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Supplementary appendix

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Supplemental Materials For --- Nursing home crowding and its association with outbreak-associated respiratory infection prior to the COVID-19 pandemic (2014–2019) in Ontario, Canada: a cohort study of 588 homes – Table of Contents

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Appendix Table 1. Unadjusted and adjusted associations of nursing home characteristics with outbreak-associated respiratory infections, deaths, and outbreak frequency and outbreak size in Ontario, 2014-2019.

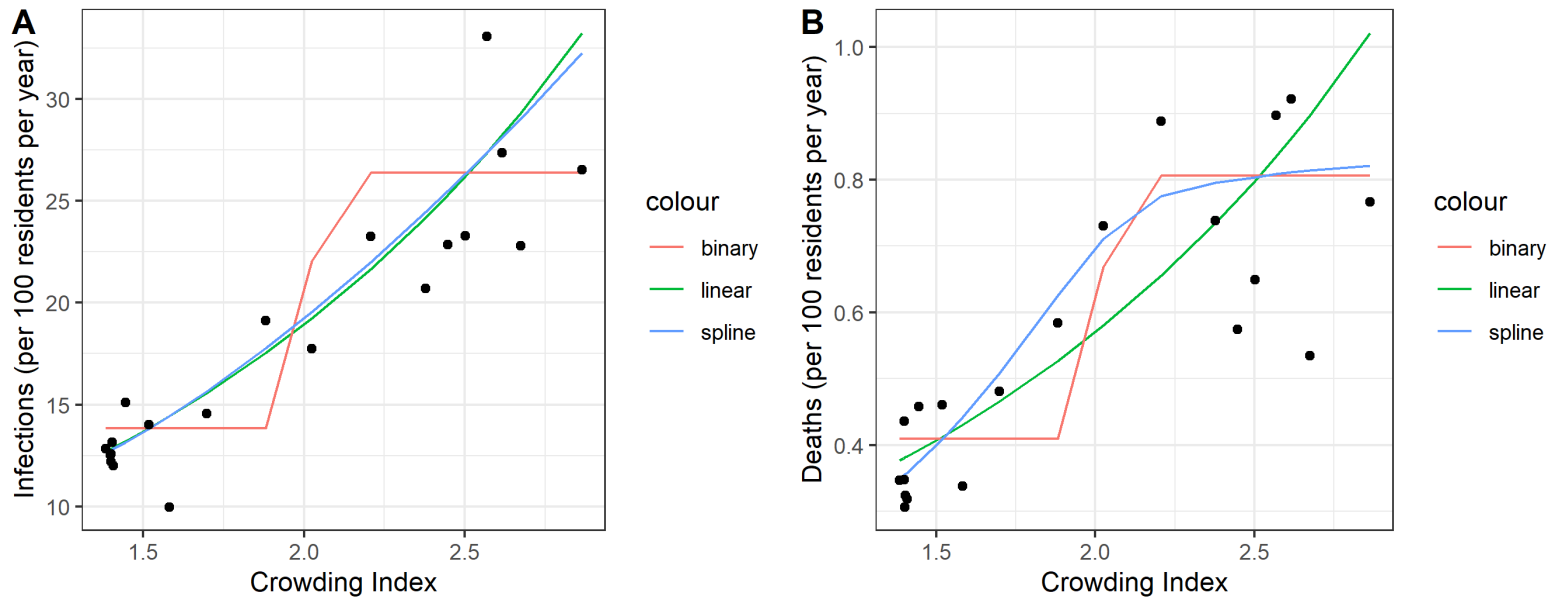
Term	Infection incidence (RR, 95%CI)		Death incidence (RR, 95%CI)		Outbreak frequency (RR, 95%CI)		Outbreak size (RR, 95%CI)	
	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted	Unadjusted	Adjusted
Crowding index (per 1 resident per room increase)	1.92 (1.74, 2.11)	1.89 (1.64, 2.17)	1.96 (1.68, 2.28)	2.34 (1.88, 2.92)	1.02 (0.92, 1.13)	1.42 (1.25, 1.61)	1.79 (1.65, 1.94)	1.28 (1.19, 1.37)
Nursing home size								
Spline basis dimension 1		0.72 (0.52, 0.99)		1.02 (0.62, 1.65)		3.39 (2.55, 4.51)		0.22 (0.19, 0.26)
Spline basis dimension 2		1.10 (0.57, 2.12)		0.56 (0.19, 1.65)		21.0 (11.3, 39.0)		0.04 (0.03, 0.06)
Spline basis dimension 3		0.89 (0.46, 1.73)		0.78 (0.31, 2.00)		7.62 (4.43, 13.11)		0.12 (0.09, 0.16)
Sector								
Municipal		Reference		Reference		Reference		Reference
For-profit		1.06 (0.90, 1.25)		1.07 (0.83, 1.37)		0.94 (0.81, 1.09)		1.12 (1.04, 1.21)
Non-profit		1.01 (0.84, 1.20)		1.19 (0.91, 1.56)		0.95 (0.82, 1.12)		1.06 (0.97, 1.15)
Region								
Central West		Reference		Reference		Reference		Reference
Central East		0.94 (0.80, 1.10)		1.15 (0.91, 1.46)		1.06 (0.92, 1.21)		0.90 (0.83, 0.96)
Eastern		0.89 (0.74, 1.05)		1.05 (0.81, 1.37)		0.84 (0.72, 0.98)		1.04 (0.95, 1.13)
North		0.91 (0.72, 1.15)		1.05 (0.73, 1.50)		0.84 (0.68, 1.04)		1.08 (0.97, 1.21)
South East		0.90 (0.75, 1.07)		0.97 (0.74, 1.28)		0.88 (0.75, 1.04)		1.02 (0.94, 1.11)
Toronto		0.87 (0.71, 1.05)		0.58 (0.43, 0.78)		0.83 (0.70, 0.98)		1.05 (0.96, 1.15)
Nursing home resident demographics								
Mean age (per 5-y increase)		1.08 (0.94, 1.24)		1.25 (1.01, 1.55)		1.03 (0.91, 1.17)		1.03 (0.96, 1.10)
Female (per 5% change)		1.01 (0.97, 1.06)		1.01 (0.95, 1.08)		1.01 (0.97, 1.05)		1.01 (0.99, 1.03)
Nursing home resident comorbidities (per 5% change in prevalence)								
Dementia		0.99 (0.96, 1.01)		1.01 (0.97, 1.05)		1.01 (0.98, 1.03)		0.98 (0.97, 1.00)
Diabetes		0.99 (0.95, 1.04)		0.99 (0.93, 1.07)		1.00 (0.96, 1.04)		1.00 (0.98, 1.02)
Chronic heart failure		0.90 (0.80, 1.02)		1.03 (0.85, 1.24)		0.94 (0.84, 1.05)		0.98 (0.92, 1.04)
Renal failure		0.97 (0.88, 1.08)		0.99 (0.84, 1.15)		0.97 (0.88, 1.06)		1.00 (0.95, 1.05)
Cancer		1.01 (0.90, 1.12)		1.00 (0.84, 1.19)		1.01 (0.92, 1.12)		0.99 (0.94, 1.05)
COPD		1.03 (0.93, 1.15)		0.91 (0.77, 1.08)		1.00 (0.91, 1.10)		1.03 (0.98, 1.09)
Mean resident ADL hierarchy		0.97 (0.83, 1.14)		1.06 (0.83, 1.36)		0.99 (0.85, 1.14)		0.97 (0.90, 1.05)

