors that contribute to climate change (Table 4). Among those with more climate anxiety, 60% believe they can do something to help, and 71% try to reduce their behaviors. Adolescents with more climate anxiety are almost two times more likely to believe that they can do something to help (RR = 1.91; CI95 [1.82; 2.00] and to try to change their behaviors (RR = 1.78; CI95 [1.71; 1.86]).

Table 4
Association between engagement and climate anxiety

	Believe they can do something to help	Try to reduce behaviours that contribute
Adolescents with less climate anxiety	31.2%	39.7%
Adolescents with more climate anxiety	59.5%	70.8%
Risk ratios* (IC95%)	1.91 (1.82-2.00)	1.78 (1.71–1.86)
* Those who sometimes, often or almost always experience difficulty sleeping or interference with work vs those two never or rarely experience these situations		
** Adjusted for potential confounders		

Figure 5 illustrates the role of self-efficacy in the youth's attempts to reduce their behaviors that contribute to climate change. Most adolescents who believe they can help reduce climate change try to change their behaviour. Among those whose self-efficacy is more limited, only one-quarter (16.3% vs. 48.8%) are trying to change their behaviours that contribute to climate change.

INSERT Fig. 5. Relationship between the feeling of self-efficacy and engagement regarding climate change

Discussion

We presented the characteristics of adolescents who are experiencing functional impairments associated with climate change and who adopt pro-environment behaviours in a large sample of adolescents. By revealing that 11% of adolescents experience functional impairments related to climate anxiety, this study highlights the importance of this public health issue and calls for greater attention from researchers, public health agencies, school specialists and healthcare professionals.

Our findings are consistent with Clayton & Karazsia's (1) study suggesting that females are more likely to display behavioural engagement regarding climate concerns than males. Studies on climate anxiety have yet to recognise the non-binary nature of gender, as such our study provides new insight showing that compared to male adolescents, those who do not identify as being either male or female are significantly more likely to experience functional impairments, to believe that they can contribute and to try to change their behaviour than men. Future studies should try to replicate this new finding and explore environmental anxiety among cis-gender and gender minority populations longitudinally as youth transition through school.

The study also supports existing evidence on experiential inequalities regarding climate change (21). We found that eco-anxiety is higher among adolescents from less affluent families. Some authors suggest that negative outcomes of climate change might be more salient for disadvantaged and vulnerable

families (2). In addition, it is possible that disadvantaged adolescents who want to act may not have the agency or resources to do so and this limited power may exacerbate climate anxiety.

Adolescents who are more anxious and who adapted to the pandemic less well were almost two times more likely to experience difficulty sleeping or interference with their ability to work. Those who are able to talk to their family members about problems and feel connected to the school are less likely experiencing climate anxiety. This is consistent with the literature. For instance, Costa et al. (22) found that children who were more insecurely attached to their parents (had lower levels of trust and communication with their parents) had greater anxiety following exposure to Hurricane Katrina. Similarly, Crandon et al., (2) argue that not providing a safe space to engage in dialogue about climate change isolates adolescents within their own experience of anxiety. Teenagers should be encouraged to maintain their peer connections, particularly during climate-change-related stressors (2).

The study highlights the positive association between adolescents' beliefs that they can do something to help address the problem and pro-environmental behaviour. These findings are consistent with previous studies. Stevenson and Peterson (23) found that climate change concern and hope were positively related to pro-environmental behaviours while despair was negatively related to such behaviours. Similarly, Olaja (24) found that climate change hope predicted pro-environmental behavior among adolescents in Sweden. Together, these studies do not support the hypothesis that climate anxiety leads to eco-paralysis by inhibiting people from taking effective action (11).

The results of this study have important implications for practice and policy. First, the findings are useful to identify vulnerable groups that are more likely to experience functional impairments due to climate anxiety. As the threat of climate change increases, adolescents experiencing great levels of distress may require additional support from teachers and mental health professionals in schools. It will be important to conduct longitudinal studies to assess whether the prevalence of climate anxiety gets worse over time and to understand the characteristics of students among which it escalates faster than others.

At the same time, the findings can be useful to develop campaigns targeting groups that are less likely to try to reduce their behaviour. It is noteworthy that 56% of adolescents in this sample never or rarely tried to reduce their behaviors that contribute to climate change while 65% never or rarely believed that they can do something to help address the problem. Our results on group differences suggest that it may be useful to sensitize adolescent males as well as those attending schools in rural areas or public schools. Social media platforms could be useful to reach specific groups of adolescents (25).

