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Municipal officials' propensity toward active transportation: A rural-urban comparison

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ABSTRACT

Introduction: Built environments can influence physical activity habits. Their features vary according to population size and density. In developed countries, rural populations often display higher rates of obesity and lower levels of physical activity compared with urban populations. This study aims to 1) assess municipal officials' propensity to improve their community's environment to render it conducive to active transportation (AT), and 2) assess whether the level of propensity varies between municipal officials from rural and urban communities.

Methods: In 2015, 412 of an invited 1661 municipal officials in Quebec (Canada) completed an online survey. Among them, 57% served a rural community. The Theory of Planned Behavior served as the theoretical framework for measuring participants' propensity to implement policies conducive to citizens' AT. Structural Equation Modeling was used to analyze relations between variables. Tests of invariance compared rural and urban municipal officials.

Results: Antecedent actions related to AT and perceived control were the two key factors that predicted officials' intentions to take action toward AT. Attitudes also predicted intentions toward AT to a lesser extent. The contribution from subjective norms was not significant. In summary, the model accounted for 60% of explained variance (R^2) in intentions. The model applied to both groups, but urban officials reported more antecedent actions and a higher perceived control than rural officials.

Conclusions: Improving municipal officials' competencies and support from public health networks along with a greater investment of time and resources could increase their perceived control and involvement in AT-related policies, especially in rural communities.

1. Introduction

Substantial evidence links built environment features (i.e., the physical form of communities) with levels of physical activity (PA) and active transportation (AT) (Bauman et al., 2012; Panter et al., 2008; Pont et al., 2009; Sallis et al., 2006). Since the environmental features of a community vary according to its population size and density, the associations between these features and PA appear to differ in rural and urban settings (Frost et al., 2010). Unlike densely populated urban settings, where public transportation, walking, and biking are often viable options, rural communities have limited active living environment experience unique barriers to PA and face greater challenges to AT (Hansen et al., 2015).

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According to Statistics Canada, urban centers (or population centers) are defined as an area with a population of at least 1000 and a density of 400 or more people per square kilometer. All areas outside urban centers are defined as rural area. Urban centers are classified into three groups, depending on the size of their population: small population centers, with a population between 1000 and 29,999; medium population centers, with a population between 30,000 and 99,999; large population centers, with a population of 100,000 or more (Statistics Canada, 2016). The literature offers conflicting views on whether rural residents are less physically active than urban residents, and findings vary by age and type of activity. In the case of adults, previous studies have reported that PA levels are higher in urban areas (Martin et al., 2005; Patterson et al., 2004), and rural residents are less likely to meet PA recommendations compared with their urban counterparts (Blackwell et al., 2014; Parks et al., 2003; Patterson et al., 2004). Others found that rural adults were more active in household and transportation-related PA, but less active in leisure-time PA than urban adults (Fan et al., 2014). Concerning AT, some studies found that rural, small-town residents walked less for utilitarian purposes (Doescher et al., 2014; Stewart et al., 2016), but more for recreation than populations living in larger urban areas (Stewart et al., 2016). In the U.S., AT is more prevalent in densely populated, urban areas (Whitfield et al., 2015). These findings suggest that adults in rural regions from developed countries are, on average, less active.

Results are more ambiguous for children and youth than for adults. Recent national data in the U.S. did not show urban-rural differences in the proportion of children meeting PA recommendations (Davis et al., 2011; Kenney et al., 2014). In Ontario (Canada), students from rural schools reported significantly more time spent on PA than students attending urban or suburban schools (Hobin et al., 2013). Regarding AT, the percentage of students using active and mixed modes of transport to school in urban schools was higher than in suburban or rural schools (Hobin et al., 2013).

Improving built environment is a sustainable approach for promoting PA and improving public health. Related policies occur largely at the local/municipal level and require participation and cooperation among elected and appointed officials (Lemon et al., 2015). To date, research exploring municipal officials' perspectives on PA and AT has mainly focused on barriers to interventions (namely environments or policies). A survey among urban municipal officials explored perceived barriers to the consideration of PA in community design decision making (Goins et al., 2013). The most common barriers included lack of political will, limited staff and lack of collaboration across municipal departments. According to a recent review, municipal stakeholders reported that the lack of financial resources associated with building, operating and maintaining appropriate infrastructure represents a common barrier to investing in AT (Kornas et al., 2017).

Qualitative studies interviewed key stakeholders - including municipal officials - regarding the implementation of environments supportive of PA (Barnidge et al., 2013; Clark et al., 2010). Factors facilitating the development of walkable neighborhoods included a growing awareness of health and environmental issues among stakeholders (Clark et al., 2010). Common barriers included financial costs, lack of public and stakeholder awareness about healthy neighborhoods, lack of collaboration among stakeholders (e.g., silo mentality), and social norms, attitudes and behaviors pertaining to urban planning principles (e.g., density) and lifestyle choices (e.g., car dependency) (Clark et al., 2010). In another study, barriers to implementing interventions supportive of PA in rural communities included cultural differences, population size, limited human capital and difficulty demonstrating the connection between policies and health outcomes (Barnidge et al., 2013).

