



➤ The Diminishing Returns to Density:
Built form and soft infrastructure costs

Murtaza Haider

Visiting Scholar

Institute on Municipal Finance and Governance

Munk School of Global Affairs

University of Toronto

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Institute on Municipal
Finance & Governance

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Infrastructure and built form

- Studies show that hard infrastructure costs are lower for high-density, compact built form
- Research suggests that the primary reasons for the fiscal differences between sprawl and compact development are related to their differences in density and connectivity.
- Sprawling cities and suburbs spend more on building and maintaining hard infrastructure
- What about the soft/community infrastructure costs?



The quest for density

1. Low density sprawl: bad
2. High-density smart growth: good
 - Cervero and Kockelman:
 1. Density alone is not enough, Adopt 3Ds for travel demand
 2. Land use Diversity
 3. Pedestrian oriented Designs
 - “Thus it supports the contention of new urbanists and others that creating more compact, diverse, and pedestrian-orientated neighborhoods, in combination, can meaningfully influence how Americans travel.”

Dense and densibility, Peshawar



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Wheels on the bus go round and round ...



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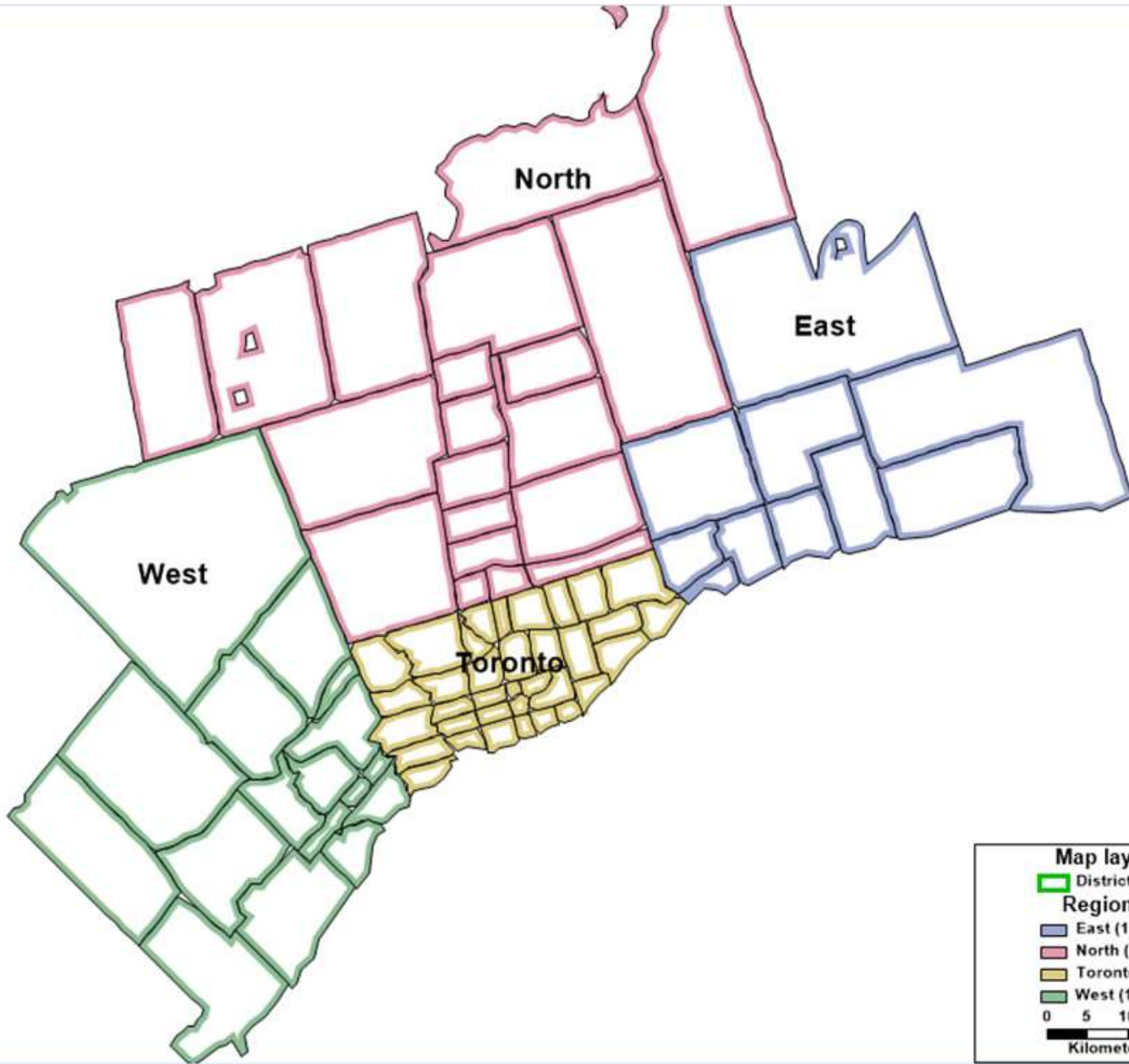


