

# Unmet dental needs in children – a cross-sectional study of 0.6 million children in the United States

IRENE RETHEMIOTAKI<sup>A-F</sup>

ORCID ID: 0000-0001-5229-9946

Department of Production Engineering and Management, Technical University of Crete, Chania, Greece

A – Study Design, B – Data Collection, C – Statistical Analysis, D – Data Interpretation, E – Manuscript Preparation, F – Literature Search, G – Funds Collection

**Summary Background.** It is of the utmost importance to acknowledge the seriousness of unmet dental needs in children, which in return reflects the responsibility of underlying factors that lead to barriers to dental care.

**Objectives.** The aim of this work is to study unmet dental needs in children and adolescents in the United States during the years 2009–2018 with the ultimate goal of finding statistically significant predictors for barriers to dental treatment.

**Material and methods.** The statistical methods used to extract the results of this work are the chi-square test and one-way analysis of variance (ANOVA) to examine the statistical significance of socio-economic factors in the unmet dental needs of children. A multiple logistic regression analysis was used to find statistically significant prognostic factors for the barriers to dental treatment.

**Results.** The prevalence of unmet dental needs in the United States during 2009–2018 was found to be 5.17%. According to multiple logistic regression analysis, female children from single-parent families with a low family income have a higher risk of developing unmet dental needs. In addition, the parents' education and race proved to also be prognostic risks for unmet dental needs. Lastly, families with no health insurance coverage are more likely to have children with unmet dental needs.

**Conclusions.** The results of this study highlight the significance of the family structure, the level of parents' education and deprivation of financial support as the main prognostic risk factors for unmet dental needs. Moreover, children with barriers to dental care are six times more likely to visit a dentist every 2–5 years.

**Key words:** prognosis, health services needs and demand, socioeconomic factors.

Irene Rethemiotaki. Unmet dental needs in children – a cross-sectional study of 0.6 million children in the United States. *Fam Med Prim Care Rev* 2021; 23(2): 215–219, doi: <https://doi.org/10.5114/fmpr.2021.105929>.

## Background

UDN (Unmet Dental Needs) is a concept that describes the extent to which existing health problems are not addressed due to lack of health insurance, as well as financial or other problems [1, 2]. Dental care is the top unfulfilled need for health care among children, accounting for 6.6% of all American children [3, 4]. Untreated caries are the most dominant dental condition worldwide, with a prevalence of 6% in children and 15.3% in adolescents [5, 6] and can lead to a range of adverse consequences, such as severe mouth pain, infection and inability to eat, speak and learn, as well as weight loss and decreased nutritional status [7–9]. These adverse health outcomes might affect children's smile patterns, self-esteem and social interactions and development [10]. Socio-Economic Status (SES) has been reported to play a crucial role in the incidence of UDC in children. More precisely, Black children are less likely to visit a dentist and more likely to suffer from untreated dental caries compared to the White children [11, 12]. Parents' education impacts the oral health of their children through health beliefs and subjective norms [13]. Lastly, poverty status plays a key role in UDN, with children coming from poor or low-income families experiencing more years of untreated cavities compared to their peers who come from high-income families [14].

It is of paramount importance to acknowledge the seriousness of UDN in children, which in return reflects upon the underlying factors that lead to barriers to dental care. For this purpose, this work studies UDN in the United States during the period 2009–2018 with the aim at finding the underlying factors related with the highest risk for UDN.

## Objectives

The aim of this work is to study unmet dental needs in children and adolescents in the United States during the years 2009–2018 with the ultimate goal of finding statistically significant predictors for barriers to dental treatment.

## Material and methods

The data used in this work originates from the National Health Interview Survey (NHIS) dataset [15] and covers the period 2009–2018. The total amount of children examined was 659,192, while the number of children with UDN was 34,093. The statistical methods used to extract the results of this work are the chi-square test and one-way analysis of variance (ANOVA) for categorical and continuous variables, respectively, to examine the statistical significance of socio-economic factors in unmet dental needs of children, such as gender, age, race, family structure, parents' education, family income, poverty status, health insurance coverage, place of residence and origin. A multiple logistic regression analysis was used to find statistically significant predictors for the barriers to dental care. A cross-sectional study was carried out, where the children were classified into two groups: the case group and the control group. More specifically, the control group was made up of children without UDN. In contrast, the case group consisted of children with UDN with the same socio-economic characteristics as the control group. The data was weighted before analysis. Predictive factors were presented using the Odds Ratio (OR) and 95%



confidence intervals, and  $p < 0.05$  was considered as statistically significant. Notably, OR was used to define whether a specific characteristic is a risk factor for unmet dental needs and to compare the magnitude of various risk factors for that outcome. An  $OR > 1$  means that the characteristic is associated with higher odds of outcome, and an  $OR < 1$  means that the characteristic is associated with lower odds of outcome. The study was carried out using the IBM SPSS 25 software package for Windows.

