Exploring the social and economic impact of schools on rural communities in Ontario, Canada

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ABSTRACT

The past two decades of educational policy in Ontario has resulted in the amalgamation of smaller local schools into larger sites, and often the closure of schools in smaller rural communities. This trend towards amalgamating rural students into larger communities may have impacts on the vitality of smaller rural communities that lose schools. Our analysis examines the differences between communities with schools compared to communities without schools in rural Ontario, Canada using binomial regression. The results indicate that rural Ontario communities with schools, independent of overall population, tended to have more services in the community like banks, grocery stores, emergency services, libraries, and community centres than communities without schools. These communities with schools also tended to have more residents that have moved into the community within the last year, more affordable and recently constructed housing options, and more school age children compared to the total population in the region. The reduced number of services, reduced population growth, and fewer options for affordable housing mean that school closures do not merely affect the individuals who attend a school, but over the long-term may harm the vitality and socioeconomic performance of the surrounding community.

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1. Background

The past two decades of educational policy in Ontario has resulted in the amalgamation of smaller local schools into larger buildings, and often the closure of schools in smaller rural communities. In recent years, school closures in rural Ontario communities have substantially increased, with over 2000 schools permanently closed since 1990 (Seasons, Irwin, and Rappolt, 2017). In 2017, 600 schools were under review for potential closure with 500 of those schools located in small rural communities outside of midsize to large population centres (Seasons, Irwin, and Rappolt, 2017). Instead of attending school within their local community, many students are forced to attend schools in communities further away from home. This trend towards gathering rural students into larger communities or isolated geographically centred sites, can have wide-ranging impacts on the health, wellbeing, and stability of students, parents, and affected communities. Unfortunately, the accommodation review procedure used by the Ontario Ministry of Education and local school boards often fails to account for the unique challenges of serving the educational needs of rural Ontario communities. It also does not consider broader socioeconomic impacts on communities from a closure of a school or siting of a new school. Though the impacts of these

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closures may also not manifest immediately, the longer-term impacts from these closures, or failure to locate new schools within existing communities, may be observed decades later in economic competitiveness and sociocultural outcomes. School property management is a major public policy issue for many rural Ontario communities, but there is a dearth of spatialized evidence surrounding the impacts of school presence on rural communities.

Despite the claims by rural communities and advocacy organizations (People for Education, 2009) that there are adverse socioeconomic impacts of closing a school or failing to locate a new school near existing communities, there is little evidence to support that claim (Hargreaves et al., 2009). Internationally, the lack of schools in rural communities may hamper population growth, lower economic potential, contribute to public and private amenities becoming unviable, reduce social capital, and lower the attractiveness of the community to new residents (Egelund & Lausten, 2006; Kearns et al., 2009; Lyson, 2002; Solstad, 2009; Witham, 1997). In particular, Kroismayer (2019) found school closures negatively impact socioeconomic trends in rural communities over the long term. However, broader investigations of rural community vitality have found employment opportunities, affordable housing, and public service levels are more predictive of overall community wellbeing than school presence (Barakat, 2015; Egelund & Lausten, 2006; Elshof et al., 2015; Slee & Miller, 2014; Tantarimäki and Törhönen, 2020). Within the Ontario context, Seasons et al. (2017) have found rural communities without a local school can struggle to gather sufficient financial and human resources, fund infrastructure, and support high-quality public services. In addition, school sites tend to provide communities with amenities that may not otherwise be accessible to them, such as recreation facilities, libraries, and gathering space for social groups (Autti & Hyry-Beihammer, 2014; Irwin, 2012; Seasons et al., 2017). Schools may attract and retain more private amenities and public services within small rural communities.

Therefore, what are the differences in the presence of private amenities and public services between communities with schools and communities without schools in rural Ontario, Canada? Does the presence of these amenities and services result in schools being in closer proximity to communities? Our analysis focuses on how the presence or absence of schools in rural communities determines local amenities, services, sociodemographics, and housing market conditions. We first determine differences in private amenity presence, public service provision, sociodemographics, and housing market condition between rural Ontario, Canada communities with schools and communities without schools using binomial regression. We follow with constructing a distance-based model of how these community features predict the proximity of the community's centre to elementary and secondary schools using a generalized linear model. These two analyses provide valuable evidence of how schools may contribute to community vitality and socioeconomic status in rural contexts.