Our findings also shed light on some avenues that can be used to promote environmental engagement. Improving the youth's self-efficacy or beliefs in their capacity to help address the issue may be a key strategy to promote pro-environmental actions. Anderson et al., (13) argue that empowerment programs for adolescents could focus on psychosocial issues such as managing stress, obtaining family support, negotiating with peers, and dealing with uncomfortable emotions. Similarly, Wang et al (26) advocate for messages purposefully structured to increase human agency and facilitate climate action. Lastly, it may

also be useful to determine whether climate self-efficacy could promote environmental actions among other age groups that experience powerlessness (27).

Limitations

The study has some limitations related to its cross-sectional design. It allowed the identification of factors correlated with climate anxiety but causal inference was not possible. Moreover, climate anxiety is a rapidly evolving phenomenon that is influenced by the collective awareness of climate change as well as the sanitary crisis. The study presented a snapshot of this phenomenon at a specific point in time but it will continue to evolve among the youth. Also, our analysis is based on the indicators available in the COMPASS 2022 survey. They provide a first and incomplete overview of the attitudes of Canadian secondary school students towards climate change. Certain factors that could predispose young people to believe that they can be agents of change could not be included. For example, future work could consider cultural differences, local norms and parental beliefs and practices.

Conclusion

Climate anxiety causes functional impairment during adolescence, a vital period for laying the foundations of good health. The study revealed cognitive and experiential inequalities regarding climate anxiety. As climate change increasingly impacts our livelihoods in the upcoming years, it will be important to follow the evolution of climate anxiety among adolescents with different characteristics and living in different contexts. Future research should continue to explore the association between a young person's relationship with their environment and their concerns, attitudes, and engagement in relation to climate change. Young people who feel more empowered to take action regarding climate change are also those who are trying to change their behaviors. Capacity-building training programs could be useful to educate adolescents about their power to act, without causing interference with their sleep or work, and to incite them to participate in the fight against climate change in a constructive way.

Abbreviations

COMPASS: The Cannabis use, Obesity, Mental health, Physical activity, Alcohol use, Smoking, and Sedentary behaviour Study

CI: confidence intervals

RR: risk ratios

Declarations

Ethics approval and consent to participate: All procedures involving human participants were in accordance with the ethical standards of the institutional and/or provincial research committee and with the 1964 Declaration of Helsinki and its later amendments or comparable ethical standards. All procedures in the COMPASS study received ethics approval from the University of Waterloo Research Ethics Board (ORE 30118), as well from the Research Ethics Review Board of the *Centre intégré universitaire de santé et de services sociaux de la Capitale-Nationale* (#MP-13-2017-1264) and participating school board review panels. All students attending participating schools were invited to participate using active-information passive-consent parental permission protocols, which are critical for collecting data among youth. All students provided informed consent and could decline to participate at any time.

Availability of data and materials: The datasets used and/or analysed during the current study available from the corresponding author on reasonable request submitted via the following online application form (<https://uwaterloo.ca/compass-system/information-researchers>).

Conflicts of interest: The authors declare that they have no conflicts of interest.

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Authors' contributions: AMTT, GF and SH conceptualized and conducted the analysis. AMTT and GF conducted the literature review. AMTT led the writing and wrote the first draft of the manuscript. STL conceptualized and leads the larger COMPASS study. AMTT, RB and SH are the COMPASS-Québec provincial leads. CBD coordinated the data collection and helped with the data analysis and interpretation. RJG helped with the data cleaning, analysis and interpretation. All authors provided feedback on drafts and reviewed and approved the final manuscript. The content and views expressed in this article are those of the authors and do not necessarily reflect those of the Government of Canada.