## Results

As shown in Table 1, there is a statistically significant difference in the number of UDN in relation to age, and this occurs mainly in the age group of 12–17 (49.8%), while the most common origin and race is White (80.5%) and not Hispanic or Latino (36.1%). However, gender is not statistically significant. Most children with unmet dental needs have parents with more than a high school diploma (60.7%) and a current health status of excellent or very good (75.6%). Moreover, most families whose children have UDN are not poor (38.6%), with a family income of \$35,000 or more (36.2%) and private health insurance coverage (36.7%). In addition, most children with UDN have both a mother and father as the family structure (62.5%). The region

with the most frequent occurrence of UDN is the South (38.6%), with a population size of one million or more (54.7%). Lastly, 42.9% of these children visited their dentist within a six month period from their last visit.

Table 2 shows the multiple logistic regression analysis and Odds Ratios with the aim of finding the predictors of UDN. Based on multiple logistic regression, black or African American (OR 1.66) females (OR 1.00) in the age group of 12–17 (OR 1.0) are more likely to have UDN. Near-poor children (OR 2.25) with Mexican or Mexican American origin (OR 1.56) and low level of parents' education (OR 1.82) who come from single-parent families with a mother but no father (OR 2.29) are two times more likely to have UDN. Moreover, children whose families have an income of less than \$35,000 are four times more likely to have UDN (OR 4.21). Children without health insurance coverage (OR 1.00) and poor current health status who live the West (OR 1.00) in a small Metropolitan Statistical Area (OR 1.07) are also more likely to have UDN. Lastly, children with UDN are six times more likely to visit their dentist every 2–5 years (OR 6.12).

Figure 1 shows the prognostic risk factors with the Odds Ratios for UDN in children during the period 2009–2018. As can be seen, family income and family structure play a crucial role in the appearance of UDN, while these children are more likely to have a long period of lack of access to dental treatment.

**Table 1. Chi-square and ANOVA test**

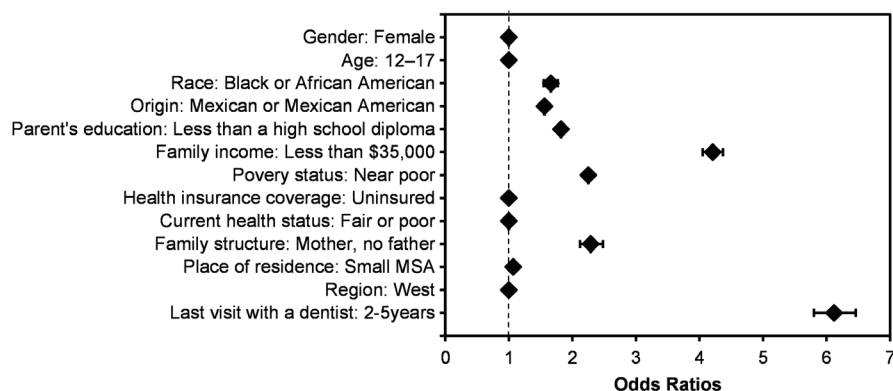
Characteristics of children with unmet dental needs: United States 2009–2018		Children with UDN	Percentages	$p$
Gender	Male	17,295	50.7%	> 0.05
	Female	16,798	49.3%	
Age	2–4	3,571	10.5%	< 0.05
	5–11	13,554	39.8%	
	<b>12–17</b>	16,969	49.8%	
Race	<b>White</b>	25,600	80.5%	< 0.05
	Black or African American	5,122	16.1%	
	Asian	1,078	3.4%	
Origin	Hispanic or Latino	11,660	18.8%	< 0.05
	Mexican or Mexican American	8,305	13.4%	
	<b>Not Hispanic or Latino</b>	22,433	36.1%	
	White. Single race	15,081	24.3%	
	Black or African American. Single race	4,646	7.5%	
Parents' education	Less than a high school diploma	6,015	18.2%	< 0.05
	High school diploma	6,970	21.1%	
	<b>More than a high school diploma</b>	20,019	60.7%	
Family income	Less than \$35,000	13,891	27.6%	< 0.05
	<b>\$35,000 or more</b>	18,213	36.2%	
	\$35,000–\$49,999	5,537	11.0%	
	\$50,000–\$74,999	6,491	12.9%	
	\$75,000–\$99,999	2,952	5.9%	
	\$100,000 or more	3,232	6.4%	
Poverty status	Poor	9,065	28.2%	< 0.05
	Near poor	10,647	33.2%	
	<b>Not poor</b>	12,384	38.6%	
Health insurance coverage	<b>Private</b>	12,403	36.7%	< 0.05
	Medicaid	12,132	35.9%	
	Other coverage	381	1.1%	
	Uninsured	8,889	26.3%	
Current health status	<b>Excellent or very good</b>	25,568	75.6%	< 0.05
	Good	7,118	21.0%	
	Fair or poor	1,139	3.4%	
Family structure	<b>Mother and father</b>	20,879	62.5%	< 0.05
	Mother, no father	10,856	32.5%	
	Father, no mother	1,039	3.1%	
	Neither mother nor father	654	2.0%	
Place of residence (MSA: Metropolitan Statistical Area)	<b>Large MSA (population size 1 million or more)</b>	18,641	54.7%	< 0.05
	Small MSA (less than 1 million)	10,809	31.7%	
	Not in MSA	4,643	13.6%	

