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Original Article

Association between Family Routines and Oral Health Outcomes in U.S. Children: Evidence from the 2020–2021 National Survey of Children's Health

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ABSTRACT

This work sought to determine whether day-to-day household patterns relate to the presence of dental caries and children's self-assessed oral health. We utilized information collected in the United States through the 2020–2021 National Survey of Children's Health (NSCH). Two outcomes were examined: parent-reported dental caries (yes/no) and unfavorable oral health (yes/no). The primary predictors represented routine family behaviors:
(1) having a consistent bedtime (yes/no);
(2) number of evenings the family ate dinner together (0–7 days);
(3) duration of exposure to televisions, computers, smartphones, or similar electronics; and
(4) sufficient nightly sleep (yes/no).

Covariates included socioeconomic indicators, type of health insurance, household structure, and characteristics of the surrounding neighborhood. Analyses were carried out using univariate and multivariable logistic regression. For dental caries, children who followed predictable bedtimes (AOR = 0.68, 95% CI: 0.58–0.79), had more shared meals (AOR = 0.90, 95% CI: 0.85–0.96), and lived in neighborhoods perceived as supportive (AOR = 0.88, 95% CI: 0.78–0.99) showed lower odds of reporting dental caries. Longer screen exposure (AOR = 1.10, 95% CI: 1.04–1.15) was linked with higher odds. Regarding oral health ratings, stable bedtimes (AOR = 0.60, 95% CI: 0.48–0.75), supportive surroundings (AOR = 0.81, 95% CI: 0.68–0.97), and greater neighborhood amenities (AOR = 0.92, 95% CI: 0.88–1.00) were associated with more favorable health assessments. Increased screen use (AOR = 1.11, 95% CI: 1.02–1.21) and poorer neighborhood conditions (AOR = 1.13, 95% CI: 1.02–1.26) were linked to worse oral health. These findings underscore the influence of daily family rhythms on children's oral health. Further work should emphasize interdisciplinary and community-based strategies that strengthen healthy family practices.

Keywords: Family routines, Oral health, U.S. children, Dental caries

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Introduction

Despite being preventable, dental caries remains the most widespread pediatric condition, affecting 45.8% of U.S. children aged 2–19 years [1]. Globally, approximately 2 billion individuals and 514 million children are estimated to have caries in permanent and primary dentitions, respectively [2].

Family routines—such as shared mealtimes, bedtime habits, and children's media consumption—can either elevate or reduce the likelihood of experiencing dental caries. These routines are shaped by broader social determinants of health (SDoH). Prior work has shown connections between parental socioeconomic status (SES), health practices, and household composition

with oral health outcomes [3]. Many daily routines involve protective behaviors like toothbrushing [4, 5], while the absence of stable routines may contribute to risk factors such as irregular brushing or frequent snacking.

A variety of household behaviors influence susceptibility to caries, including dietary choices, sleep quality, and screen exposure. Families often rely on quick meals, ultra-processed foods, flexible or late bedtimes, and unrestricted screen use to manage daily pressures — all of which may shape oral health trajectories. Insufficient or inconsistent sleep has been identified as an independent risk factor for early childhood caries [6–8]. Bedtime routines that incorporate toothbrushing help guard against caries [9]. In adolescents, those with a preference for later bedtimes were found to have greater caries risk, brush less often, and skip breakfast more frequently than peers with morning or intermediate circadian patterns [10]. Prolonged screen time has been tied to poor dietary behaviors, including higher consumption of sugary drinks and energy-dense snacks, both known contributors to dental caries [11, 12]. Research also shows that routines related to meals, media use, and sleep are connected to childhood obesity [13, 14]. Establishing healthy habits requires ongoing effort, and meal planning involves choosing foods and feeding strategies while accounting for factors that shape children's eating tendencies [15].

Although numerous studies have explored how family routines relate to general health, significantly fewer have examined their relevance to oral health. Most earlier research centered on SES or brushing behaviors rather than broader family patterns. Understanding these relationships is vital for designing interventions aimed at preventing childhood caries. We anticipated that consistent bedtime habits, adequate sleep duration, frequency of shared dinners, and screen exposure would all be related to caries experience and oral health ratings. Therefore, we assessed how these routines corresponded with dental caries and perceived oral health status.