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Figures

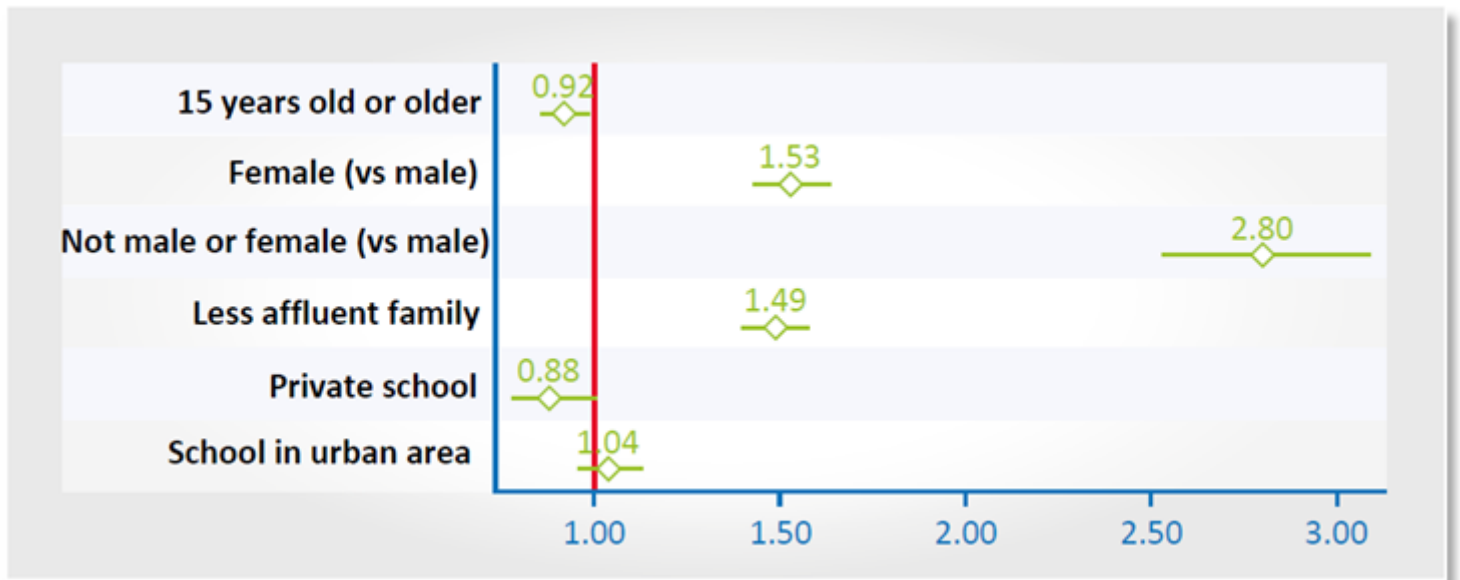


Figure 1

Association between adolescents' characteristics and climate anxiety* - Adjusted Risk Ratios

*Variable combining responses to the two questions about the impact of environmental concerns (prevents sleep or interferes with work).

**Respondents who reported identifying themselves as non-binary, two-spirited, describe their gender differently, or prefer not to answer.

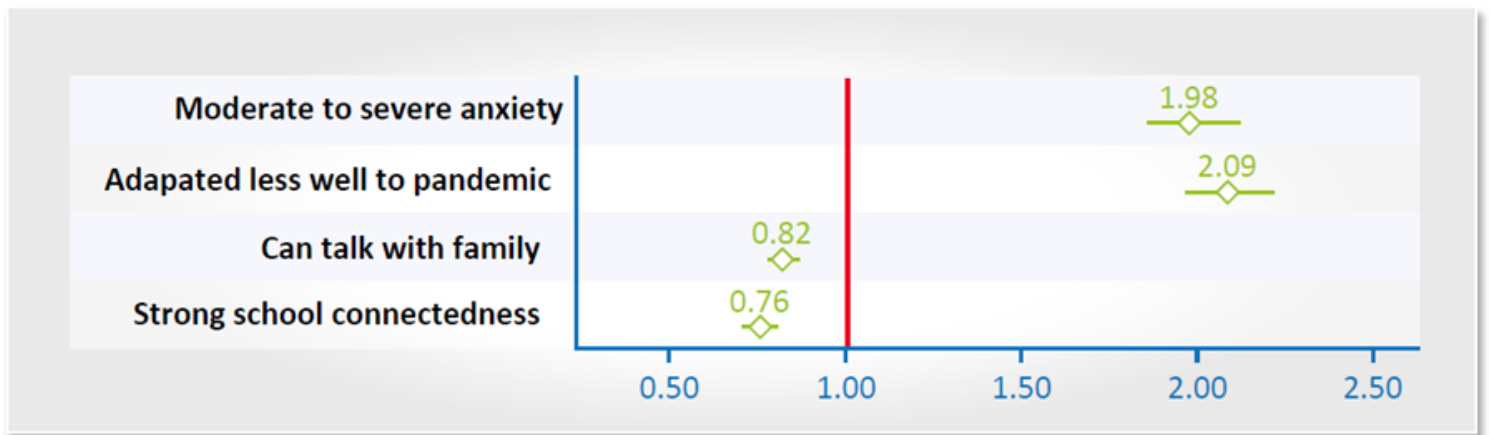


Figure 2

Associations between climate anxiety and markers of well-being* - Adjusted risk ratios

*Variable combining responses to the two questions about the impact of environmental concerns (prevents sleep or interferes with work).