**Table 1. Chi-square and ANOVA test**

Characteristics of children with unmet dental needs: United States 2009–2018		Children with UDN	Percentages	<i>p</i>
Region	Northeast	3,803	11.2%	< 0.05
	Midwest	6,767	19.9%	
	South	13,153	38.6%	
	West	10,367	30.4%	
Time since last visit with a dentist	< 6 months	14,428	42.9%	< 0.05
	6 months–1 year	6,790	20.2%	
	1–2 years	6,112	18.2%	
	2–5 years	3,437	10.2%	
	> 5 years	2,828	8.4%	

**Table 2. Statistically significant predictors of unmet dental needs in children using multivariate logistic regression**

Socio-economic characteristics of children: United States 2009–2018		Children with UDN	Controls	Odds Ratio (95% CI)	<i>p</i>
Gender	Male	17,295	319,120	0.98 (0.96–1.00)	< 0.001
	Female	16,798	305,979	1.0 (ref)	
Age	3–4	3,571	120,349	0.40 (0.38–0.41)	< 0.001
	5–11	13,554	273,682	0.67 (0.65–0.68)	
	12–17	16,969	230,728	1.0 (ref)	
Race	White	25,600	463,502	1.64 (1.54–1.75)	< 0.001
	Black or African American	5,122	91,904	1.66 (1.55–1.77)	
	Asian	1,078	32,138	1.0 (ref)	
Origin	Hispanic or Latino	11,660	145,814	1.47 (1.42–1.52)	< 0.001
	Mexican or Mexican American	8,305	97,714	1.56 (1.50–1.62)	
	Not Hispanic or Latino	22,433	478,951	0.86 (0.83–0.89)	
	White. Single race	15,081	334,454	0.83 (0.80–0.85)	
	Black or African American. Single race	4,646	85,573	1.0 (ref)	
Parents' education	Less than a high school diploma	6,015	69,357	1.82 (1.77–1.88)	< 0.001
	High school diploma	6,970	112,175	1.30 (1.27–1.34)	
	More than a high school diploma	20,019	421,210	1.0 (ref)	
Family income	Less than \$35,000	13,891	171,684	4.21 (4.05–4.37)	< 0.001
	\$35,000 or more	18,213	405,815	2.33 (2.24–2.42)	
	\$35,000–\$49,999	5,537	69,683	4.13 (3.95–4.32)	
	\$50,000–\$74,999	6,491	85,320	3.95 (3.79–4.13)	
	\$75,000–\$99,999	2,952	72,705	2.11 (2.00–2.22)	
	\$100,000 or more	3,232	168,174	1.0 (ref)	
Poverty status	Poor	9,065	116,734	2.14 (2.08–2.20)	< 0.001
	Near poor	10,647	130,727	2.25 (2.19–2.31)	
	Not poor	12,384	342,073	1.0 (ref)	
Health insurance coverage	Private	12,403	348,082	0.13 (0.12–0.13)	< 0.001
	Medicaid	12,132	224,516	0.19 (0.19–0.20)	
	Other coverage	381	17,192	0.08 (0.07–0.09)	
	Uninsured	8,889	32,653	1.0 (ref)	
Current health status	Excellent or very good	25,568	524,988	0.50 (0.47–0.54)	< 0.001
	Good	7,118	88,073	0.84 (0.78–0.89)	
	Fair or poor	1,139	11,869	1.0 (ref)	
Family structure	Mother and father	20,879	431,893	1.51 (1.40–1.64)	< 0.001
	Mother, no father	10,856	148,429	2.29 (2.12–2.48)	
	Father, no mother	1,039	24,487	1.33 (1.20–1.47)	
	Neither mother nor father	654	20,537	1.0 (ref)	
Place of residence (MSA: Metropolitan Statistical Area)	Large MSA (population size 1 million or more)	18,641	342,776	1.04 (1.00–1.07)	< 0.001
	Small MSA (less than 1 million)	10,809	193,145	1.07 (1.03–1.10)	
	Not in MSA	4,643	88,844	1.0 (ref)	
Region	Northeast	3,803	103,804	0.52 (0.50–0.54)	< 0.001
	Midwest	6,767	142,241	0.68 (0.65–0.70)	
	South	13,153	230,559	0.81 (0.79–0.83)	
	West	10,367	148,165	1.0 (ref)	
Time since last visit with a dentist	< 6 months	14,428	415,555	0.68 (0.65–0.71)	< 0.001
	6 months–1 year	6,790	94,143	1.42 (1.36–1.48)	
	1–2 years	6,112	33,331	3.61 (3.45–3.79)	
	2–5 years	3,437	11,071	6.12 (5.80–6.46)	
	> 5 years	2,828	55,800	1.0 (ref)	