Materials and Methods

Data source

This study used information from the 2020–2021 National Survey of Children's Health (NSCH) [16]. The NSCH is conducted yearly and provides a nationally representative snapshot of children aged 0–17 residing in all 50 U.S. states and the District of Columbia. The survey is overseen and funded by the Maternal and Child Health Bureau within the Health Resources and Services Administration. It offers extensive information on children's demographic, physical, mental, and oral health, their access to health services, and details about their home, neighborhood, school, and social environments. All responses were supplied by parents or guardians familiar with the child's health.

The final analytic dataset consisted of 86,226 children between ages 2 and 17 years. Sampling weights were used to correct for nonresponse and limit potential bias. A poststratification procedure ensured accurate representation of key sociodemographic groups. Because the survey is publicly accessible, this analysis was exempt from Institutional Review Board review [17].

Measures

Outcome variables

Two parent-reported outcomes were analyzed:

1. Dental caries (Yes/No): determined by whether the child had any decayed teeth or cavities within the previous 12 months.
2. Poor oral health (Yes/No): defined based on the parent's rating of the child's oral condition. Responses of "fair/poor" were categorized as poor oral health, whereas "excellent," "very good," and "good" indicated the absence of poor oral health.

Independent variables

Family routine indicators included:

1. Consistent bedtime: "How often does this child go to bed at about the same time on weeknights?" Responses were grouped into two categories: coded as 1 (always/usually) and 0 (sometimes/rarely/never).
2. Shared dinners: "During the past week, on how many days did all family members living in the home eat a meal together?" (0–7 days).
3. Screen time: "On most weekdays, how much time does this child spend using a TV, computer, cellphone, or similar device for entertainment or social media—not counting schoolwork?" (ranging from <1 hour to 5 or more hours).
4. Adequate sleep: Defined according to whether the child met age-based sleep recommendations from the American Academy of Pediatrics (Yes/No), using reported hours of daily sleep, including naps.

Covariates

Covariates were chosen based on available NSCH variables and previous research [18, 19]. These included:

- Age groups (2–5, 6–8, 9–11, 12–15, 16–17 years)
- Sex
- Race/ethnicity (non-Hispanic white, non-Hispanic Black, Hispanic, Asian, other)
- Highest adult education in the household (less than high school, high school, some college, college or higher)
- Family income relative to the Federal Poverty Level (0%–99%, 100%–199%, 200%–399%, ≥400% FPL)
- Insurance status (none, private, public, both public and private)
- Medical home (Yes/No)
- Presence of special health care needs (Yes/No)
- Family structure (two married parents, two unmarried parents, grandparents, other caregivers)
- Number of children in the home
- Dental visit in the last year (Yes/No)

Neighborhood factors were also considered:

1. Neighborhood amenities: count of available features such as parks, libraries, sidewalks, or recreation centers (0–4).
2. Neighborhood problems: number of negative elements like litter, rundown housing, or vandalism (0–3).
3. Supportive neighborhood: whether the child lived in a supportive community (Yes/No).
4. Neighborhood safety: coded "yes" if parents agreed or somewhat agreed that the child was safe, and "no" for disagree or somewhat disagree.

Statistical analysis

Descriptive statistics summarized the characteristics of the children in the study. Two multivariable logistic regression models were then estimated to examine relationships between family routines and the two outcome variables—dental caries and poor oral health—while adjusting for covariates. Model development was guided by the conceptual framework proposed by Fisher-Owen *et al*. (2007) [18]. Analyses were performed in Stata 16 (StataCorp), incorporating sampling weights to generate population-level estimates. A p-value of 0.05 was used to determine statistical significance.

Results and Discussion

Descriptive statistics

Table 1 shows the distribution of key variables by dental caries status and oral health rating. The proportion of children with caries was 12.8% (95% CI: 12.2–13.4), while 6.1% (95% CI: 5.7–6.6) were reported to have poor oral health (N = 86,226).

Families ate meals together an average of 3.1–3.2 days per week; mean screen exposure was 3.6–3.8 hours among those with caries and poor oral health, respectively. The prevalence of caries was higher among children without a consistent bedtime compared with those who had one (18.7% vs. 11.6%), and higher among those who lacked adequate sleep compared with those who met recommended guidelines (15.1% vs. 11.6%). Children with caries also reported a slightly higher number of family meal days (3.2 vs. 3.1) and more weekday screen time (3.6 vs. 3.4 hours).

