# Out of home child care as a risk factor for prepandemic endemic human coronavirus infections in a birth cohort of children 0-2 years

Ardythe L. Morrow[1,2], Shannon C. Conrey[1,2], Liang Niu[1], Allison R. Burrell[1,2], Claire P. Mattison[3,4], Zheyi Teoh [2,6], Meredith McMorrow[3], Monica McNeal[2], Daniel C. Payne[5], Mary A. Staat[2,6]

[1] University of Cincinnati College of Medicine, Department of Environmental and Public Health, Cincinnati, OH
[2] Cincinnati Children's Hospital Medical Center, Department of Infectious Disease, Cincinnati, OH
[3] Centers for Disease Control and Prevention, Division of Viral Diseases, Atlanta, GA
[4] Cherokee Nation Assurance, Arlington, VA
[5] Centers for Disease Control and Prevention, Division of Foodborne, Waterborne, and Environmental Diseases, Atlanta, GA
[6] University of Cincinnati College of Medicine, Department of Pediatrics, Cincinnati, OH

Background:

Four endemic human coronaviruses (HCoV) - HKU1, OC43, 220E, NL63 - belong to the same viral subfamily as SARS-CoV-2 and routinely circulate worldwide, but typically cause only mild illness. Studying these endemic HCoVs in relation to out of home child care provides a general epidemiological model of coronavirus transmission.

Methods:

We analyzed HCoV infection rates, associated symptoms, and risk factors for infection in a subset of children enrolled in PREVAIL, a CDC-funded birth cohort study conducted in Cincinnati, OH from 4/2017 – 4/2020. Enrolled children were followed continuously from birth to age 2. Weekly, study mothers responded to surveys about their child's symptoms delivered via cell phone and collected mid-turbinate nasal swabs from their child. Swabs were tested for HCoVs using the Luminex Respiratory Pathogen Panel. Subjects included in these analyses provided samples in $\geq$70% of study weeks.

Results:

Of 101 children who met inclusion criteria, median follow-up was 24 months; 162 HCoV infections were documented in 80 (79%) children. The most commonly identified HCoV was OC43 (58 infections), followed by HKU1 (49 infections) and NL63 (46 infections). Most HCoV infections were asymptomatic (*n*=108, 67%). The median age at first HCoV infection was 8.3 months. Only 23 (14%) infections were medically attended, and none resulted in hospitalization. More than 60% of mothers reported out-of-home childcare (OOHC) use at 6 weeks of age. Use of OOHC was evenly split between childcare homes (in which providers care for small groups of children in a residential building) and licensed childcare centers until 12 months of age; however, two-thirds of children were enrolled in a center by 18 months of age. As expected, peer group size was larger in centers (median=9/group) than childcare homes (median=4/group; $p<0.001$). In a generalized Cox survival model, periods of OOHC were associated with increased infection risk (residential childcare: relative risk [RR] 1.6; 95% CI 1.1, 2.1; $p=0.05$; center-based childcare: RR 3.0; 95% CI 2.5, 3.4 $p<0.001$). Male children were at increased risk of HCoV infection (RR=1.6; 95% CI 1.2, 2.0; p=0.03), but household size, breastfeeding, and maternal demographics were not significantly associated with risk of infection. Among those infected, OOHC use did not influence risk

of respiratory symptoms, but male children were 3.2 times more likely to have acute respiratory symptoms than female children (p=0.008).

Conclusions:

In the PREVAIL Cohort, the high frequency of HCoV infection indicates that young children, particularly those in center-based OOHC, may play an important role in community transmission of HCoV. These findings may be relevant to efforts to minimize transmission of coronaviruses.

Conference: Pediatric Academic Societies, 2022