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Can a Voluntary Isolation Centre Reduce Secondary Transmission of SARS-CoV-2 in Households?

A Matched Cohort Study

Presented at Public Health Ontario Rounds

On April 1, 2025

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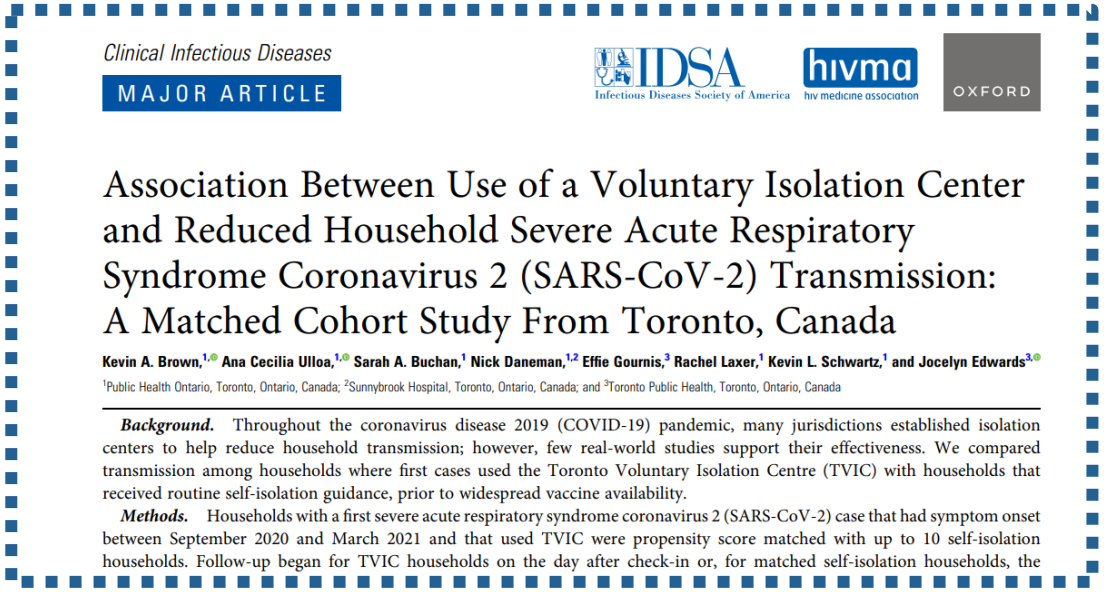

Clinical Infectious Diseases

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Association Between Use of a Voluntary Isolation Center and Reduced Household Severe Acute Respiratory Syndrome Coronavirus 2 (SARS-CoV-2) Transmission: A Matched Cohort Study From Toronto, Canada

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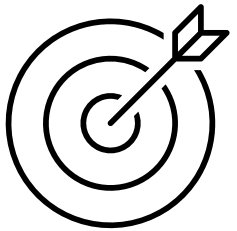
Background. Throughout the coronavirus disease 2019 (COVID-19) pandemic, many jurisdictions established isolation centers to help reduce household transmission; however, few real-world studies support their effectiveness. We compared transmission among households where first cases used the Toronto Voluntary Isolation Centre (TVIC) with households that received routine self-isolation guidance, prior to widespread vaccine availability.

Methods. Households with a first severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) case that had symptom onset between September 2020 and March 2021 and that used TVIC were propensity score matched with up to 10 self-isolation households. Follow-up began for TVIC households on the day after check-in or, for matched self-isolation households, the

Learning Objectives



By the end of this presentation, participants will be able to:

1. Describe the role of a voluntary isolation centre in a COVID-19 public health response
2. Describe the uptake and impact of a voluntary isolation centre in reducing secondary COVID-19 household transmission in Toronto
3. Discuss how the use of voluntary isolation centres could be applied in future responses to diseases of public health significance, particularly those with high likelihood of household transmission and high severity of disease

Presentation Outline

1. Evidence for a Voluntary Isolation Centre
2. Overview of the Toronto Voluntary Isolation Centre (TVIC)
3. TVIC Evaluation
    - TVIC Process Evaluation
    - TVIC Outcome Evaluation
4. TVIC Outcome Evaluation Results
5. Limitations, Discussion, and Implications