2. Methodology

Our sample includes all areas in Ontario, Canada outside of medium to large population centres (30,000 people), as defined by Statistics Canada. Communities in the sample include small population centres (1,000 – 29,999 people) and designated places (< 1000 people) as defined by Statistics Canada. In addition, other smaller communities (300 – 999 people) were manually added to the sample based on identifying areas with high intersection density. Each community was visually assigned a point at the centre of the built-up area, or the geographic centroid of the defined population centre boundary. Communities with less than 300 people or more than 5,000 people were removed from the sample, as these communities were either too small to delineate meaningful boundaries or were too large becoming outliers in our sample.

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Locations of English Public or Catholic elementary and secondary schools was sourced from the Ontario Ministry of Education. Amenities such as grocery stores, variety stores, pharmacies, doctors and dental offices, banks, emergency service stations such as police stations, fire halls and paramedic stations, libraries, community centres, and public parks were also included in the analysis as different independent variables. These locations were all sourced from DMTI Spatial (2016). All other data was sourced from Statistics Canada (2016). A buffer distance of 3200 metres along the road network around the centre of the community was used to determine the presence of a school and/or other amenities within the community. This distance was selected in consultation with the Community Schools Alliance – an Ontario-specific rural schools advocacy organization – as it represents a reasonable journey to school in rural contexts. A buffer distance of 1200 metres along the road network from the centre of the community was used to select the census dissemination areas (DA) that comprise the community, as DA boundaries do not typically match designated place boundaries. Community centroids were determined by either using the mean centre of the official Statistics Canada Designated Place boundary, or in the case of manually identified communities, the mean centroid of intersections within the visually identified area. Distance from the centre of the community was calculated to the nearest English Public or Catholic elementary (kindergarten to grade 8) and secondary (grade 9 to 12) school. Schools were separated based on grade-level as they are located based on different catchment area criteria by school boards. All buffers and distances were generated along the road network using ArcGIS Pro 2.9.5 Network Analyst Toolbox (Esri 2022), as delineated by the Ontario Ministry of Transportation (2016). Models were run in R, using the glm function in the stats package (R Core Team, 2022). Model coefficients and diagnostics were produced using the gtsummary package (Sjoberg et al, 2021).

The first binomial model was constructed with the presence of a school (0 or 1) in the community set as the dependent variable. Amenities and sociodemographic indicators were set as the independent variables. Given the bifurcation by population size in our sample of communities, we elected to construct two comparative subsamples for the analysis, small communities with 300 to 1500 people (n=268) and large communities with 1501 to 5000 people (n=465). These groups ensure communities are compared against similar peers, potentially revealing differences based on school presence rather than sociodemographic structure or population-scaled amenity presence. The second generalized linear model was constructed with distance to the nearest elementary or secondary school from the community centroid set as the dependent variable. Distance to the nearest school was calculated along the road network. The independent variables include binary indicators of amenity presence, and measures of sociodemographic outcomes.

3. Results

We found of the 733 rural communities in Ontario with more than 300 and less than 5,000 people, 303 (41%) had no schools, 232 (32%) only have one school, and 198 (27%) have two or more schools. Small communities with less than 1500 people tended to not have a school (Table 1), while large communities with more than 1500 people tended to have schools (Table 2). Rural Ontario communities with schools tended to have more services in the community like banks, grocery stores, emergency services, libraries, and community centres. These communities also tended to have more residents that have moved into the community within the last five years, more affordable and recently constructed housing options, and more school age children.