In Ontario (Canada), two projects aiming to improve built environment and PA policy called on multisectoral expertise in the areas of public health, land use planning, and transportation engineering. Following completion of the projects, critical factors that facilitated and accelerated the development and implementation of such policies were identified. Most "pathways to policy" emphasized multisectoral collaboration, mainly between urban planners and public health officials (Politis et al., 2017). Nevertheless, more work is needed to extend knowledge on the diverse perspectives of those responsible for planning neighborhoods conducive to PA (Clark et al., 2010).

This study had two objectives. The first was to assess municipal officials' propensity to implement actions favorable to AT in their communities. Using the Theory of Planned Behavior (TPB) as a framework, we identified the factors that influence their intentions to take action to promote AT and analyzed the contribution of antecedent actions on TPB constructs. Second, we examined whether the mechanisms underlying decision makers' intentions to promote AT differ based on population size and density (rural versus urban). Consistent with previous research, it seems plausible to anticipate that rural municipal officials will be less inclined to implement actions conducive to AT compared with their urban counterparts.

1.1. Theoretical framework

The present study reached out to Quebec municipalities to document municipal officials' propensity to implement policies conducive to AT based on the Theory of Planned Behavior (TPB) (Ajzen, 1985). This social psychology theoretical model has been used in various fields to understand mechanisms underlying the adoption of human behaviors. The TPB stipulates that intention is the key determinant of a specific behavior. Participants' intentions are determined by three factors: attitudes, subjective/social norms and perceived control. Attitudes reflect a person's beliefs about a specific behavior (e.g., usefulness, relevance, etc.). Subjective norms (SN) represent an individual's perception of social influences related to the behavior (e.g., encouragement, support, etc.). Perceived (behavioral) control is an individual's appreciation of his/her own ability to adopt the behavior under specific circumstances. In theory, these three constructs are influenced by external factors such as age, socio-demographic variables and past experiences related to the behavior under study. More specifically, past experiences have often been identified as key factors in TPB constructs, including behavior itself (Ajzen, 1991). Many areas of study have demonstrated that past experiences can influence beliefs, attitudes and perceptions regarding the adoption of a behavior (McEachan et al., 2011). Thus, the TPB is useful for investigating many factors other than barriers and facilitators for taking action. In the long term, it can facilitate the implementation of interventions designed to

Table 1
Participants' profile.

Characteristics	All N (%)	Rural N (%)	Urban N (%)	χ^2	df	*p*
Gender				22.241	1	< .001
male	267 (64.8)	129 (55.1)	138 (77.5)			
female	145 (35.2)	105 (44.9)	40 (22.5)			
Age group (in years)				2.302	4	.680
< 35	35 (8.6)	17 (7.3)	18 (10.2)			
35–44	83 (20.3)	51 (22.0)	32 (18.1)			
45–54	111 (27.1)	60 (25.9)	51 (28.8)			
55–64	131 (32.0)	77 (33.2)	54 (30.5)			
≥ 65	49 (12.0)	27 (11.6)	22 (12.4)			
Position				10.341	2	.006
Mayor	127 (30.8)	69 (29.5)	58 (32.6)			
City manager	182 (44.2)	118 (50.4)	64 (36.0)			
Urban planner	103 (25.0)	47 (20.1)	56 (31.5)			
Experience (in years)				1.290	3	.731
≤ 1	90 (21.8)	51 (21.8)	39 (21.9)			
2–5	108 (26.2)	64 (27.4)	44 (24.7)			
6–9	91 (22.1)	54 (23.1)	37 (20.8)			
≥ 10	123 (29.9)	65 (27.8)	58 (32.6)			

raise decision makers' awareness of the promotion of AT in their communities.

2. Methods

2.1. Data collection

To conduct this cross-sectional study – i.e. an observational study that analyzes data from a population, or a representative subset, at a specific point in time – a private polling firm was hired to recruit participants and administer the survey. An invitation to complete an online survey was emailed to 1661 municipal officials (mayors, city managers and urban planners) from all municipalities (N = 1133) in the province of Quebec (Canada) in February 2015. A follow-up call was made a week later and data collection ended on March 15, 2015. The survey was completed on a voluntary basis. The Research Ethics Committee of the authors' institution approved the project. The survey was administered in French (92%) and English (8%). A total of 412 municipal officials, of whom 65% (n = 267) were men, agreed to complete the survey (response rate of 25%). The sample consists of 127 mayors (31%), 182 city managers (44%), and 103 urban planners (25%). Participants were asked to indicate if they served a rural or urban population (following Statistics Canada, 2016): 57% (N_{rural} = 234) were from a rural area and 43% (N_{urban} = 178) were from a small (n = 103), medium (n = 18) or large (n = 57) urban center. Participants' characteristics are presented in Table 1.