Date	COVID-19 Pandemic Milestone
January 25, 2020	Toronto Public Health notified of first case of COVID-19 in Toronto
March 11, 2020	World Health Organization declares pandemic
March 17, 2020	Government of Ontario declares an emergency under the Emergency Management and Civil Protection Act
April 1, 2020	Toronto Public Health issues self-isolation Class Order
September 12, 2020	Toronto Public Health opens Canada's first COVID-19 voluntary isolation site
September 12, 2020 to March 15, 2021: Evaluation Study Period	
December 15, 2020	Availability of the COVID-19 vaccine to vulnerable seniors and healthcare workers
March 12, 2021	Availability of the COVID-19 vaccine to: • Older adults between 60-79 years of age; • Individuals with specific health conditions and some primary caregivers; • People who live and work in congregate settings and some primary caregivers; • People who live in hot spots with high rates of death, hospitalizations and transmission; and, • Certain workers who cannot work from home.
April 2, 2021	General availability of COVID-19 vaccine to non-healthcare worker public

Evidence for a Voluntary Isolation Centre

Household Transmission of COVID-19

- During the pandemic, a person infected with COVID-19 was required to self-isolate to prevent transmission of COVID-19 in the home and community
- Not everyone was able to adhere to physical distancing and hygiene measures within a home to prevent transmission of COVID-19
- Between December 2019 and April 2020, 17% of household contacts of cases acquired polymerase chain reaction(PCR)-confirmed COVID-19 infection[1]
- A global estimate of household attack rates in the period from July 2020 through March 2021 was even higher (31%)[2], likely due to the emergence of more transmissible COVID-19 variants[3]

Evidence for Isolation Centres

- Isolation centres can provide a safe space to voluntarily isolate
- Isolation centres can reduce household transmission and reserve health facility resources for more seriously ill patients[4]
- Testing, alongside isolation and quarantine, were pillars of the COVID-19 pandemic response globally
- Isolation centres were opened in Canada, the United States, and across Europe and Asia

Evidence for Voluntary Isolation Centres

- Few epidemiologic studies have quantified the potential benefit of voluntary isolation centres in the real-world

Cochrane Review of the Use of Quarantine for Control of SARS-CoV-2[5]

- No randomized studies
- Only 4 observational studies, all lacked a “no-quarantine” control group

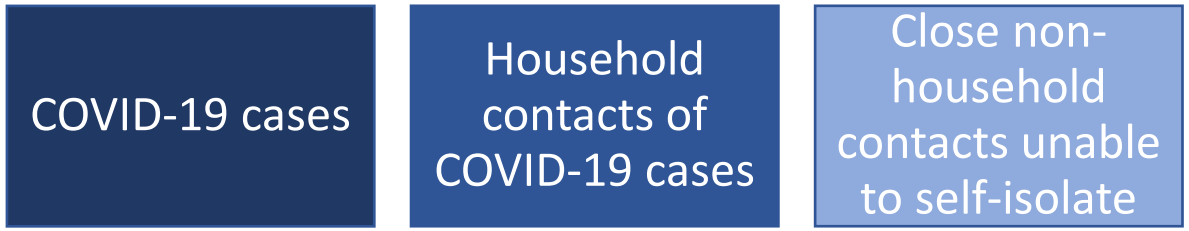
Study from Barcelona, Spain[6]

- 44 households that used an isolation centre and 45 households that did not
- 67% increase in odds of secondary transmission when first cases isolated at home compared with the isolation centre

Overview of the TVIC

TVIC

- Established as a public health strategy to prevent the spread of COVID-19 in Toronto
- Funded by the Public Health Agency of Canada
- Operated between September 12, 2020 and March 31, 2023
- Designed for those who cannot safely isolate at home:



TVIC Goals

1. Decrease household COVID-19 transmission

2. Provide a safe self-isolation space for Toronto residents who were unable to effectively self-isolate at home

Toronto Voluntary Isolation Centre

TVIC Features

TVIC Supports

- Free transportation to and from the TVIC
- Clean private room with ensuite bathroom
- Three meals and two snacks/day
- 24/7 support staff and security, access to concierge
- Cable TV, Wifi, telephone for local calls
- Language interpretation services available by phone
- Laundry services

Toronto Public Health Case Management Onsite

- Provided information to guests about their stay
- Completed daily check-in by phone
- Answered questions related to COVID-19
- Facilitated onsite testing for contacts that developed symptoms while at the TVIC

Referrals to the TVIC

Toronto Public Health Case and Contact

- Communicable disease investigators contacted COVID-19 cases in Toronto to ask if cases or household contacts had space to self-isolate
- If not, case/contact was assessed and referred to the TVIC