Appendix Table 2. Sensitivity analyses of modeling decision impact on the coefficient estimates for crowding in the analysis of the incidence of respiratory infections in nursing homes.

Sensitivity analysis	Unadjusted Crowding				Adjusted Crowding			
	Index RR	2.5% CL	97.5% CL	SE	Index RR	2.5% CL	97.5% CL	SE
Original analysis	1.915	1.735	2.113	0.050	1.888	1.641	2.171	0.071
Model fitted using quasipoisson family	1.782	1.628	1.951	0.046	1.721	1.505	1.969	0.068
Negative binomial model fitted in MASS	1.915	1.734	2.116	0.050	1.887	1.639	2.171	0.070
Adjustment of nursing home size								
Quintiles					1.859	1.613	2.142	0.072
Linear					1.879	1.643	2.149	0.068

Abbreviations: CL, confidence limit; RR, relative risk; SE, standard error.

Appendix Figure 1. A comparison of binary, linear, and spline-based modeling of the crowding effect.



Appendix Table 3. Nursing-home crowding index risk ratio for respiratory pathogen-specific outbreak-associated infections and deaths.

Pathogen Group	Adjusted infection incidence (RR, 95%CI)	Adjusted death incidence (RR, 95%CI)
Single pathogens		
Coronaviruses	1.42 (0.75, 2.71)	1.80 (0.54, 6.01)
Human Metapneumovirus	1.96 (0.98, 3.90)	2.24 (0.95, 5.25)
Human Parainfluenza Virus	1.85 (1.01, 3.39)	1.74 (0.87, 3.48)
Influenza A	1.59 (1.35, 1.86)	1.67 (1.32, 2.12)
Influenza B	1.82 (1.24, 2.68)	2.15 (1.32, 3.51)
Respiratory Syncytial Virus	2.00 (1.22, 3.26)	2.31 (1.24, 4.32)
Rhinovirus/enterovirus	2.84 (1.91, 4.22)	4.09 (2.24, 7.44)
Other	1.37 (0.39, 4.80)	2.44 (0.53, 11.2)
Multiple pathogens	2.52 (1.42, 4.49)	2.55 (1.38, 4.72)
Unidentified	1.94 (1.51, 2.50)	2.25 (1.41, 3.59)
Overall estimate (based on meta-analysis)	1.89 (1.62, 2.20)	2.15 (1.75, 2.65)