2.2. Variables and instrument

As mentioned earlier, the TPB provided the theoretical framework for our study (Ajzen, 1991). A social psychology model, it has been used extensively in areas such as education and health behavior (Armitage and Conner, 2001; Godin and Kok, 1996). The theory served recently to explore environmental behavior intentions in the workplace (Greaves et al., 2013). Similarly, this survey addressed municipal officials' intentions and propensity to implement AT-related policies. The survey was developed according to the recommendations of Francis et al. (2004), leading to the assessment of the following variables: antecedent behavior (actions favorable to citizens' AT), attitudes, SN, perceived behavioral control, and the perceived barriers, facilitators, and intentions for taking action. For every variable except antecedent actions, which was an open question, participants indicated their level of agreement with the statements based on a 5-point Likert-type scale ranging from 1 (strongly disagree) to 5 (strongly agree). Each variable is explained in the following sections, and the corresponding items.

2.2.1. Municipal officials' antecedent behavior or actions were defined as decision makers' past actions to facilitate active transportation in their communities

Participants were asked the following open question: *Which action(s) or measure(s) did you implement to make it easier for the citizens of your municipality to walk or cycle?* They could report (in strings) up to four actions. The actions were categorized, and the most frequent actions are described in Section 3 on results. For the analysis, each participant was given a score according to the number of actions they had reported (antecedent actions ranged from 0 to 4).

2.2.2. Attitudes/beliefs toward actions that facilitate AT were assessed on the basis of two items

This approach is frequently used to measure belief-based constructs (Francis et al., 2004). Participants were asked to indicate if they agreed with the following statements: 1) *Environments more conducive to AT would make it possible for citizens in my municipality to be healthier,* and 2) *It is important for me to implement environments conducive to AT*. The reliability of this scale was acceptable ($\alpha_{attitude}$

= 0.72), and we calculated an attitudes/beliefs composite mean score (item parceling, by combining and calculating the mean score of these two items) for further analyses.

2.2.3. Subjective norms were assessed with two pairs of multiplicative items

Participants were asked to indicate their level of agreement with the four statements. The first pair of items concerned SN regarding citizens in their communities. These included 1) normative beliefs about citizens: *Citizens in my municipality believe it is important to make environments more conducive to AT,* and 2) motivation to comply with citizens: *I am motivated to address the concerns of citizens in my municipality regarding AT*. The first item was recoded from -2 to + 2, and multiplied by the second item to result in a score $SN_{citizens}$ ranging between -10 (low) and + 10 (high). The second pair of items assessed subjective norms in relation to actual and potential collaborators or "partners" on AT. These included 3) normative beliefs about partners: *With respect to environments conducive to AT, my partners' opinions are important to me*, and 4) motivation to comply with partners: *I am motivated to work with partners from different networks on actions related to environments conducive to AT*. The third item was recoded from -2 to + 2 and multiplied by the fourth item to result in a score $SN_{partners}$ ranging between -10 (low) and + 10 (high). A composite score for SN was calculated by averaging $SN_{citizens}$ and $SN_{partners}$ despite a questionable reliability (α_{SN} = 0.59). Using this method, a positive (+) score means that, overall, the participant experiences social pressure to comply, and a negative (-) score means that, overall, the participant experiences social pressure not to comply (Francis et al., 2004).

2.2.4. Perceived control was measured using the following three items

1) *I exercise effective control over implementing environments conducive to AT as part of my duties*; 2) *If I wanted, I could easily implement environments conducive to AT in my municipality*; 3) *I feel that I am capable of implementing actions in connection with AT in the next 12 months*. Preliminary analysis revealed the good reliability of this scale ($\alpha_{perceived\ behavioral\ control}$ = 0.83). We calculated a perceived control composite score (mean of the three items).

2.2.5. Perceived barriers and facilitators to taking action consisted of four items (two barriers and two facilitators)

Participants were asked to say if the following factors could hinder their actions in connection with AT: 1) *crowded schedule (lack of time)*, and 2) *lack of resources (human or financial)*. The barriers scale showed questionable reliability ($\alpha_{barriers}$ = 0.61). They also had to indicate if the following factors could facilitate their actions regarding AT: 1) *possession of the necessary knowledge and skills* and 2) *support from the public health care system*. Despite a poor reliability ($\alpha_{facilitators}$ = 0.28), the facilitators scale was preserved because of its conceptual relevance. Composite perceived barriers and perceived facilitators scores (item parceling, mean of two items) were calculated for further analyses.

2.2.6. Intentions to implement actions conducive to AT were assessed on the basis of two items

Participants had to answer yes or no to the following: 1) *I intend to implement measures that will improve safety or walking and cycling for citizens in the next 12 months*, and 2) *Chances or the likelihood that I will implement actions conducive to active transportation for citizens in the next 12 months are strong.* The reliability of this scale was acceptable ($\alpha_{intentions}$ = 0.78), and we calculated an intentions composite mean score (item parceling, two items) for further analyses.