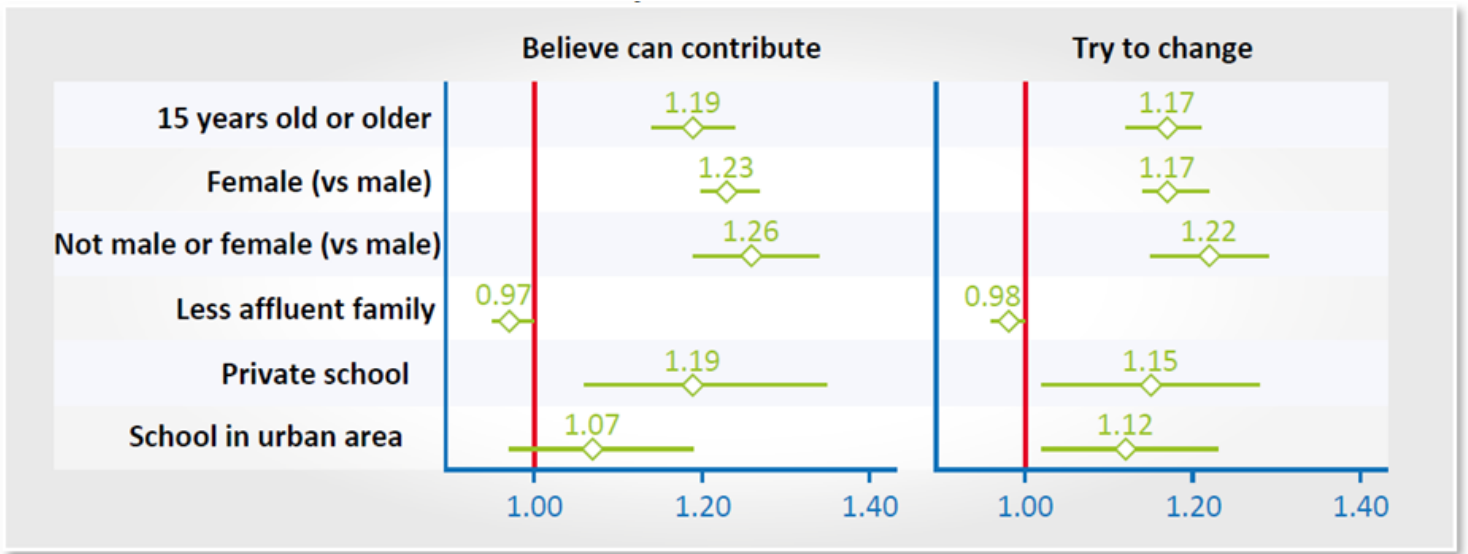


Figure 3

Characteristics associated with engagement - Adjusted risk ratios

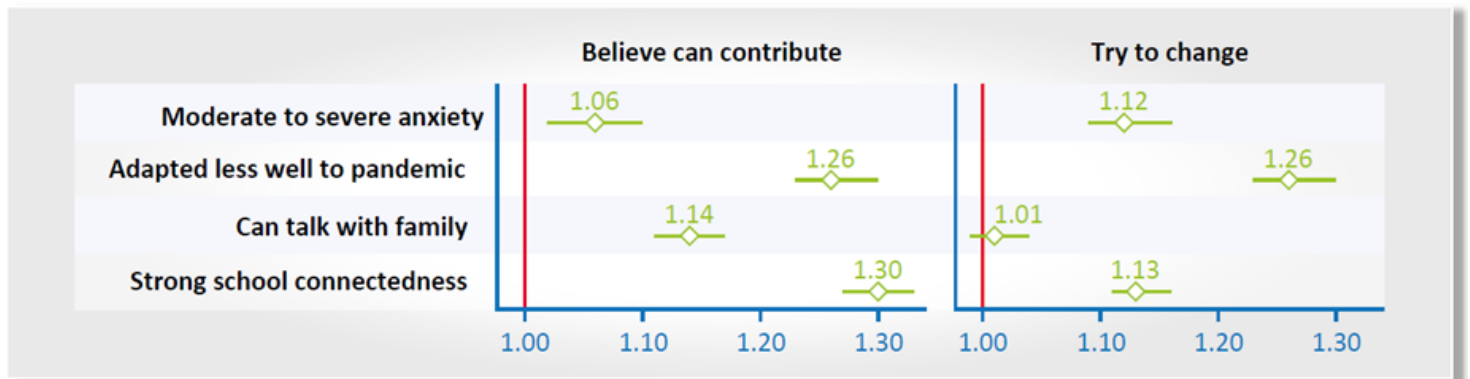


Figure 4

Association between adolescents' environmental implication and markers of well-being- Adjusted risk ratios