Self-Referrals

- Individuals self-referred by calling the COVID-19 Hotline

Provider Referrals

- Service providers referred individuals directly to Toronto Public Health by contacting the TVIC Operations Managers

Eligibility Criteria for TVIC Admission

1. COVID-19 diagnosis (within 5 days of symptom onset or test date) or a household contact of someone with COVID-19 (within 5 days of case's symptom onset)
2. Over the age of 18 years
3. Non-smoker, or able to isolate for the duration without smoke breaks
4. No existing acute or chronic health condition requiring ongoing medical care
5. Does not require hospitalization for COVID-19
6. Not a sole care provider for a household member
7. Can commit to the full isolation period

TVIC Evaluations

1. Process Evaluation 2021
2. Outcome Evaluation 2024

1. TVIC Process Evaluation

Toronto Public Health partnered with Public Health Ontario

Used a mixed methods developmental evaluation approach

Data were collected between September 2020 and March 2021

The TVIC provided a safe self-isolation space for Toronto residents who were unable to effectively self-isolate at home

Recommendation #8: Conduct an outcome evaluation to determine if the TVIC reduced the risk of household transmission of COVID-19

2. TVIC Outcome Evaluation

Toronto Public Health partnered with Public Health Ontario

Project team: Scientist, Epidemiologist, Associate Director, Program Evaluator

Was the TVIC an effective strategy in preventing household transmission of COVID-19 in the homes of those who stayed at the TVIC?

Methods

Research Objective

- To estimate the association between voluntary isolation centre use by the first COVID-19 case and secondary household transmission compared to households where the first COVID-19 case did not use a voluntary isolation centre (self-isolated)

Design and Population

- Propensity score matched cohort study
- Included cases with symptom onset between September 12, 2020, and March 15, 2021
- Matched COVID-19 case households using the TVIC to 10 households that self-isolated

Data Sources and Linkage

- Case and household characteristics
  - Case and Contact Management System
- Neighbourhood characteristics
  - Statistics Canada Census 2021
- The TVIC line list

Methods

Matching

- 10:1 households [self-isolation user]:[TVIC user]
- Propensity score = logistic regression model with first-case TVIC use as binary outcome

Model Covariates

- Age
- Gender
- Specimen collection delay
- Household size
- Calendar date
- Outbreak size
- Household crowding
- Low-income
- Visible minority

Outcome

- Secondary attack rates were calculated among at-risk household members within 1 to 28 days after the date of entry for the matched TVIC user household
- Follow-up start