Several covariates demonstrated significant associations (all $p < .001$) with dental caries in bivariate analyses, including race/ethnicity, family structure, number of children, adult education, income level, type of insurance, dental visits, medical home, and various neighborhood indicators (safety, amenities, supportiveness, and neighborhood problems) **(Table 1)**.

Table 1. Characteristics of children by self-reported dental caries and poor oral health (N = 86,226).

Variables	Dental Caries (%)			Poor Oral Health (%)		
	Yes	No	P-value	Yes	No	P-value
Consistent bedtime			**<.001**			**<.001**
No	18.7	81.3		11.8	88.2	
Yes	11.6	88.4		4.9	95.1	
Number of days eating dinner together per week (Mean)	3.2	3.1	**0.001**	3.1	3.2	**0.001**
Daily screen time in hours (Mean)	3.6	3.4	**<.001**	3.8	3.4	**<.001**
Sufficient sleep			**<.001**			**<.001**
No	15.1	84.9		8.2	91.9	
Yes	11.6	88.4		5.0	95.0	
Age (years)			**<.001**			**<.001**

2–5	9.2	90.8		4.4	95.6	
6–8	19.1	80.9		6.3	93.7	
9–11	15.6	84.4		7.2	92.8	
12–15	10.9	89.1		7.2	92.8	
16–17	10.2	89.8		5.5	94.5	
Sex			0.129			0.856
Male	13.2	86.8		6.2	93.8	
Female	12.3	87.7		6.1	93.9	
Race/Ethnicity			**<.001**			**<.001**
Non-Hispanic White	11.3	88.7		4.5	95.5	
Non-Hispanic Black	12.6	87.4		7.5	92.6	
Hispanic	15.7	84.3		8.9	91.1	
Asian	13.1	86.9		6.2	93.8	
Other	12.9	87.1		5.4	94.7	
Household structure			**<.001**			**<.001**
Two married parents	10.9	89.1		4.2	95.8	
Two unmarried parents	17.9	82.1		10.0	90.0	
Single parent	15.6	84.4		8.4	91.6	
Grandparent(s)	17.3	82.7		13.5	86.5	
Other arrangement	15.8	84.2		13.6	86.4	
Special healthcare needs (SHCN)			**<.001**			**<.001**
No	11.7	88.3		4.9	95.1	
Yes	16.7	83.3		10.6	89.4	
Average number of children in household (Mean)	2.4	2.2	**<.001**	2.3	2.2	**0.014**
Highest education level of adult in household			**<.001**			**<.001**
Less than high school	18.8	81.2		12.8	87.2	
High school graduate	15.7	84.3		9.5	90.6	
Some college	15.0	85.0		7.2	92.8	
College degree or higher	9.6	90.4		3.1	96.9	
Household income as % of Federal Poverty Level			**<.001**			**<.001**
0–99%	17.8	82.2		10.5	89.5	
100–199%	15.2	84.8		8.8	91.2	
200–399%	12.5	87.5		5.7	94.3	
≥400%	8.4	91.6		2.1	97.9	
Health insurance type			**<.001**			**<.001**
Uninsured	18.5	81.5		11.1	88.9	
Private only	17.9	82.1		10.0	90.1	
Public only	9.2	90.8		3.3	96.7	
Both public and private	16.5	83.5		10.2	89.8	
Dental visit within the past 12 months			**<.001**			**<.001**
No	10.3	89.7		9.7	90.3	
Yes	13.3	86.7		5.3	94.7	
Has a medical home			**<.001**			**<.001**
No	14.5	85.5		8.2	91.8	
Yes	10.8	89.2		3.7	96.3	
Number of neighborhood amenities (Mean)	2.5	2.6	**<.001**	2.5	2.6	**<.001**
Neighborhood in poor physical condition (Mean score)	0.6	0.4	**<.001**	0.7	0.4	**<.001**
Supportive neighborhood			**<.001**			**<.001**
No	15.1	84.9		8.4	91.6	
Yes	10.9	89.1		4.3	95.7	
Safe neighborhood			**<.001**			**<.001**
No	17.3	82.7		12.5	87.5	

Yes	12.6	87.4	5.7	94.3
Overall prevalence	**12.8**		**6.1**	

a SHCN, special health care needs.