2.3. Statistical analyses

Data screening showed a low amount of missing data. Data were complete for 380 of the 412 participants and original items of the TPB had only 3.7% missing data. Presented in Table 2, descriptive statistics (means and standard errors) were calculated for each construct, as well as correlations (Pearson coefficients) between constructs, using IBM SPSS software (version 23). To meet the first objective of our study, a path analysis involving each TPB construct was conducted by Structural Equation Modeling using Mplus software (version 8). Detailed procedures for Structural Equation Modeling path analysis with Mplus are provided by Muthén and Muthén (2015). For path analyses, we handled missing data by using the default Expectation Maximization algorithm data

Table 2
Correlation matrix (Pearson coefficients) and descriptive statistics for the full sample (N = 412).

	AA	ATT	SN	PC	PB	PF	INT
Antecedent action (AA)	1						
Attitude (ATT)	0.302**	1					
Subjective norms (SN)	0.216**	0.645**	1				
Perceived control (PC)	0.350**	0.484**	0.520**	1			
Perceived barriers (PB)	-0.104*	0.120*	0.020	-0.201**	1		
Perceived facilitators (PF)	0.321**	0.510**	0.529**	0.540**	-0.011	1	
Intentions (INT)	0.466**	0.486**	0.449**	0.709**	-0.091	0.457**	1
Mean	0.88	4.08	3.75	3.06	3.90	3.46	3.50
S.D.	1.27	0.75	3.16	0.91	0.83	0.79	0.97

All variables range from 1 to 5 except for AA (0–4) and SN (− 10 to + 10).
* $P < .05$ (two-tailed).
** $P < .01$ (two-tailed).

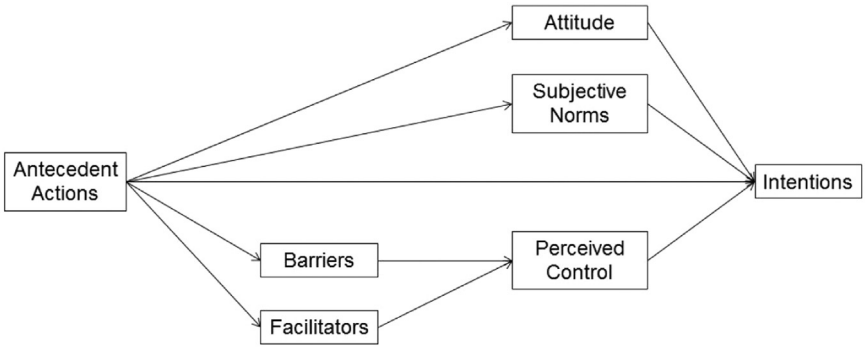

Fig. 1. The tested model.

imputation. A first path model was estimated to identify the mechanisms and explain the decision makers' intentions and actions toward environments conducive to AT in their respective communities over the next year. As shown in Fig. 1, the model was based on TPB assumptions. Model estimation was conducted using the Maximum Likelihood with robust estimates to account for possible normality violation, which occurs when data is not distributed according to a normal bell-shaped curve. This was the case, with negative values for skewness (asymmetry) and kurtosis of most variable's distributions. Such distributions were expected, due to the participants' level of engagement and involvement in the promotion of favorable environments. We also checked for multivariate normality (a generalization of the normal distribution considering the model's multidimensionality) using the Mardia's coefficient (Mardia, 1970). In this case, the analysis indicated violation from multivariate normality ($M_{skewness} = 4.91$, $M_{kurtosis} = 58.08$, both at $P < .001$). We based our interpretations on the traditional fit indices used in Structural Equation Modeling where a non-significant chi-square value is considered a good-fitting model. Since we realize the chi-square is sensitive to a large sample, however, we are cautious in our interpretations (Hox and Bechger, 2007). At this point, we also used other fit indices to estimate our model. The Comparative Fit Index is indicative of model adequacy. Values over .90 suggest very good adjustment (Hu and Bentler, 1999). The Rooted Mean Square Error of Approximation gives an approximation of data adjustment. Rooted Mean Square Error of Approximation with values below .08 is considered a satisfactory adjustment index (Hu and Bentler, 1999). The Lagrange Multiplier test was used for post hoc analyses. The Lagrange Multiplier test is a default option in Mplus, and allows for estimating the contribution of additional parameters on the model's global fit.

We achieved the second objective of the study by conducting invariance testing across two groups (rural versus urban municipal officials). In Structural Equation Modeling, invariance testing is an optimal strategy to perform multi-group comparisons and involves comparisons between a series of multi-group models. In the present study, we tested for two types of invariance using Structural Equation Modeling: residual invariance and structural invariance. In residual invariance, error covariances between constructs are constrained to be equal. In structural invariance, equality constraints are fixed on factor means and path coefficients. When comparing the tested models, we determined the model providing the best fit by using the recommended Satorra-Bentler chi-square test (SB-$\Delta\chi^2$) (Satorra and Bentler, 2001). A significant difference on this test would mean that the less constrained model is a better fit than the one with more constraints, suggesting a non-invariant model. In such cases, results from the Wald test allow us to identify the constraints that must be released, providing a partial invariant model. We would then repeat model comparisons until the SB-$\Delta\chi^2$ becomes non-significant which means that models are equivalent. Standardized estimates (β) are displayed and may be interpreted as correlation coefficients among variables.

