

Human Parainfluenza Epidemiology in Homeless Shelters – King County, Washington



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Background

- Human parainfluenza virus (HPIV) contributes to acute respiratory tract infection burden in adults and children (<18 years old).
- People experiencing homelessness (PEH) are at increased risk for respiratory viral complications due to chronic disease burden, mental illness and social inequities.
- Homeless shelters may lack resources to reduce respiratory viral transmission through non-pharmaceutical interventions.
- We describe the HPIV clinical and genomic epidemiology in King County homeless shelters before and during the COVID-19 pandemic.

Methods

- We analyzed respiratory virus surveillance data from a repeated cross-sectional study across 23 King County homeless shelters from October 2019-May 2021.
- Eligible participants were shelter residents aged ≥3 months with acute respiratory illness; beginning April 1, 2020, shelter residents and staff were eligible, regardless of symptoms.
- Questionnaires and respiratory (nasal) samples were collected.
- Respiratory virus testing using a multiplex RT-PCR platform including HPIV 1-4 was performed on respiratory specimens.
- Whole genome sequencing was performed on HPIV-positive samples with cycle threshold <22 using hybrid capture and type-specific phylogenetic trees were generated.

Results

- There were 14,464 encounters from 3,281 unique participants (median age: 37 years, range 0.3-85 years; 16% children; 17% shelter staff) over the study period.
- Among the 1,569 virus-positive encounters, 32 (2%) encounters from 29 unique participants were HPIV positive (median age: 29 years, range: 0.3-64 years; 62% children, 45% female, 52% white, 100% residents; 10% had ≥1 chronic conditions).
- Two HPIV-3 clusters were identified in separate family shelters in October 2019 and May 2021; all cases associated with the HPIV-3 clusters occurred in children aged <5 years.

Table. Human Parainfluenza Encounters by Shelter Type Before and After April 1, 2020

Time Period	Type of Shelter	Total (N)	Human Parainfluenza, n (%)	Human Parainfluenza Types
Before April 1, 2020	Shelters: Family (Site: D, E, O)	303	16 (5.3)	HPIV-1, n = 5 HPIV-3, n = 6 HPIV-4, n = 5
	Shelters: Adults 18-25 years (Site: C)	89	1 (1.1)	HPIV-1, n = 1
	Shelters: Adults ≥18 years (Site: A, B, F, L)	845	3 (0.4)	HPIV-1, n = 2 HPIV untyped, n = 1
	Shelters: Adults ≥ 50 years (Site: M)	453	3 (0.7)	HPIV-1, n = 2 HPIV untyped, n = 1
After April 1, 2020	Shelters: Family (Site: D, E, H, N, O, OF, OG)	4764	8 (0.2)	HPIV-3, n = 5 HPIV untyped, n = 3
	Shelters: Adults 18-25 years (Site: C, OH)	1228	0	N/A
	Shelters: Adults ≥18 years (Site: A, B, F, G, J, K, L, OB, OD)	6078	1 (0.02)	HPIV untyped, n = 1
	Shelters: Adults ≥ 50 years (Site: I, M, OA, OC, OE)	661	0	N/A
Total		14,421*	32	HPIV-1, n = 10 HPIV-3, n = 11 HPIV-4, n = 5 HPIV untyped, n = 6

*n = 43 encounters where dates were missing were not included in this table (none involved human parainfluenza-positive specimens).