Children reporting poorer oral health were more commonly those without a fixed nightly routine (11.7% vs. 4.9%), those getting insufficient sleep (8.1% vs. 5.0%), those whose families shared meals less often (3.1 vs. 3.2 days per week), and those spending more time on screens (3.8 h vs. 3.4 h on weekdays) (all $p < .001$). Additional variables showing significant bivariate links with poor oral health were race, household composition, total number of children in the home, adults' education levels, family income, type of health coverage, dental care utilization, presence of a medical home, and neighborhood attributes—specifically safety, amenities, social support, and environmental deterioration (all $p < .05$) **(Table 1).**

Logistic regression model results

In the dental caries model, two household practices—maintaining a predictable bedtime (AOR = 0.68, 95% CI: 0.58–0.79) and having more shared dinners (AOR = 0.90, 95% CI: 0.85–0.96)—were linked to reduced odds of reported caries. Conversely, greater screen exposure increased the likelihood of caries (AOR = 1.10, 95% CI: 1.04–1.15). Children aged 6–11 had a higher risk than those aged 2–5 ($p < .001$). With regard to home structure, children in single-parent settings (AOR = 1.16, 95% CI: 1.00–1.34) or larger households (AOR = 1.13, 95% CI: 1.07–1.20) exhibited heightened caries risk. Relative to non-Hispanic white children, Asian American children showed increased odds (AOR = 1.26, 95% CI: 1.01–1.58), whereas non-Hispanic Black children showed reduced odds (AOR = 0.76, 95% CI: 0.64–0.90). Neighborhood factors also mattered: children in supportive environments had lower odds (AOR = 0.88, 95% CI: 0.78–0.99), while those living in areas with poorer physical conditions had higher odds (AOR = 1.13, 95% CI: 1.05–1.22). Additional significant predictors included adults' educational attainment, type of insurance, recent dental care, SHCN status, and number of children in the household (all $p < .05$).

Table 2. outlines the logistic regression findings.

Variables	**Dental Caries**			**Poor Oral Health**		
	AOR	95% CI	P-value	AOR	95% CI	P-value
Consistent bedtime (Yes vs No)	0.68	0.58–0.79	**<.001**	0.60	0.48–0.75	**<.001**
Days family eats dinner together per week	0.90	0.85–0.96	**<.001**	0.94	0.86–1.04	0.24
Average daily screen time (hours)	1.10	1.04–1.15	**<.001**	1.11	1.02–1.21	0.01
Sufficient sleep (Yes vs No)	0.92	0.82–1.04	0.17	0.91	0.76–1.09	0.31
Age group (reference: 2–5 years)						
6–8 years	2.20	1.85–2.61	**<.001**	1.58	1.19–2.11	**<.001**
9–11 years	1.53	1.28–1.84	**<.001**	1.61	1.20–2.15	**<.001**
12–15 years	0.91	0.75–1.09	0.31	1.46	1.08–1.96	0.01
16–17 years	0.85	0.69–1.05	0.13	1.02	0.73–1.43	0.91
Female (vs Male)	0.91	0.82–1.02	0.11	1.05	0.89–1.24	0.56
Race/Ethnicity (reference: Non-Hispanic White)						
Non-Hispanic Black	0.76	0.64–0.90	**<.001**	0.92	0.73–1.17	0.51
Hispanic	1.05	0.90–1.23	0.53	1.19	0.96–1.48	0.11
Asian	1.26	1.01–1.58	0.04	1.40	1.01–1.95	0.04
Other	1.03	0.87–1.22	0.75	0.99	0.73–1.34	0.95
Household structure (reference: Two married parents)						
Two unmarried parents	1.18	0.93–1.50	0.17	1.33	0.94–1.88	0.11
Single parent	1.16	1.00–1.34	0.04	1.17	0.95–1.45	0.14
Grandparent(s) as guardian	1.13	0.85–1.51	0.39	1.92	1.30–2.82	**<.001**
Other arrangement	0.95	0.61–1.48	0.83	1.36	0.80–2.32	0.26
Child has special healthcare needs (Yes vs No)	1.32	1.18–1.49	**<.001**	2.10	1.78–2.48	**<.001**
Number of children in household (mean)	1.13	1.07–1.20	**<.001**	1.10	1.01–1.20	0.03
Highest adult education in household (reference: < High school)						