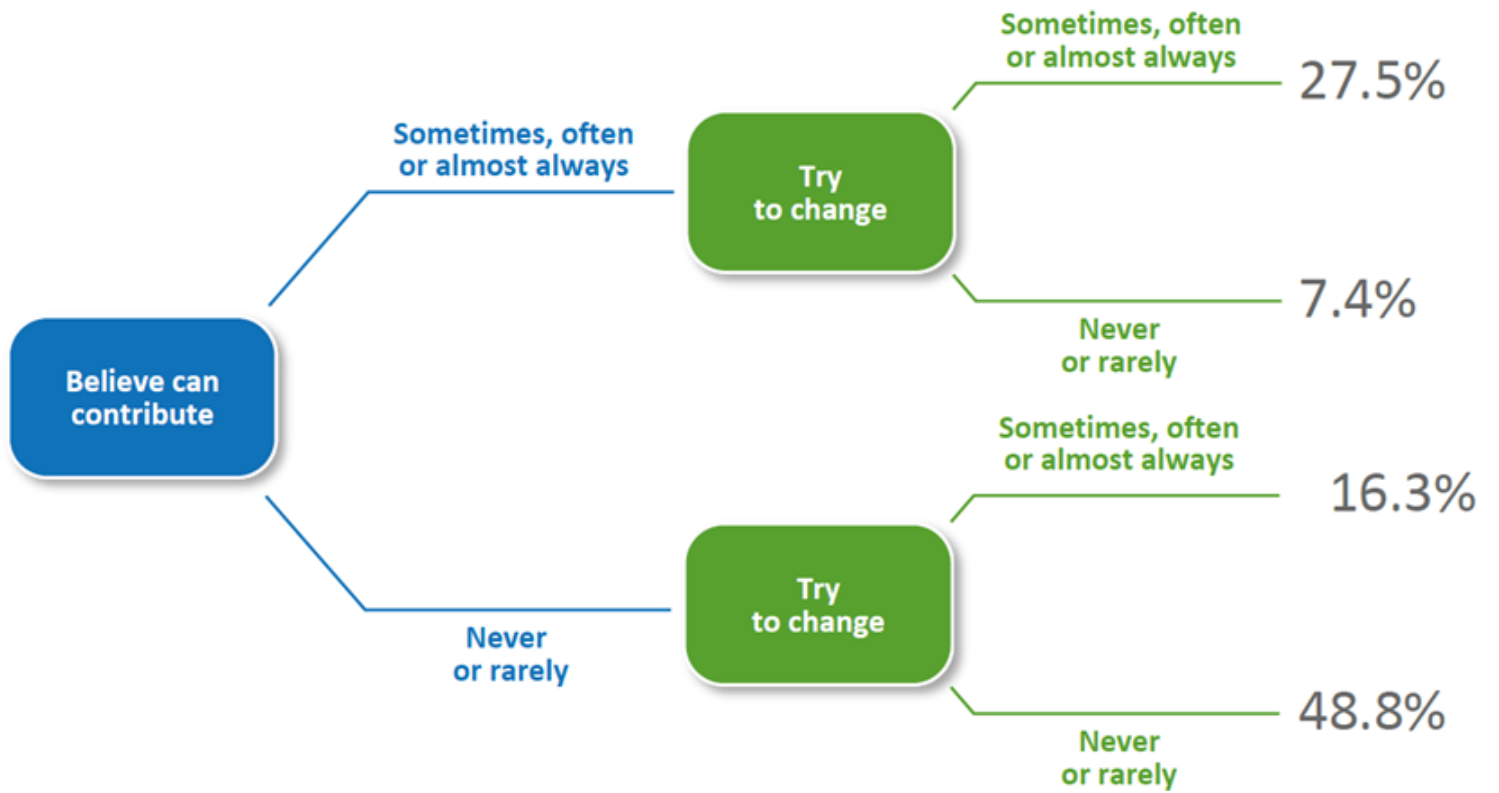


Figure 5

Relationship between the feeling of self-efficacy and engagement regarding climate change

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