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How much of density?

- How big the influence?
 1. Remember the OOMPH factor by Deirdre McCloskey
- Cervero and Kockelman:
 1. “The research finds that density, land-use diversity, and pedestrian-oriented designs generally reduce trip rates and encourage non-auto travel in statistically significant ways, though their influences appear to be fairly marginal.”

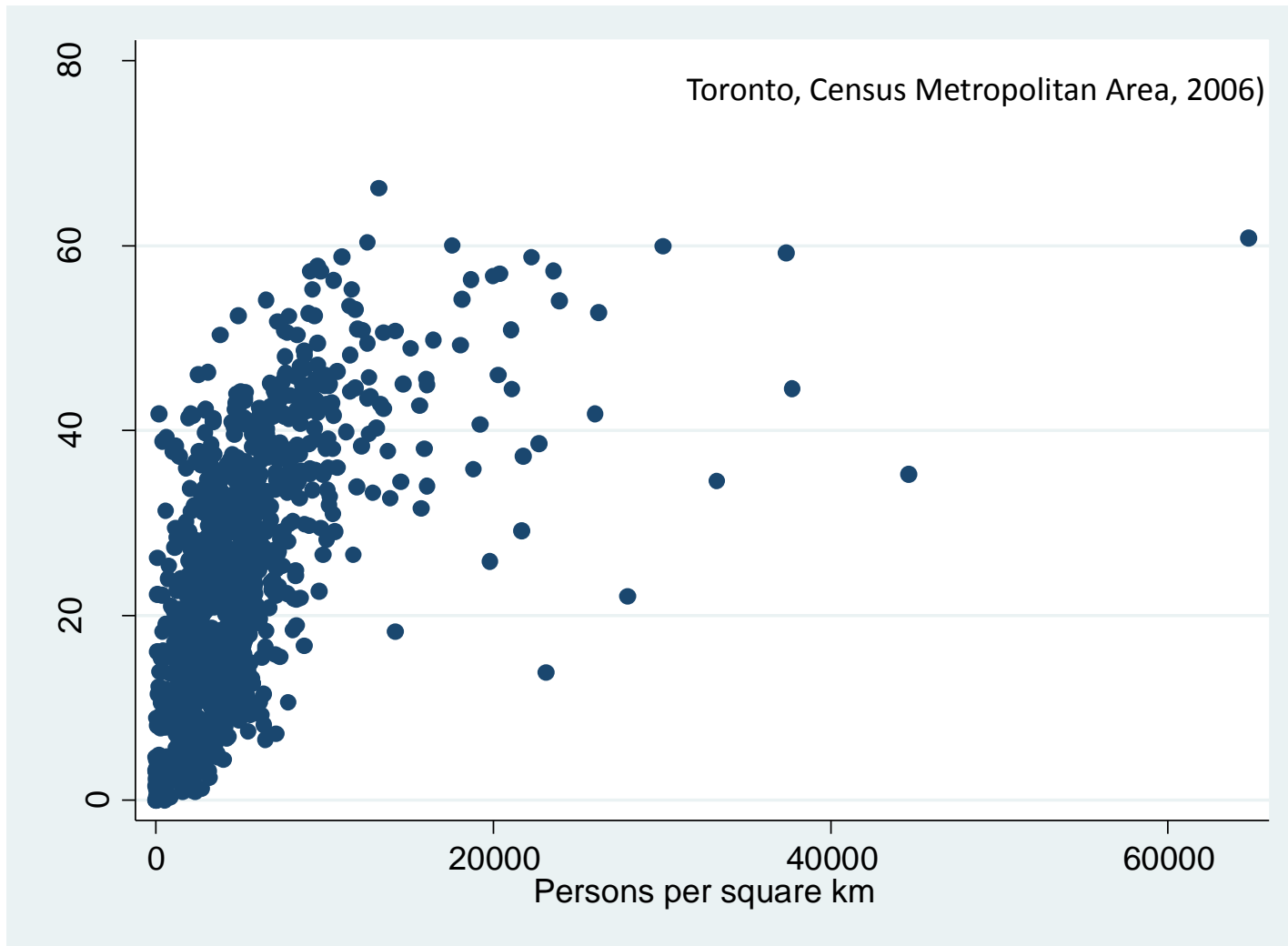


Map layers

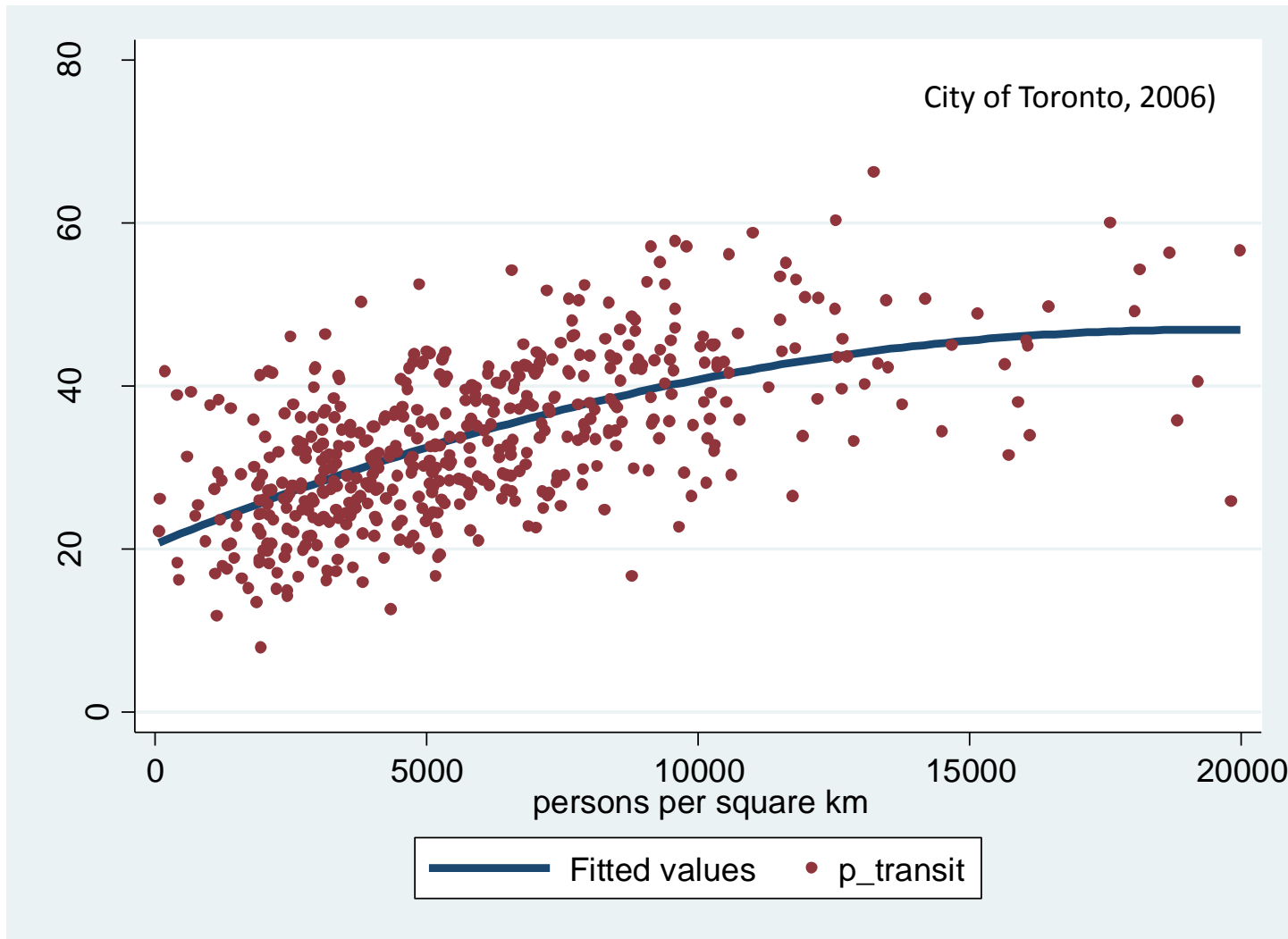
- Districts
- Region_2**
- East (1)
- North (1)
- Toronto (1)
- West (1)