Table 1. Summary of variables by school presence for communities with less than 1500 people

Variable	Com. WITHOUT School, n=164	Com. WITH School, n=104
Bank, in com.	13 (7.9%)	38 (37%)
Grocery, in com.	21 (13%)	39 (38%)
Variety, in com.	21 (13%)	23 (22%)
Pharmacy, in com.	4 (2.4%)	18 (17%)
Doctor, in com.	7 (4.3%)	14 (13%)
Emergency Services, in com.	33 (20%)	42 (40%)
Library, in com.	25 (15%)	41 (39%)
Community Centre, in com.	7 (4.3%)	27 (26%)
Public Park, in com.	17 (10%)	17 (16%)
Total population	994 (746, 1224)	1102 (905, 1310)
# School age children	156 (95, 201)	180 (124, 224)
Median housing value	$250318 (193559, 318222)	$221141 (159590, 276913)
Median household income	$64128 (56699, 71936)	$60341 (53632, 70864)
% Low-income	3.35% (2.25, 4.53)	3.55% (2.75, 4.96)
% Residents	90% (69, 95)	89% (72, 95)
% New dwellings (2011-16)	2.74% (0, 5.28)	2.70% (0, 5.07)
% Move in last year	7.50% (5.60, 10.50)	8.90% (6.80, 11.30)
% Move in last 5 years	25% (22, 30)	27% (23, 31)

Com., community; (IQR), Inter-Quartile Range

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Table 2. Summary of variables by school presence for communities with more than 1500 people

Variable	Com. WITHOUT School, n=131	Com. WITH School, n=334
Bank, in com.	18 (14%)	243 (73%)
Grocery, in com.	24 (18%)	224 (67%)
Variety, in com.	23 (18%)	182 (54%)
Pharmacy, in com.	5 (3.8%)	158 (47%)
Doctor, in com.	10 (7.6%)	206 (62%)
Emergency Services, in com.	42 (32%)	253 (76%)
Library, in com.	26 (20%)	197 (59%)
Community Centre, in com.	21 (16%)	182 (54%)
Public Park, in com.	40 (31%)	231 (69%)
Total population	1978 (1681, 2444)	2930 (2187, 4820)
# School age children	340 (282, 444)	512 (366, 778)
Median housing value	$325353 (266699, 440392)	$260185 (213764, 333568)
Median household income	$71760 (61161, 82994)	$63484 (55912, 75062)
% Low-income	2.97% (2.18, 3.91)	3.83 (2.67, 5.22)
% Residents	94% (81, 97)	95% (91, 97)
% New dwellings (2011-16)	3.90% (2.00, 5.30)	3.70% (2.00, 5.90)
% Move in last year	8.70% (6.95, 10.83)	10.01% (8.05, 12.04)
% Move in last 5 years	27% (24, 30)	31% (27, 35)

Com., community; (IQR), Inter-Quartile Range

The first set of models determine the which amenities, services, and sociodemographic factors contribute to the presence of a school (Table 3). In small communities with 300 to 1500 people, having a bank means the community is 2.73 times more likely to have a school, and having a community centre means it is 3.72 times more likely to have a school. Small communities with at least one school also have slightly lower housing values. School presence did not correlate with the availability of other amenities in a community, or more population-centric predictors of community size.

Large communities with 1501 to 5000 people, having a bank meant the community was 3.17 times more likely to have a school. Large communities with emergency services were 2.80 times more likely to have a school, and those with a public park were 1.93 times more likely to have a school. Housing values were not correlated with school presence in large communities. However, for every percentage point increase in new dwellings constructed from 2011 to 2016, it is 1.17 times more likely the community has a school. Population-centric predictors of community size had no correlation with school presence.

Table 3. Model results for school presence within 3200 metres of community centroid