Figure 1. Human Parainfluenza-Positive Specimens by Shelter Type Among Unique Participants

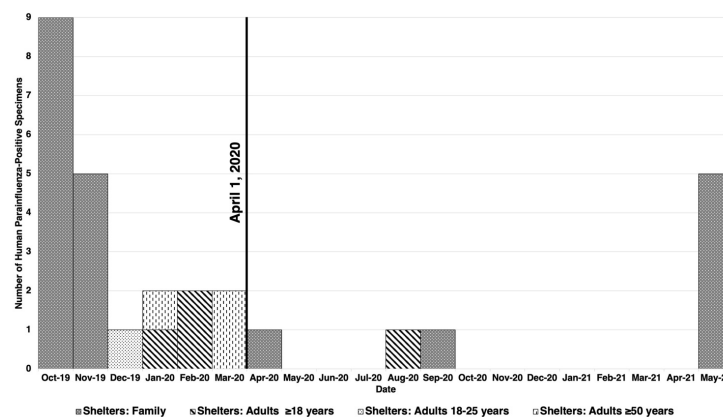


Figure 2. Phylogenetic Trees of Human Parainfluenza Viruses in King County Homeless Shelters

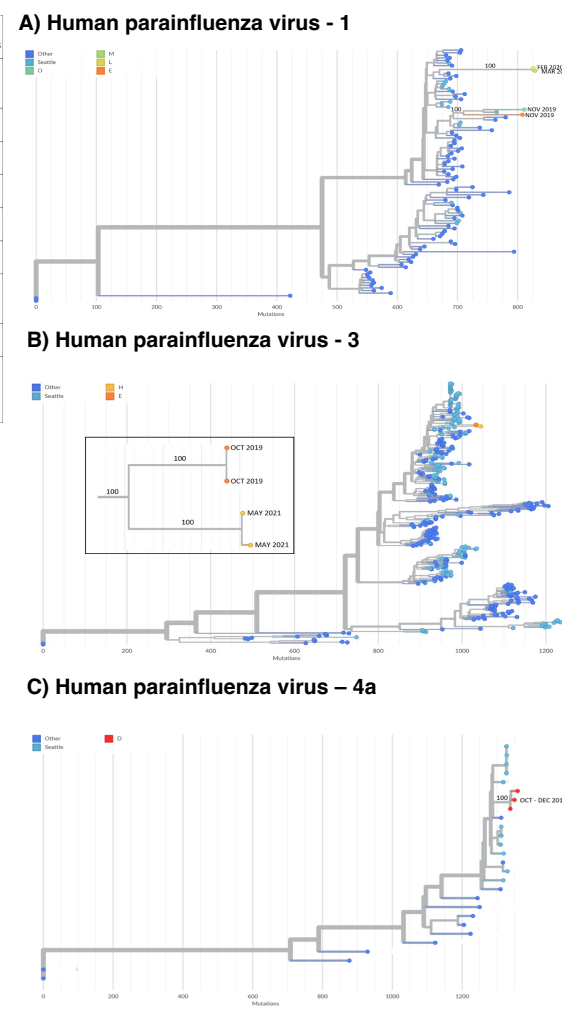
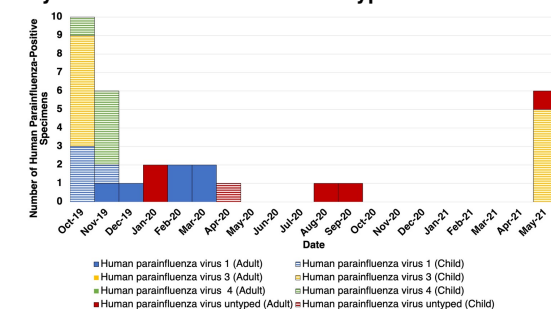


Figure 3. Human Parainfluenza-Positive Specimens by Human Parainfluenza Virus Type*



*All pediatric cases of HPIV infection over the study period occurred in children aged ≤12 years; No HPIV-2 infections were identified in this study.

Conclusion

- HPIV infections affect homeless shelter residents of all ages.
- Family shelters with adults and children had the greatest percentage of HPIV detections.
- Two pediatric HPIV-3 clusters occurred before and during the COVID-19 pandemic.
- Numbers of HPIV infections declined after the implementation of COVID-19 community mitigation policies in Washington State.
- Congregate-setting-based community studies are important to understanding respiratory virus epidemiology and to inform public health guidance.

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