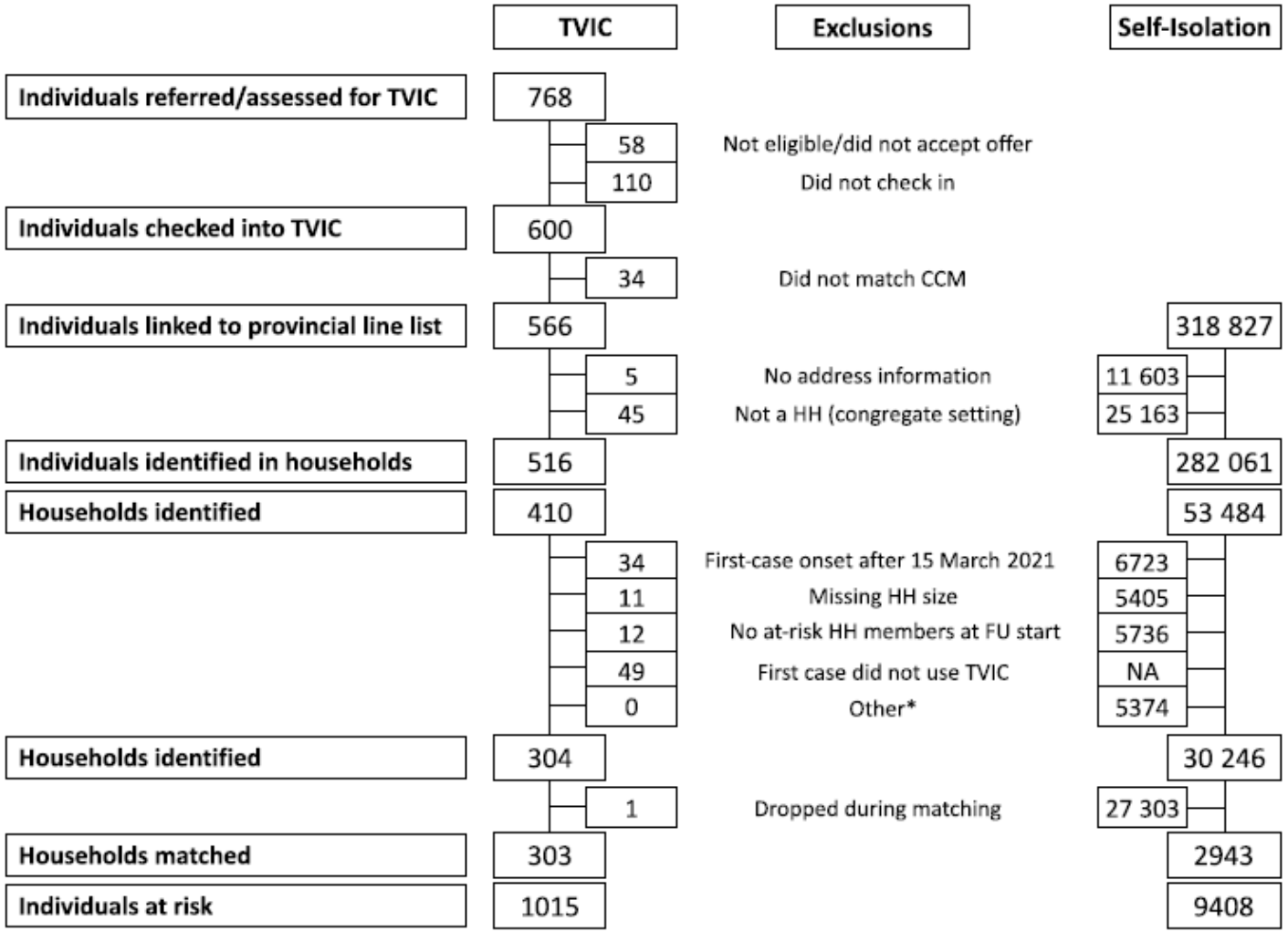
Statistical Analysis

- Time-to-event parametric proportional hazards model with random intercepts corresponding to the households and for the matching strata

TVIC Outcome Evaluation Results

Study Flowchart

Study flowchart for inclusion of TVIC households and matched self-isolation households [7].



Notes.

*First case hospitalized within 2 days of the follow-up start date, no TVIC users in neighbourhood.

Abbreviations: CCM, Case and Contact Management System; FU, follow-up; HH, household; TVIC, Toronto Voluntary Isolation Centre

Table 1

Characteristics and Differences Between Toronto Voluntary Isolation Centre and Self-Isolation Households Before and After 10:1 Propensity Score Matching: 12 September 2020 to 15 March 2021[7].

	Unmatched				Matched			
Parameter	TVIC Households	Self-isolation Households	p value	SMD*	TVIC Households	Self-isolation Households	p value	SMD
Households (N)	304	30,246			303	2,943		
Household factors								
First-case count, ≥ 2 (N, %)	5 (1.6)	1095 (3.6)	.092	0.12	5 (1.7)	58 (2.0)	.868	<.01
First-case period, 1 January 2021–15 March 2021 (N, %)	164 (53.9)	13 251 (43.8)	<.001	0.20	163 (53.8)	1575 (53.5)	.974	<.01
First-case age (mean, years, SD*)	36.5 (13.7)	40.1 (17.6)	<.001	0.23	36.5 (13.7)	36.6 (14.0)	.884	<.01
First-case gender, female (N, %)	170 (55.9)	15 583 (51.5)	.142	0.09	169 (55.8)	1645 (55.9)	1.000	<.01
First-case collection delay (mean, days, SD)	.9 (2.6)	2.9 (5.1)	<.001	0.51	0.9 (2.6)	1.0 (2.5)	.458	.04
Household size, N (mean, SD)	4.5 (1.9)	3.6 (1.5)	<.001	0.54	4.5 (1.9)	4.4 (1.8)	.518	.04
Neighbourhood factors								
Household crowding (mean, SD)	16.3 (6.8)	16.0 (6.8)	.315	.058	16.3 (6.8)	16.3 (7.1)	.912	.01
Low income (mean, SD)	9.2 (3.2)	8.5 (2.6)	<.001	.227	9.2 (3.2)	9.2 (3.2)	.999	<.01
Visible minority (mean, SD)	62.8 (18.2)	62.6 (19.7)	.824	.013	62.8 (18.2)	63.1 (18.7)	.795	.02

* Abbreviations: SD, standard deviation; SMD, Standardized mean difference.