0 5 10 15
Kilometers

Population Density and Transit commutes (%)



Population Density and Transit commutes (%)





Diminishing Returns to Density

Variable	Transit_rid~p
popdens	.00272358***
popdens_sq	-7.056e-08***
_cons	20.608825***
N	506
r2_a	.37843995

legend: * p<0.05; ** p<0.01; *** p<0.001



So what about soft infrastructure?

Purpose: Examine the linkages between the urban/built form and the costs of providing social infrastructure in Peel.

- How costs differ as a function of alternative urban forms in the Peel Region?

Services: Spending on Ontario Works, social housing support for low-income residents, child care subsidies, health (paramedic, emergency and dental hygiene of school-aged children in particular) and para-transit services.



Peel Region snapshot, 2006

Statistics	Peel	Mississauga	Brampton	Caledon
Population, 2006	1,159,405	668,549	433,806	57,050
Area (Km2)	1242.4	288.5	266.7	687.2
National Pop. Rank (CSDs)	n/a	6	11	83
Pop. Change 01/06	17.2%	9.1%	33.3%	12.7%
Pop. Density, 2006 (ha)	9.3	23.2	16.3	0.83
Owner Occupied	78%	75%	81.2%	91%
Single Detached Houses	47%	40.9%	51.8%	85.7%
Immigrants	48.6%	51.6%	47.8%	20.8%
Recent Immigrants	10.2%	11.1%	9.9%	0.9%



Community infrastructure costs (2007)

- Ontario Works: \$147m
- Social housing: \$113m
- Health services: \$161m
- Protection services: \$264m
- Transhelp: \$10.1m