3. Results

3.1. Descriptive statistics and correlation matrix

Table 2 displays the correlation matrix (Pearson *r* coefficients) involving each of the TPB constructs and the mean scores. All constructs except perceived barriers are significantly associated with municipal officials' intentions to implement environments conducive to AT. Attitudes, SN and perceived control were significantly correlated with intentions to take action (all *r* coefficients varying between 0.41 and 0.71, all at $P < .01$). Antecedent actions conducive to AT were significantly correlated with attitudes/beliefs, SN, perceived control and intentions (*r* coefficients varying between 0.22 and 0.47, all at $P < .01$). Perceived barriers were negatively associated with perceived control ($r = 0.20$, $P < .01$) and antecedent actions ($r = -0.10$, $P < .05$).

We also verified the association between the participants' sociodemographic variables and their antecedent actions and intentions. Participants' age group was correlated with intentions (Pearson $r = 0.152$, $p = .002$) but not with antecedent actions ($P = .885$). Years of experience was correlated with neither antecedent actions nor intentions ($P = .377$ and .807, respectively). Men reported more antecedent actions (0.97 ± 1.28) than women (0.71 ± 1.23), $t(410) = 1.991$, $P = .047$, as well as a higher intentions (3.51 ± 0.99) than women (3.22 ± 1.06), $t(403) = 2.784$, $P = .006$. Regarding the position they occupied, urban planners reported more antecedent actions (1.19 ± 1.44) than mayors (0.79 ± 1.15) and city managers (0.76 ± 1.22), Welch's $F_{(2, 234.08)} = 3.590$, $P = .029$. However, mayors' intention was higher (3.71 ± 0.86) than urban planners (3.34 ± 1.02) and city managers (3.23 ± 1.08),

Welch's $F_{(2,\ 239.01)} = 9.919$, $P < .001$.

In addition, we assessed the proportion of participants in agreement (scoring 4 or 5) with the items related to barriers and facilitators. The lack of resources represents a barrier for 83.2% of participants and lack of time for 60.5% of participants. For facilitators, more participants perceive that the support from the public health care system facilitate their actions (63.9%), compared with possession of the necessary knowledge and skills (44.1%). The proportion of participants in agreement with the items related to barriers and facilitators is similar between urban and rural officials except where a majority of urban officials (59.7%) versus a minority of rural officials (31.7%) perceived themselves in possession of the necessary knowledge and skills to take action (χ^2 (1) = 31.128, P = .001).

When participants were invited to describe (in strings) up to four antecedent actions, they only reported an average of 0.88 ± 1.27 antecedent actions related to AT. Hence, the majority of them, 59%, did not report any action in their communities compared with 41% who reported at least one. The most frequently reported actions can be classified into developing or improving bike paths/lanes (21.4%), developing or improving pedestrian paths/lanes (7.5%), implementing safety measures for pedestrians and cyclists (7.0%), promoting AT via advertising, events or programs (3.9%), and maintaining streets and sidewalks (3.6%).

3.2. Objective 1: predicting municipal officials' intentions to take action toward AT

Structural Equation Modeling analyses showed that the proposed model (Fig. 2) has an adequate fit when taking into account the complete sample (rural and urban) ($\chi^2_{(4)} = 1.364$, $P = .85$; Comparative Fit Index = 1.000, Rooted Mean Square Error of Approximation = 0.000). Antecedent actions regarding AT were a determinant of attitudes/beliefs ($\beta = 0.35$, $P < .001$) and SN ($\beta = 0.22$, $P < .001$). Barriers and facilitators were also determined by antecedent actions ($\beta_{barriers} = -0.12$, $P < .05$ and $\beta_{facilitators} = 0.32$, $P < .001$). As expected, perceived control was determined by perceived barriers with a negative coefficient ($\beta = -0.13$, $P = .001$) and a positive coefficient from perceived facilitators ($\beta = 0.53$, $P < .001$). Negative coefficients mean that high perceptions related with barriers were negatively associated with perceived control to take action. Results also showed that antecedent actions ($\beta = 0.19$, $P < .001$) and perceived control ($\beta = 0.61$, $P < .001$) were the two key factors predicting the officials' intentions. Attitudes ($\beta = 0.12$, $P < .05$) also predicted participants' intentions. However, the contribution from SN was not significant ($\beta = 0.00$, $P = .76$). In summary, the model accounted for 60% of the explained variance (R^2) in intentions to implement actions conducive to AT. Finally, results from the Lagrange Multiplier test did not suggest additional parameters to increase model fit (Fig. 2).