Characteristics Prior to Matching

- First cases from the TVIC user households (304) had significant differences when compared to self-isolation households (30,246)
  - shorter symptom onset to specimen collection delays (0.9 vs. 2.9 days)
  - younger (36.5 vs. 40.1 years)
  - larger household size (4.5 vs. 3.6 members)
  - more likely to live in lower income neighbourhoods (9.2% vs. 8.5%)

- Once matching was complete, these differences were no longer significant

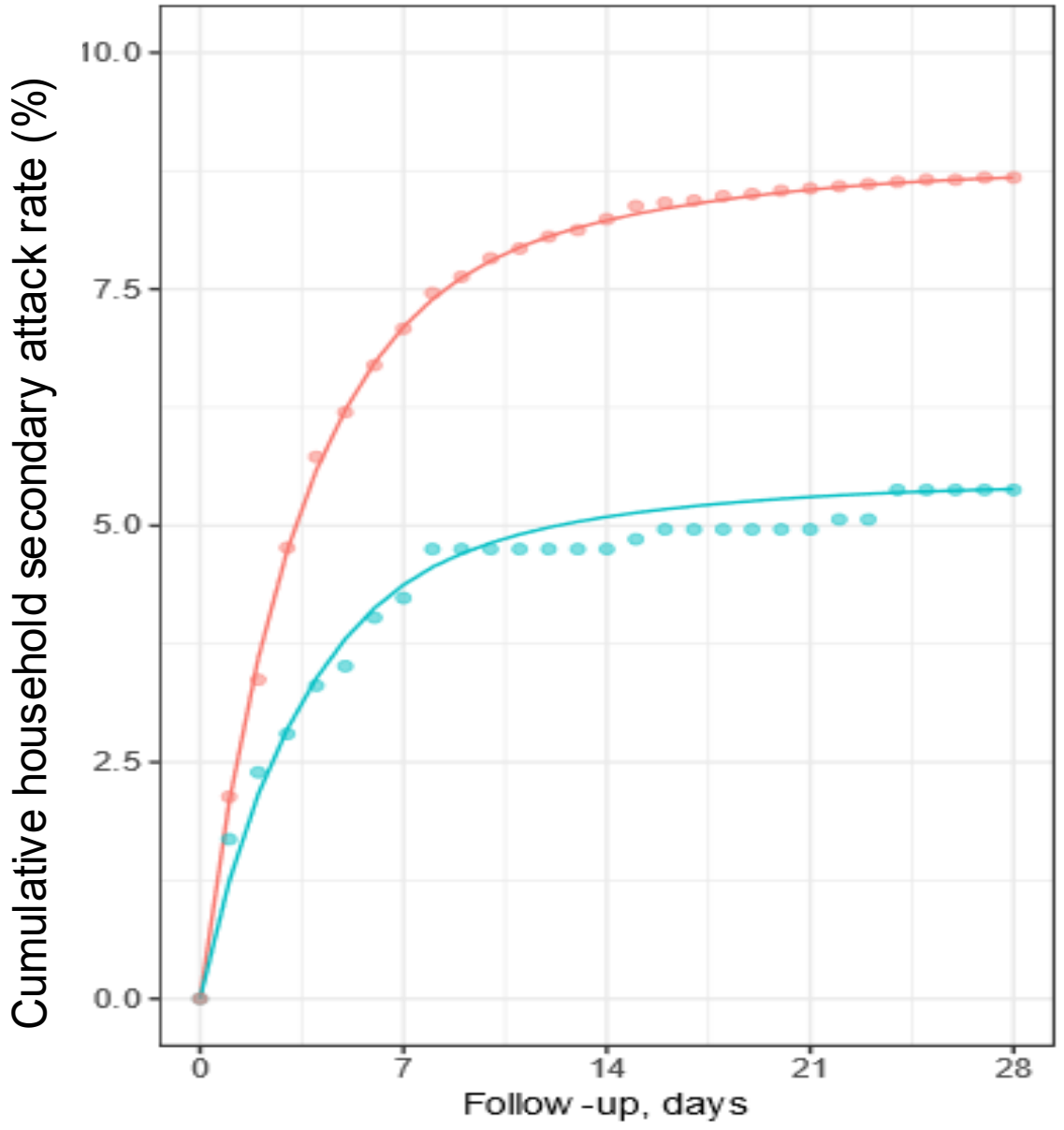
Results of Matching

- 303 TVIC user households were successfully matched with 2,943 self-isolation households
  - Uptake was estimated to be 1.0% of households

- Within these households, there was a total of 1,015 individuals at risk for COVID-19 infection in the TVIC user households and a total of 9,408 individuals at risk in the self-isolation households

Primary Outcome

Cumulative household COVID-19 secondary attack rate as a function of time since start of follow-up for TVIC (blue) and matched self-isolation households (red)[7].