High school graduate	0.84	0.63–1.10	0.21	0.74	0.52–1.03	0.08
Some college	0.88	0.67–1.15	0.34	0.60	0.43–0.84	**<.001**
College degree or higher	0.72	0.55–0.94	0.02	0.48	0.34–0.68	**<.001**
Household income (reference: 0–99% FPL)						
100–199% FPL	0.99	0.83–1.19	0.96	1.03	0.80–1.31	0.83
200–399% FPL	1.00	0.82–1.21	0.98	0.97	0.74–1.28	0.84
≥400% FPL	0.86	0.70–1.06	0.17	0.56	0.42–0.74	**<.001**
Insurance coverage (reference: Uninsured)						
Private insurance only	0.73	0.57–0.94	0.02	0.80	0.57–1.12	0.19
Public insurance only	0.48	0.38–0.61	**<.001**	0.66	0.47–0.93	0.02
Both public & private	0.67	0.50–0.92	0.01	0.93	0.61–1.43	0.76
Has a medical home (Yes vs No)	0.92	0.82–1.02	0.13	0.64	0.54–0.77	**<.001**
Dental visit in past 12 months (Yes vs No)	1.54	1.27–1.85	**<.001**	0.66	0.53–0.84	**<.001**
Number of neighborhood amenities	0.97	0.93–1.01	0.11	0.93	0.88–1.00	0.04
Neighborhood in poor physical condition (score)	1.13	1.05–1.22	**<.001**	1.13	1.02–1.26	0.02
Lives in supportive neighborhood (Yes vs No)	0.88	0.78–0.99	0.03	0.81	0.68–0.97	0.02
Lives in safe neighborhood (Yes vs No)	1.19	0.90–1.57	0.22	0.94	0.66–1.33	0.72

a SHCN, children and youth with special health care needs.

Results from the model for general oral health status followed similar patterns. A stable bedtime routine reduced the odds of reporting poor oral health (AOR = 0.60, 95% CI: 0.48–0.75), while greater weekday screen time raised the odds (AOR = 1.11, 95% CI: 1.02–1.21). Poorer oral health was also more common in children ages 6–15 compared with those ages 2–5 ($p < .001$). Children living with grandparents (AOR = 1.92, 95% CI: 1.30–2.82) or in homes with more siblings (AOR = 1.10, 95% CI: 1.01–1.20) had greater odds of unfavorable oral health. Supportive neighborhood environments (AOR = 0.81, 95% CI: 0.68–0.97) and more neighborhood amenities (AOR = 0.92, 95% CI: 0.88–1.00) were protective, whereas deteriorating neighborhood conditions increased risk (AOR = 1.13, 95% CI: 1.02–1.26). Other relevant variables included SHCN, income, adult education level, insurance status, medical home status, and dental visits (all $p < .05$) **(Table 2).**

Daily household patterns appear to be a crucial, yet understudied, component of children's oral health outcomes. Using data from the 2020–2021 National Survey of Children's Health (NSCH), this analysis indicates that consistent bedtime routines, more frequent family meals, and reduced screen exposure are linked to lower odds of dental caries after controlling for multiple risk factors. Similar associations emerged for overall oral health ratings, with children from smaller households and supportive, amenity-rich neighborhoods demonstrating better outcomes.

These findings align with earlier literature reporting that irregular or delayed sleep routines correlate with poorer dental outcomes [7–9]. Although many caregivers state that bedtime routines exist, the reliability with which these routines are followed can vary [20]. Elements such as bathing or eating typically appear in these routines, but other components vary across families [20]. Cultural, racial/ethnic, and socioeconomic patterns also shape routine consistency [20]. For instance, African American children, children in several Asian regions, and those from low-SES backgrounds often experience less stable bedtimes [20]. In line with this work, our study identified regular bedtimes as a protective factor in both caries risk and general oral health.