3.3. Objective 2: invariance tests to compare rural and urban decision makers' predispositions to implement actions conducive to AT

As mentioned earlier, invariance testing was conducted to see if the proposed model varied based on type of urbanization. This procedure involved two steps: 1) residual invariance (equality constraint on error covariance) and 2) structural invariance (equality constraints on factor means and model paths). Table 3 depicts the results from the invariance testing procedures. Our analyses showed that the model was partially invariant. First, residual invariance was observed, meaning that correlations between each variable's error terms were invariant (SB-$\Delta\chi^2$ = 13.91 (12), $P = .31$). As Table 3 demonstrates, the model showed partial structural invariance, whereas two equality constraints had to be released on the mean scores of two factors: antecedent actions and perceived control (their scores were higher for the urban group). After releasing these constraints, we tested for path invariance. The chi-square test was non-significant (SB-$\Delta\chi^2$ = 9.31 (9), $P = .41$), which means that relation among variables remains the same between groups (i.e. path invariance). Model fit indices were satisfying ($\chi^2_{(37)} = 49.645$, $P = .08$; Comparative Fit Index = 0.984, Rooted Mean Square Error of Approximation = 0.041).

Table 4 displays the results from invariance testing for urban and rural officials. In summary, urban participants had a higher score than rural participants on every factor (except for barriers), but only two factor scores were non-invariant: antecedent actions (1.51 versus 0.40) and perceived control (3.29 versus 2.85). Concerning path invariance, the association between antecedent actions and other variables (attitude, SN, barriers and facilitators) was stronger among urban participants, but the differences between

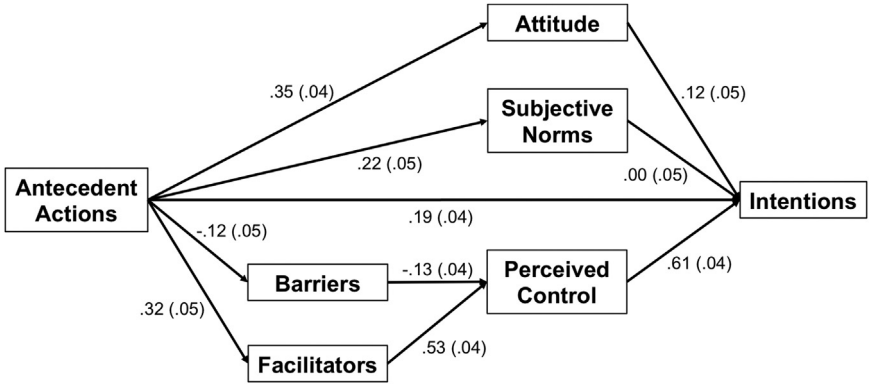

Fig. 2. Model results with full sample. Beta coefficients (standard errors) are displayed.

Table 3
Invariance testing for urban-rural comparisons on each of the TPB model's parameters ($P < .01$).

Tested model for invariance	Fit indices (χ^2 (df)) CFI/RMSEA	SB-$\Delta\chi^2$ (df)	Interpretation
M1: Configural model	18.60 (10) 0.990/0.057	N/A	Acceptable model fit
M2: Residual invariance	33.42 (22) 0.985/0.050	13.91 (12)	Partial invariance on error covariance (AA)
M3: Structural invariance	39.88 (28) 0.985/0.045	6.07 (6)	Partial invariance on 2 factors scores (AA, PC)
M4: Partial structural	49.65 (37) 0.984/0.041	9.31 (9)	Path invariance

M1: In the configural model, parameters from both groups are freely estimated.
M2: The residual invariance model involves equality constraints on error covariances.
M3: The structural invariance has equality constraints on factor scores and model paths.
M4: Path invariance was assumed by releasing 2 equality constraints from M3 (on factor scores).
AA: Antecedent Actions.
CFI: Comparative Fit Index.
PC: Perceived Control.
RMSEA: Rooted Mean Square Error of Approximation.

Table 4
Predicting municipal officials' intentions to implement actions conducive to AT. Results from invariance testing (standardized coefficients).