Earlier Versus Later Check-in

Cumulative household COVID-19 secondary attack rate as a function of time since start of follow-up stratified by first case symptom onset to TVIC check-in delay (≤2 days versus ≥3 days) for TVIC (blue) and matched self-isolation households (red)[7].

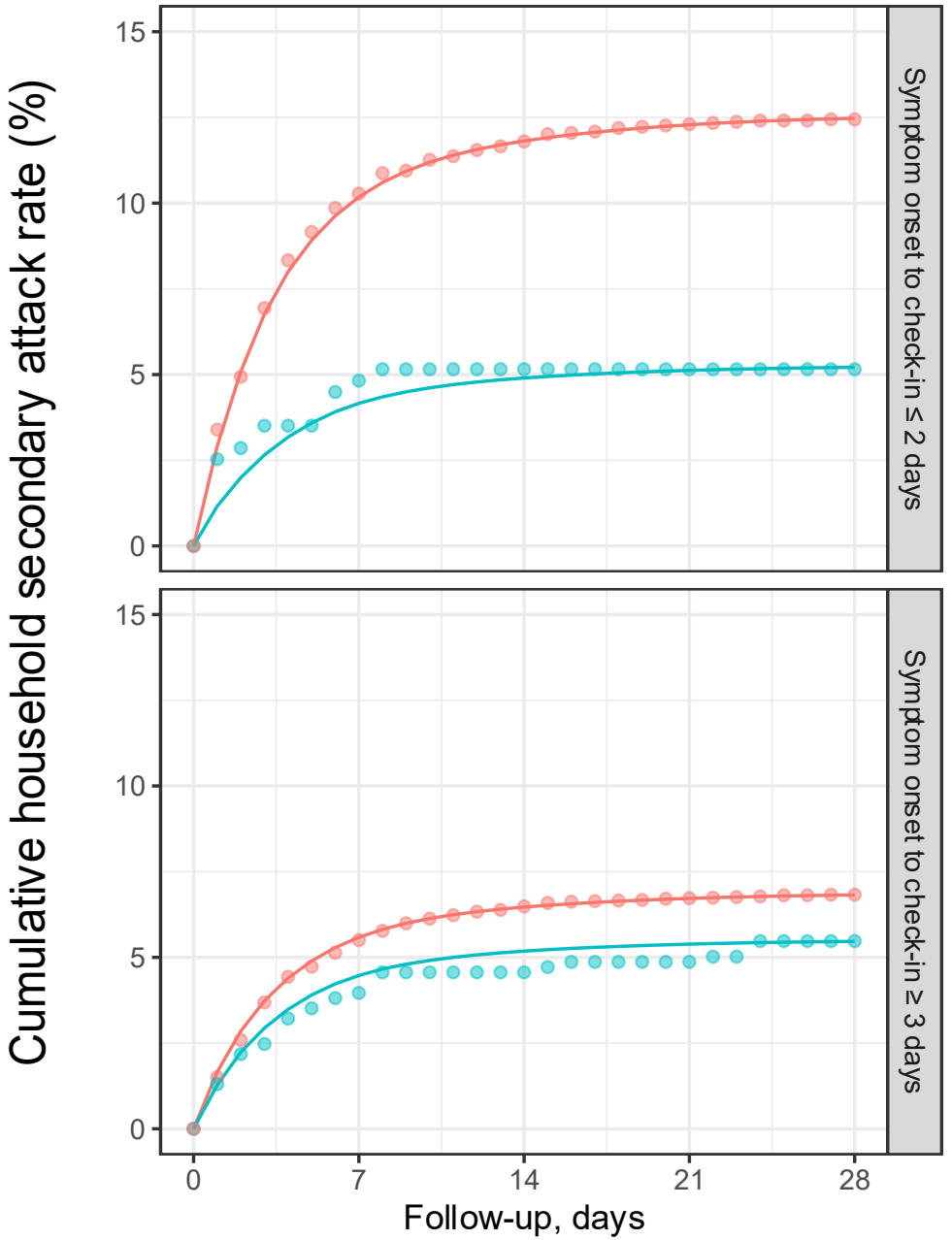


Table 2

Incidence of COVID-19 infection secondary to an index case who used TVIC versus who did not, and the association between TVIC use and COVID-19 incidence based on proportional hazards model[7]. Significant results are highlighted in blue.