Variable	Small Communities *OR (95% CI)* *p-value*	Large Communities *OR (95% CI)* *p-value*
Bank, in community	**2.73 (1.16, 6.62)** **0.02**	**3.17 (1.55, 6.64)** **<0.01**
Grocery, in community	1.55 (0.71, 3.34) 0.30	1.46 (0.72, 2.97) 0.30
Variety, in community	0.68 (0.27, 1.62) 0.40	1.81 (0.92, 3.61) 0.08
Pharmacy, in community	3.04 (0.72, 16.2) 0.20	2.49 (0.83, 8.62) 0.12
Doctor, in community	0.74 (0.19, 2.77) 0.70	2.30 (0.92, 6.03) 0.08
Emergency Services, in community	1.93 (0.99, 3.74) 0.05	**2.80 (1.57, 5.06)** **<0.01**
Library, in community	1.90 (0.88, 4.08) 0.10	1.63 (0.86, 3.13) 0.14
Community Centre, in community	**3.72 (1.44, 10.6)** **<0.01**	1.10 (0.51, 2.35) 0.80
Public Park, in community	1.76 (0.72, 4.27) 0.20	**1.93 (1.00, 3.78)** **0.05**
Total Population (hundreds)	1.10 (0.92, 1.32) 0.30	0.99 (0.91, 1.07) 0.80
# School age children (hundreds)	0.88 (0.33, 2.28) 0.80	1.28 (0.82, 2.01) 0.30
Median housing value ($ tens)	**0.96 (0.92, 1.00)** **0.04**	0.99 (0.95, 1.03) 0.50
Median household income ($ thousands)	1.04 (1.00, 1.08) 0.06	0.97 (0.92, 1.03) 0.30
% Low-income	1.14 (0.98, 1.33) 0.08	0.88 (0.69, 1.13) 0.30
% Residents	1.00 (0.98, 1.02) 0.70	1.01 (0.98, 1.04) 0.50
% New dwellings (2011-16)	1.05 (0.96, 1.15) 0.30	**1.17 (1.04, 1.33)** **0.01**
% Move in last year	1.07 (0.97, 1.18) 0.20	0.97 (0.85, 1.12) 0.70
% Move in last 5 years	0.99 (0.93, 1.05) 0.70	0.99 (0.91, 1.07) 0.80
Model Diagnostics	R^2 = 0.33 AIC = 322 n = 268	R^2 = 0.58 AIC = 349 n = 465

OR, Odds Ratio; CI, Confidence Interval; p-value <0.05 are **bolded**

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Table 4. Model results for distance to nearest elementary or secondary school from rural DA centroids

Variable		Elementary Schools *β (95% CI)* *p-value*	Secondary Schools *β (95% CI)* *p-value*
Bank, in community		**-1572 (-2697, -447)** **<0.01**	-1731 (-4592, 1131) 0.20
Grocery, in community		**-1047 (-2054, -40)** **0.04**	-412 (-2974, 2150) 0.80
Variety, in community		72 (-887, 1031) 0.90	-775 (-3215, 1665) 0.50
Pharmacy, in community		-312 (-1522, 897) 0.60	-1741 (-4817, 1335) 0.30
Doctor, in community		-233 (-1500, 1035) 0.70	-843 (-4068, 2382) 0.60
Emergency Services, in community		**-1056 (-1947, -164)** **0.02**	-1276 (-3545, 992) 0.30
Library, in community		**-1472 (-2381, -562)** **<0.01**	1211 (-1103, 3524) 0.30
Community Centre, in community		**-1065 (-2118, -12)** **0.04**	761 (-1917, 3438) 0.60
Public Park, in community		-549 (-1551, 454) 0.30	415 (-2315, 2964) 0.70
Total Population (hundreds)		-30 (-120, 60) 0.50	**-400 (-629, -171)** **<0.01**
# School age children (hundreds)		188 (-319, 695) 0.50	**1453 (164, 2743)** **0.02**
Median housing value ($ tens)		39 (-16, 94) 0.20	-37 (-178, 103) 0.60
Median household income ($ thousands)		-53 (-115, 8.6) 0.09	-90 (-246, 67) 0.30
% Low-income		-159 (-402, 83) 0.20	388 (-229, 1004) 0.20
% Residents		**-107 (-138, -75)** **<0.01**	**-282 (-363, -201)** **<0.01**
% New dwellings (2011-16)		-76 (-204, 52) 0.20	**406 (80, 732)** **0.01**
% Move in last year		**-198 (-358, -37)** **0.01**	**-419 (-828, -11)** **0.04**
% Move in last 5 years		41 (-54, 137) 0.40	-32 (-274, 211) 0.80
Regional Area, Compared to Central;	East	1496 (-56, 3048) 0.05	-675 (-4623, 3273) 0.70
	North	**2193 (434, 3951)** **0.01**	**7501 (3028, 11975)** **<0.01**
	West	**1784 (378, 3190)** **0.01**	-621 (-4197, 2956) 0.70