Parameters		**Rural (n = 234)**	**Urban (n = 178)**
Paths		estimate (s.e.)	estimate (s.e.)
	Attitude → Intention	0.12 (0.05) *	0.12 (0.06) *
	Subjective norms → Intention	0.00 (0.05)	0.00 (0.05)
	Perceived control → Intention	0.62 (0.04) **	0.60 (0.04) **
	Antecedent action → Intention	0.13 (0.03) **	0.22 (0.04) **
	Antecedent action → Attitude	0.23 (0.03) **	0.40 (0.04) **
	Antecedent action → Subjective norms	0.14 (0.04) **	0.25 (0.06) **
	Antecedent action → Perceived barriers	-0.08 (0.04) *	− 0.13 (0.06) *
	Antecedent action → Perceived facilitators	0.22 (0.03) **	0.37 (0.05) **
	Perceived barriers → Perceived control	− 0.14 (0.04) **	− 0.14 (0.04) *
	Perceived facilitators → Perceived control	0.53 (0.04) **	0.54 (0.04) **
Covariance			
	Attitude ↔ Subjective norms	0.63 (0.03) **	0.63 (0.03) **
	Attitude ↔ Perceived facilitators	0.48 (0.05) **	0.48 (0.05) **
	Attitude ↔ Perceived control	0.23 (0.05) **	0.23 (0.05) **
	Subjective norms ↔ Perceived control	0.29 (0.05) **	0.29 (0.05) **
	Subjective norms ↔ Perceived facilitators	0.51 (0.04) **	0.51 (0.04) **
	Antecedent action ↔ Perceived control	0.21 (0.05) **	0.11 (0.03) **
Residual (error) variances			
	Intention	0.45 (0.04) **	0.40 (0.03) **
	Attitude	0.95 (0.01) **	0.84 (0.03) **
	Subjective norms	0.98 (0.01) **	0.94 (0.02) **
	Perceived facilitators	0.95 (0.01) **	0.87 (0.03) **
	Perceived barriers	0.99 (0.01) **	0.98 (0.02) **
	Perceived control	0.66 (0.04) **	0.54 (0.05) **
	Antecedent action[a]	1.00 (0.00)	1.00 (0.00)
	Factor scores	Mean (S.D.)	Mean (S.D.)
	Intention	3.19 (0.95)	3.86 (0.86)
	Attitude	3.98 (0.76)	4.21 (0.71)
	Subjective norms	3.51 (3.18)	4.06 (3.13)
	Perceived facilitators	3.33 (0.80)	3.62 (0.74)
	Perceived barriers	4.00 (0.76)	3.78 (0.88)
	Perceived control[a]	2.85 (0.913)	3.33 (0.84)
	Antecedent action[a]	0.40 (0.82)	1.51 (1.46)

* $P < .05$ (two-tailed).
** $P < .01$ (two-tailed).
[a] Non-invariant parameter.

groups remained non-significant.

4. Discussion

Policies regarding built environment and AT occur largely at the local/municipal level. The objectives of this study were to 1) assess municipal officials' propensity to improve their community's environment to make it conducive to AT, and 2) assess whether their level of propensity varies according to their community's type of urbanization (rural or urban). The TPB has proved useful for predicting individual health behaviors elsewhere (Godin and Kok, 1996). Our study demonstrates that this theory can also help predict municipal officials' intentions to implement actions related to their communities' health by promoting AT. The model showed good indices and accounted for 60% of the explained variance (R^2) in municipal officials' intentions. Antecedent actions and perceived control predicted intentions in both rural and urban communities, although some distinctions were observed between the two groups.

All variables, with the exception of SN, contributed significantly to predict intentions. All coefficients were positive except perceived barriers, which was negatively associated with antecedent actions and with perceived control. As the theory suggest, prominent perceived barriers can deter participants to adopt a healthy behavior (Ajzen, 1991). Antecedent actions were significantly associated with intentions. Perceived control was the strongest predictor of participants' intentions. We question whether or not our survey optimally identified SN. We used indirect measures, which involved multiplying participants' normative belief strength scores and corresponding motivation-to-comply scores to produce overall SN scores. A direct measure of SN may not capture the full potential of its strength in promoting PA behaviors, a possible explanation for the weak SN-intention relationships typically found in the literature (Kim et al., 2017). In contrast, indirect measures may offer researchers a more thorough understanding of SN, without necessarily providing meaningful information about the relative contribution of each component – beliefs and motivation – in producing SN scores (Kim et al., 2017).

Regarding attitudes, we must consider the limited discriminant capacity of this factor because of its negatively skewed distribution, as 71.9% of participants scored between 4 and 5 (the maximum score). This implies that most municipal officials have a favorable attitude toward AT. Our results compare with earlier research on physical activity and health behaviors, indicating that perceived control and attitudes/beliefs are often stronger predictors of intentions than SN (Armitage and Conner, 2001; Godin and Kok, 1996). As expected, perceived facilitators were positively correlated and perceived barriers were negatively correlated to participants' perceived control. In previous studies, rural (Barnidge et al., 2013) and urban (Goins et al., 2013) municipal officials reported that a lack of human resources or limited staff were among the common barriers to implementing PA-related policies. As regards the potential factors for facilitating actions, our analysis shows that a sense of competence (i.e., possession of necessary knowledge and skills) was highly correlated to perceived control, which is a new finding. Support from the health sector can also facilitate municipal actions related to AT. Our survey targeted partners from the health sector, but we may speculate that effective collaboration with stakeholders from other sectors could also increase municipal officials' propensity to take action. To this effect, previous studies revealed that developing broad-based partnerships (Barnidge et al., 2013), multisectoral collaboration (Politis et al., 2017) or effective networks between professionals at the state/provincial and municipal levels were some of the strategies for overcoming barriers and creating policies related to built environment and PA (Librett et al., 2003). Inversely, lack of collaboration has been a barrier to develop walkable neighborhoods (Clark et al., 2010).