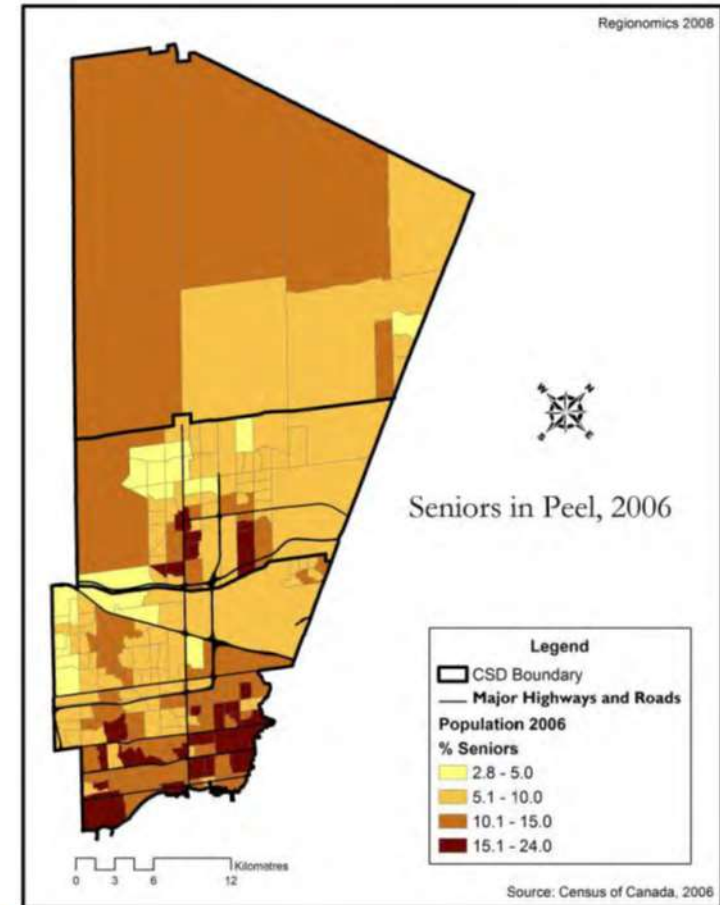


In need population

- Seniors
- Lone-parents
- Recent immigrants
- Low-income households

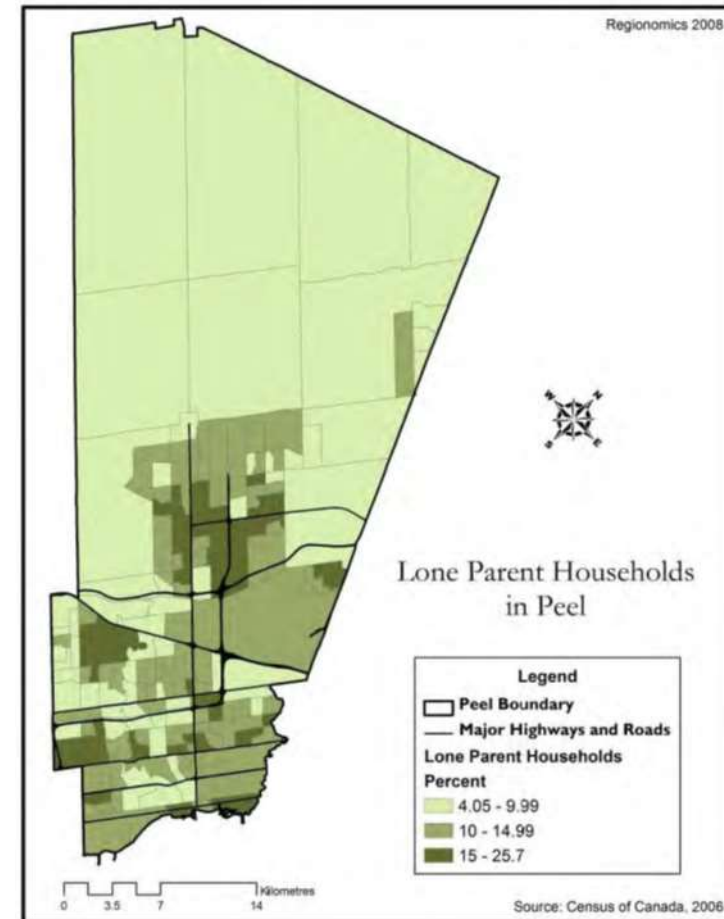
In need population

- Seniors



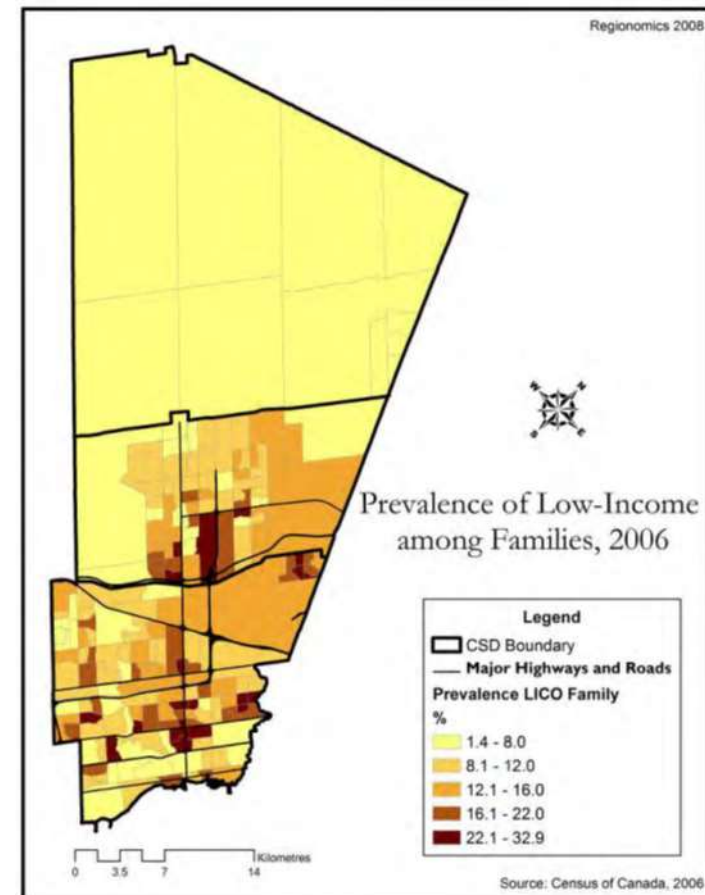
In need population

- Lone-parents