Families in which parents hold full-time jobs tend to show greater irregularity in their children's bedtime schedules compared with households where caregivers work part-time or stay at home [21]. Dental caries arises from multiple interacting factors, and behaviors such as diet choices and the use of fluoride toothpaste are central to its prevention. Routine plaque removal through brushing and flossing is essential for maintaining oral health [22]. Incorporating these practices into a predictable nighttime schedule can help reduce caries risk and support healthier mouths. Because many families face competing daily demands and may not fully understand how to prevent oral disease, toothbrushing may be skipped on many evenings. Educational efforts aimed at reinforcing the value of nighttime brushing can enhance children's oral outcomes. The American Academy of Pediatrics' "Brush, Book, Bed" initiative promotes this idea by encouraging nightly toothbrushing followed by reading and a consistent bedtime [23].

Children whose families shared dinner more frequently reported fewer dental caries, although meal frequency did not show a significant relationship with overall oral health status. A study from Scotland indicated that family mealtime patterns may influence dental health

indirectly by increasing how often children brush their teeth [5]. Prior research also shows that regular family meals correlate with healthier eating behaviors—including higher fruit and vegetable intake—in young people and are associated with lower rates of obesity, reduced risk for disordered eating, and improved academic performance [24]. Hammons & Fiese (2011) [25] noted that having at least three weekly shared meals is linked to lower odds of being overweight, decreased consumption of unhealthy foods, and a reduced likelihood of eating disorders, while encouraging healthier diets. In our analysis, the average number of weekly shared dinners was consistent with their recommendation (mean = 3.2). It is worth noting that the American Academy of Pediatrics already supports regular family meals as a strategy to reduce childhood obesity.

Extended screen exposure has been tied to inadequate sleep, decreased physical activity, poorer food choices, behavioral issues, lower academic performance, and higher obesity risk [26–31]. A recent investigation involving children aged 8–14 reported that those using screens beyond 2 hours per day ate more cariogenic foods, experienced more decay, brushed less frequently, and had more toothaches [32]. In the present work, prolonged screen time was similarly associated with higher odds of dental caries and poorer oral health, suggesting that screen habits should be addressed during caregiver education on oral health.

Our study also found that children living in neighborhoods characterized by more negative or deteriorating features faced greater chances of dental caries and poor oral health. In contrast, when parents viewed their neighborhood as supportive, their children were less likely to report these outcomes. Community-level influences—such as the child's school environment and the broader social setting—can either buffer or worsen oral health risks [18, 33]. Neighborhood conditions have previously been identified as contributors to caries risk [34]. Parents have noted that helpful community elements include social connections, accessible local resources, and shared oral health information [35].

Family structure also appeared to influence children's oral health status. Children primarily cared for by grandparents showed the highest likelihood of poor oral health compared with those in two-parent, single-parent, or cohabiting-parent households. Additionally, larger households were associated with higher prevalence of caries and poorer self-rated oral health; for example, children living with four siblings exhibited roughly a 50% increase in both outcomes compared with those living with only one sibling. These patterns highlight the need to consider household composition when planning oral health promotion at both the individual and community levels. Future studies should examine how these dynamics shape oral health so that education and clinical guidance can be better tailored.

Several limitations must be acknowledged. First, the data rely on caregiver reports, raising concerns about recall bias. Second, because the study is cross-sectional, causal inferences cannot be made. Third, the measure of family meals captured only meal frequency, not nutritional quality. Lastly, no information was collected on daily oral hygiene routines, a critical determinant of caries risk and oral health status. Despite these constraints, the findings contribute valuable insight into how household routines, family composition, and neighborhood context relate to children's oral health.

Dental caries can largely be avoided through consistent brushing with fluoride toothpaste, routine professional care, adequate oral hygiene, and access to fluoridated water. Yet families with limited knowledge or constrained access may depend more heavily on broader environmental and household patterns, which can either support or undermine oral health. Oral health providers play a key role in empowering families through education that emphasizes collaboration and shared responsibility [36, 37]. The present findings underscore the need for public health programs and policies that shift focus toward family and community-level influences rather than concentrating solely on individual behavioral risk.

Conclusion

Analysis of the 2020–2021 NSCH data demonstrates that daily household routines, family composition, and the surrounding community environment significantly shape children's oral health outcomes. Future work should prioritize interdisciplinary interventions aimed at supporting families and strengthening community-level resources to promote healthier routines.

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