4.1. Rural-urban differences in municipal officials' predisposition toward AT

Results from our invariance testing are in line with earlier research showing that rural communities are, in some ways, more challenged in terms of adopting AT or PA-related policies (Hansen et al., 2015). At first glance, a comparison of the mean factor scores suggests that urban municipal officials are more inclined to implement policies conducive to AT than their rural counterparts. However, the scores of only two factors happened to be non-invariant. Participants from urban areas reported significantly more antecedent actions and obtained a higher perceived control score. This hasn't been measured elsewhere in the literature to our knowledge. The possible explanation is that transportation efficiency may be a higher priority for urban communities, and more urban officials must be involved in such policies. Also, the urban groups had a higher percentage of urban planners, and these officials are more involved in such policies in larger population centers. Urban participants' mean score on attitudes, SN and intentions was also higher, but not significantly invariant. Secondly, the non-invariance in antecedent action residuals could be attributed to the fact that a majority of the rural participants reported no antecedent actions. Overall, invariance testing showed that the model predicting participants' intentions applies to both groups. Finally, the implementation of more antecedent actions could help urban municipal officials feel more confident about taking action in the future.

4.2. Strengths and limitations

This study helped to further advance research on health policies, physical activity and active transportation. It is among the few Canadian studies focused on AT-related municipal policies. Insofar as municipal officials such as mayors, city managers and urban planners are key actors in implementing policies regarding their community's landscape, it was relevant to assess their propensity to create environments conducive to AT. This survey examined not only the barriers and facilitators regarding action, but also rural and urban municipal officials' antecedent actions, attitudes/beliefs, SN, perceived control and intentions for getting involved in AT-related incentives.

The participation of municipal officials from all regions of Quebec is the main strength of this study. The results provide a good portrait of these officials' predispositions toward AT. Regarding the generalizability of our results, note that non-participating officials may have a lower level of propensity toward AT. Other than rural – urban setting, we found that other characteristics were correlated with participants' propensity to take action. Belonging to a higher age group was associated with a higher intentions score, but not with more antecedent actions. Surprisingly, officials with more experience did not report more antecedent actions neither higher intentions. Propensity to take action was higher among men than women. Regarding the position occupied, urban planners reported more antecedent actions than mayors and city managers. However, mayors' intention was higher than urban and city managers.

Other limitations must be considered including the potential to self-report and social desirability biases. However, Armitage and Conner (1999) reported that social desirability had little effect on relationships between TPB components. In our survey, participants' previous behavior was measured solely by reported antecedent actions. What's more, the magnitude or quality of these initiatives was not taken into account. This limitation had been reported in another survey on municipal policies (Librett et al., 2003). Future research should consider a longitudinal approach, track subsequent actions to better understand the value of intentions and, when feasible, include objective measures of behavior/actions. In addition, our survey contained only a few questions on barriers (n = 2) and facilitating factors (n = 2) for taking action. Future studies could further explore factors helping or hindering municipal stakeholders' involvement in AT-related incentives and policies, along with the differences between rural and urban populations, with a view to finding solutions tailored to an urban environment.

In our survey, we did not inquire about the officials' level of satisfaction with the current level of AT provision in their municipality, and whether they think that an improvement is needed. We also omitted to question participants about the actions taken by other officers. These variables could influence participants' propensity to act. In addition, mayors' intentions to implement projects are likely to depend on the stage of the electoral cycle and the chances of being re-elected. Mayors may be more willing to implement projects that are very visible (like projects aiming to increase AT) in the run-up period for elections.

4.3. Implications for policy and practice

Our results offer recommendations for stakeholders involved in policies related to built environment, PA and AT. According to our findings, perceived control is the best predictor of municipal officials' intentions. Improving officials' knowledge and competencies regarding AT and increasing support from health networks can help facilitate actions. Since insufficient time, money and human resources are common barriers to implementing AT-related policies, communities would benefit from receiving more time and resources for creating built environments and developing policies conducive to AT. Thus, solutions aimed at facilitating actions and reducing barriers would encourage municipal officials to become more involved in facilitating citizens' AT.

While the model predicting municipal officials' intentions is invariant between rural and urban officials, concrete incentives aimed at increasing AT often differ depending on the population size and density. Many challenges remain for rural officials since they frequently operate with a smaller budget. Improvements in urban infrastructure and the built environment, such as sidewalks, bike lanes, and mixed-use urban design, would increase AT and PA levels. While these improvements have been applied in certain rural communities, many associations linking environmental features to AT in metropolitan areas do not apply to rural areas (Hansen et al., 2015; Stewart et al., 2016). Ultimately, policies and efforts to promote AT must be tailored to rural and urban communities.

5. Conclusions

In this study, the TPB helped predicting municipal officials' intentions to implement actions related to AT. While the model predicted intentions in both rural and urban communities, some distinctions were observed between the two groups. In particular, urban officials reported more antecedent actions and a higher perceived control than rural officials. Our findings showed that improving municipal officials' competencies and support from public health networks along with a greater investment of time and resources could increase their perceived control and involvement in AT-related policies, especially in rural communities.

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Conflicts of interest disclosure

The authors of the manuscript titled: "MUNICIPAL OFFICIALS' PROPENSITY TOWARD ACTIVE TRANSPORT: A RURAL-URBAN

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