In need population

- Low-income families

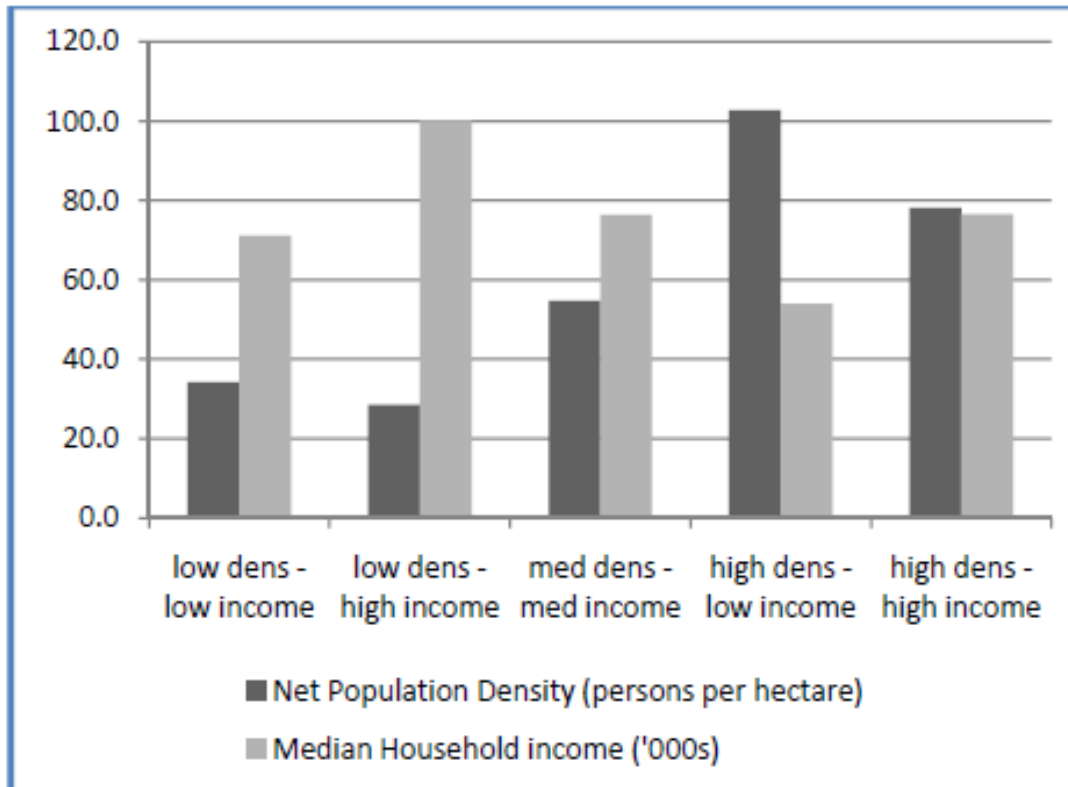




Five urban typologies

1. Low density, high income
2. Low density, low income
3. Medium density, medium income
4. High density, low income
5. High density, high income

Density and Income: 2 sides of the ...