		TVIC User Households % (Cases / At-risk)	Self-isolation Households % (Cases / At-risk)	TVIC Hazard Ratio (95%CI)	p value
Overall		5.2 (53/1015)	8.4 (787/9408)	0.50 (0.28, 0.90)	.020
First-case symptom onset to check-in (days)	≤2	5 (16/323)	11.8 (372/3146)	0.37 (0.13, 1.04)	.059
	≥3	5.3 (37/692)	6.6 (415/6262)	0.61 (0.31, 1.23)	.168
First-case age (years)	18-29	4.4 (20/455)	8.2 (290/3516)	0.36 (0.14, 0.91)	.030
	30-59	6.4 (31/486)	8.5 (454/5347)	0.67 (0.31, 1.47)	.321
	≥60	2.7 (2/74)	7.9 (43/545)	0.24 (0.02, 3.30)	.287
First-case gender	Female	6 (26/432)	7.8 (322/4116)	0.64 (0.27, 1.52)	.315
	Male	4.6 (27/583)	8.8 (465/5292)	0.40 (0.18, 0.91)	.028
Neighbourhood household crowding (percentile)	<50th	6.5 (29/444)	7.5 (331/4410)	0.74 (0.34, 1.61)	.446
	≥50th	4.2 (24/571)	9.1 (456/4998)	0.34 (0.15, 0.77)	.010
Neighbourhood low income (percentile)	<50th	4.5 (24/536)	8.3 (398/4805)	0.36 (0.16, 0.80)	.012
	≥50th	6.1 (29/479)	8.5 (389/4603)	0.72 (0.32, 1.60)	.419
Neighbourhood visible minority (percentile)	<50th	5.4 (25/462)	7.4 (325/4394)	0.63 (0.28, 1.44)	.273
	≥50th	5.1 (28/553)	9.2 (462/5014)	0.42 (0.18, 0.94)	.034

Summary of Results

- Household secondary attack rates were 5.2% (53 of 1015) for TVIC users compared with 8.4% (787 of 9408) for matched self-isolation households

- An estimated 50% reduction in hazard ratio (HR) of COVID-19 transmission in households with first cases that used the TVIC
  - HR = 0.50; 95% confidence interval (CI), 0.28-0.90

Summary of Results

- Reductions in transmissions were larger:
  - when admission to the TVIC was within two days of symptom onset (63%)
    - HR = 0.37; 95% CI, 0.13-1.04
  - for larger households (70%)
    - HR = 0.30; 95% CI, 0.14-0.67
  - for households with high household crowding (66%)
    - HR = 0.34; 95% CI, 0.15-0.77
  - for households with visible minorities (58%)
    - HR = 0.42; 95% CI, 0.18-0.94, and,
  - for household with low income (64%)
    - HR = 0.36; 95% CI, 0.16-.80

Consistent associations across sub-groups for the reduction in COVID-19 transmission in households when first cases used the TVIC compared to matched self-isolation households

Limitations, Discussion, and Implications

Limitations

- Identification of COVID-19 cases
- Potential differences between the TVIC users and non-users
- Secondary cases already infected
- Transmissions outside the household

Discussion and Implications

- Voluntary hotel-based isolation could be an option for diseases with high likelihood of household transmission, high severity of disease, prior to the availability of vaccines
- To be effective, voluntary isolation must occur early in the period of transmissibility
- Build guidelines for rapidly scaling up voluntary isolation into future pandemic preparedness plans
- During case follow-up, consider triage questionnaires that systematically assess the ability of cases to self-isolate at home and assess the morbidity risk factors of household members

Conclusion

- Use of a voluntary isolation centre was associated with reduced household secondary transmission of COVID-19, prior to vaccine availability

- Voluntary isolation centres are one public health tool that leaders can use to effectively control the transmission of future communicable infections and pandemic pathogens

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Thank you

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