Pediatric COVID-19 in Denver, Colorado: Household Transmission and the Disproportionate Impact on Hispanic Children

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**Background**

Data on COVID-19 characteristics among children in the US are limited, including impact on communities of color, relationship between total cases and school openings and the role of children as household index cases.

**Objectives**

1. Describe COVID-19 disease, demographics, and epidemiology over time among the <19 year old population in Denver, Colorado.
2. Evaluate transmission dynamics within households.
3. Examine the association between socioeconomic indicators and COVID-19 infection.

**Methods**

- Retrospective observational study using COVID-19 cases aged <19 reported to Denver Public Health
- Case interviews or medical record reviews, using standardized forms, provided demographic information, sources of exposure, signs/symptoms, and onset.
- This study included cases who:
  - Had a laboratory-confirmed diagnosis of COVID-19
  - Were living in non-congregate settings
  - Had an onset of infection between March 1 and December 5, 2020
- Cases with the same primary address and last name or phone were considered to reside in the same household
- Household clusters: all cases within a household with an onset of infection ≥26 days of another household case

**Results**

- Among all COVID-19 cases, 13.3% (n=4,857/36,492) were <19 years of age.

**Table 2:** Demographic characteristics of pediatric cases with onset of infection between March 1 and December 5, 2020 (N=4,857)

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>N(%)</th>
<th>Pediatric Population % (DOA 2019)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>Race/Ethnicity (n=4,857; n=325 missing)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Asian/Native Hawaiian/Other Pacific</td>
<td>117 (2.6)</td>
<td>4.3</td>
</tr>
<tr>
<td>Islander, non-Hispanic</td>
<td>123 (2.6)</td>
<td>4.3</td>
</tr>
<tr>
<td>Black, non-Hispanic</td>
<td>123 (2.6)</td>
<td>4.3</td>
</tr>
<tr>
<td>White, non-Hispanic</td>
<td>934 (20.6)</td>
<td>36.7</td>
</tr>
<tr>
<td>American Indian/Native Alaskan</td>
<td>35 (0.8)</td>
<td>0.7</td>
</tr>
<tr>
<td>Hispanic or Latino</td>
<td>3505 (72.5)</td>
<td>144.6</td>
</tr>
<tr>
<td>Multiple races or other, non-Hispanic</td>
<td>114 (2.5)</td>
<td></td>
</tr>
<tr>
<td>Hispanic</td>
<td>3505 (72.5)</td>
<td></td>
</tr>
</tbody>
</table>

**Table 3:** Reported cases in a household with ≥1 cases (N=2,806; unknown n=2,051)

<table>
<thead>
<tr>
<th>Household</th>
<th>Number in Household</th>
</tr>
</thead>
<tbody>
<tr>
<td>Household</td>
<td>1016 (35.7)</td>
</tr>
<tr>
<td>Non-Household</td>
<td>205 (7.2)</td>
</tr>
<tr>
<td>Other close contact</td>
<td>239 (9.7)</td>
</tr>
<tr>
<td>Healthcare contact</td>
<td>6 (0.2)</td>
</tr>
</tbody>
</table>

**Table 4:** Transmission dynamic by household cluster (N=2,093; unknown n=2,104)

<table>
<thead>
<tr>
<th>Transmission Dynamic</th>
<th>Index Case</th>
<th>Co-Index Case</th>
<th>Secondary Case</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate</td>
<td>473 (17.5)</td>
<td>515 (19.9)</td>
<td>1668 (62.6)</td>
</tr>
</tbody>
</table>

**Figure 1:** Illness characteristics of interviewed pediatric cases. Percentages reflect % of those with non-missing values.

**Figure 2:** Pediatric cases by week of onset of infection between March 1 and December 5, 2020 (N=4,857)

**Figure 3:** GIS maps of Denver County featuring COVID-19 case rates per 1,000 persons for all ages, for those 0-18 years of age, and percent of households in Denver County below federal poverty level (N=4,857)

**Conclusions**

- **Hispanic children and those aged 14-18 years had the highest proportion of infection among pediatric cases.**
- **The majority of pediatric cases that were interviewed were symptomatic (82.0%).**
- Pediatric cases mirrored general community trends without visually obvious pattern of disproportionately increased cases during periods of in-person learning.
- **Most pediatric cases reported a household member with COVID-19 (79.3%).**
- Among children associated with a household cluster, 37.4% were found to be an index or co-index case.
- The geographic distribution of pediatric cases overlap with areas with increased percentages of households below the federal poverty level.
- **Further analysis is needed to evaluate:**
  - How socioeconomic indicators contribute to disparities.
  - Specific risk reduction efforts to prevent secondary transmission within households.
  - The transmission dynamics within households with a child enrolled in in-person learning.

**Limitations**

- Not all cases were successfully contacted nor completed a comprehensive case interview.
- Data collection errors may have resulted in incorrect sources of exposure, signs/symptoms, and onset.
- Data on COVID-19 cases limited to those living in non-congregate settings.
- Logistic values.
- The method of case linkage used does not account for split households.

**Implications**

- Continued efforts are needed to:
  - Address the disproportionate impact of COVID-19 among children identifying as Hispanic.
  - Support households of a case or suspected case in practicing risk reduction efforts that prevent secondary transmission, including ensuring they have the necessary guidance and resources.
  - Support schools and educators in safely transitioning to in-person learning.

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