Ontario Works Program- Poisson

Table 48: Poisson regression for OWP recipients using urban typologies

Variable	Coefficients
ct_cat2	
2	1.398***
3	1.676***
4	1.542***
5	1.627***
CT pop06 in thousands	1.118***
children, 0-4 years of age %	1.039***
children, 5-14 years of age %	0.978***
youth, 15-24 years of age %	1.015*
seniors, living with relatives %	1.303***
seniors, living with non-relatives %	1.454***
seniors, living alone %	0.977**
visible minority %	1.002***
moved in last year %	1.005**
renter-occupied %	1.012***
lone-parent %	1.055***
travel to work by car, passenger %	1.016***
travel to work by transit %	0.990***
walk to work %	1.036***
Constant	5.412***
N	205
r2_p	.67

Legend: * p<0.05; ** p<0.01; *** p<0.001

Ontario Works Program- OLS

Table 50: Regression for OWP spending using urban typologies

Variable	Coefficients
ct_cat2	
2	-153.953
3	14.404
4	-524.188
5	282.922
children, 0-4 years of age %	60.929
children, 5-14 years of age %	3.817
youth, 15-24 years of age %	174.672*
seniors, 65 years and over %	58.548
visible minority %	1.690
llico, economic family %	133.498***
renter-occupied %	3.040
lone-parent %	63.924**
road density per km	-1.496
percent of area in commercial land use	-11.307
percent of area in government land use	-2.959
percent of area that is parkland	0.332
percent of area in industrial land use	-12.613*
Constant	529.447
N	205
r2_a	.29

Legend: * p<0.05; ** p<0.01; *** p<0.001



Ontario
Works
Program-
Average \$

Table 49: Ontario Works spending for five urban typologies

categories	Average (\$)	Std. Dev.	Freq.
low dens - high income	5,344	1,586	42
low dens- low income	5,751	1,265	27
med dens - medium income	6,174	1,550	68
high dens – low income	6,772	1,141	42
high dens - high income	6,415	1,102	26
Total	6,102	1,466	205



➤ Social
Housing-
Average \$

Table 51: The breakdown of social housing by urban typologies

categories	Mean	Std. Dev.	Freq.
low dens - high income	5,287	3,457	14
low dens- low income	7,930	7,628	11
med dens - medium income	6,906	3,744	30
high dens – low income	7,581	3,002	4
high dens - high income	6,584	4,416	7
Total	6,740	4,535	66



Community infra ... 1

- There exists a systematic relationship between income/other socio-demographic factors along with density and the costs associated with providing community infrastructure.
- High-density neighbourhoods in general generated more demand for the Ontario Works in Peel spending
- The per capita spending for Ontario Works in Peel revealed that low-income identifiers and single parents were statistically significant determinants of higher spending, all other factors being equal.



Community infra ... 2

- Social housing spending was found to be correlated with high density-low income neighbourhoods and the percentage of households below the low-income cut-off.
- For childcare spending, the housing typology indicators were not statistically significant predictors. The higher incidence of children between the ages of five and 14 years and the rental households were found to be significant predictors of childcare spending.




Community infra ... 3

- Higher population densities were positively correlated with both property and violent crimes.
- Similarly, a positive correlation between lone-parent families headed by females and violent crime was also observed.
- We believe that the underlying determinant of crime is in fact poverty and not necessarily built form.




Conclusions ... 1

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- Built form proxies have a lower impact on community infrastructure spending than income and poverty indicators.
 - Low-income households, seniors living with non-relatives, and lone parents (mostly single mothers) are the groups that generate higher demand for community infrastructure services.




Conclusions ... 2

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- Given that there exists a positive correlation between low-income and high densities, it is likely that the groups generating higher demand for social services may also reside in neighbourhoods with higher population densities because of the lower shelter costs made possible by smaller housing units.
 - Therefore, any positive correlation observed between higher community infrastructure spending and population density is perhaps is a spurious correlation, which in fact results from the correlation between low income and higher population densities.



Implications

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- As the Region intends to increase its population and employment densities to comply with the provincial Places to Grow Act, it is important that the planning authorities in the Region ensure that higher densities do not necessarily result in concentrated, low-income neighbourhoods.
 - If the densification process in Peel Region results in higher density/low-income neighbourhoods in the future, and if the current association between higher densities and lower incomes persist in the future, the densification process may also result in generating additional demand for community infrastructure spending.



Thank you