Model Diagnostics	R^2 = 0.32 AIC = 14653 n = 733	R^2 = 0.33 AIC = 16,022 n = 733

β, Beta in metres; CI, Confidence Interval; p-value <0.05 are **bolded**

The second set of models consider distance to elementary and secondary schools based on various community factors (Table 4). Communities with a bank or library had elementary schools approximately 1.5km closer to their centre. Communities with grocery stores, emergency services, or community centres had elementary schools approximately 1km closer to their centre. For every percentage point increase in the number of year-round residents, or the number of residents that moved into the community within the last year, elementary schools tended to be 107m or 198m closer to their centre, respectively. Communities in Northern and Western Ontario, as compared to Central Ontario, were substantially further away from elementary schools.

Secondary schools were not closer to a community's centre based on any amenity being present within the community. For every hundred more people, secondary schools were 400m closer, while for every hundred more school age children, secondary schools were 1.4km further away. For every percentage point increase in the number of year-round residents, secondary schools were 282m closer. For every percentage point increase in the number of residents that moved into the community within the last year, secondary schools were 419m closer. For every percentage point increase in the number of dwellings built between 2011 and 2016, secondary schools were 406m further away. Communities in Northern Ontario were substantially further away from secondary schools, as compared to Central Ontario.

4. Discussion

There is a comparative advantage for communities with schools. Communities with schools tend to have more private amenities and public services. The presence of a school aligns with both public and private investment in the community, creating a possible "lock-in" effect. In smaller communities and at the elementary school level, the number of school age children in a community does not predict having a school which runs counter to the logical service delivery expectation for education patterns. For secondary schools, the more school age children, these schools tended to be even further away from communities. In addition, communities in Northern and Western Ontario tend to be much further away from elementary and secondary schools as compared to Central Ontario. Overall, there is a clear lack of geographical rationality to school siting in Ontario, Canada.

Preliminary evidence suggests young Ontario families are rapidly departing major population centres in search of housing that accommodates their needs (Moffatt, 2021; Moffatt, 2022). Moreover, communities that can gain approval for the construction of a new subdivision may be more attractive given cheaper housing availability and, most importantly, being able to secure funds and land for the construction of a new school. However, this trend of new construction may result in the closure of an older school somewhere else in the same school board, potentially impacting the economic growth potential of another smaller community in the same regional area.

Although it would be expected that both housing value and median income would be higher in communities that have a school present (Irwin & Livy, 2021), our study has revealed that this is not the case. The most likely reason for higher housing values and median incomes in

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communities without schools is that there is a higher proportion of retirement age (or near retirement age) individuals in those communities without schools, while young families with school-age children may be seeking out cheaper communities with schools. Given Ontario's population growth patterns, it would appear young families are seeking out communities that have schools, and in turn, better services and amenities available to them. Long-term, this trend may result in communities that can secure funding for a new elementary school may have better socioeconomic outcomes. Longitudinal studies with an interrupted time series design would be the most effective in determining the impacts of these school siting decisions.

Although there are a higher percentage of schools where there are new cheaper dwellings (and vice-versa) it is not clear which came first. Ontario's system of capital construction for schools may mean that new development brings the land, and expected population, for a new school. Therefore, communities with recent new developments may attract a new school, or the relocation of an older school from another community. Unfortunately, under the current governance model, local area municipalities have no influence over school board capital infrastructure decisions. Many smaller municipalities may even be forecasting growth that would support a school with declining enrolment. However, the school board for the same regional area may be considering closing the school given short-term operational demands to meet growth elsewhere. Municipalities have no regulatory tool to prevent a school closure and disposition of land should the school board choose to do so in the short-term to meet new growth elsewhere in the board. This lack of local control and planning responsibility may explain the lack of rational outcomes to be expected in the distribution of schools across rural areas of the province.

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