**Figure 1.** Prognostic factors with the odds ratios for unmet dental needs in children

## Discussion

As can be seen, the socio-economic characteristic of children with UDN with the highest risk is family income. More specifically, it was found that children with families that have “Less than \$35,000” income are four times more likely to develop UDN (OR 4.21). Additionally, family structure plays a key role in developing this type of need. Children who are deprived of their father have a two-fold increased risk of having UDN (OR 2.29). These results are in agreement with prior studies [16–19], a fact that implies that dual-parent families are more likely to be able to provide better medical services for their children due to higher parental incomes. In addition, children with barriers to dental care are six times more likely to visit a dentist every 2–5 years (OR 6.12).

Moreover, the results of this study demonstrate the existing health disparities between Black and White children, as it was found that Black or African American children are almost two-fold more likely to have UDN (OR 1.66). One possible explanation is the lack of health insurance that these children may have, as it was found that uninsured children are more likely to have UDN.

It should also be pointed out that a low level of parental education plays a crucial role in children’s dental care. The low education level of parents might have an impact on child

health, because it reduces the ability to gain and process information. On the contrary, a high education level helps parents make better health investments for themselves and their children and may result in better parenting in general. Moreover, an increased level of education can give access to more skilled vocational rehabilitation through higher earnings, and therefore better access to health care.

It can also be seen that the prevalence of unmet dental needs in the United States during 2009–2018 was found to be 5.17%. According to the World Health Organization (WHO), this prevalence is 11.8% in Europe, 23.2% in all the countries of the Americas and is extremely high in Southeast Asia (72.3%) and Africa (58.9%) [20]. Factors influencing the prevalence of UDN in the United States have been found to be the same as in developing countries where UDN was estimated at a greater percentage. More specifically, factors including poverty and insufficient coverage against the high cost of dental care [21, 22], lower level of education and ignorance of parents/teachers and the public [23] were associated with a higher prevalence of UDN.

## Conclusions

In conclusion, this study highlights that different socio-economic variables are associated with different UDN risks, while deprivation of financial comfort, a single-parent family and a low level of parental education proved to be primary prognostic risk factors for UDN in children.

Source of funding: This work was funded from the authors’ own resources.

Conflicts of interest: The authors declare no conflicts of interest.

## References

- Fulda KG, Johnson KL, Hahn K, et al. Do unmet needs differ geographically for children with special health care needs? *Matern Child Health J* 2013; 17: 505–511.
- Kataoka SH, Zhang L, Wells KB. Unmet need for mental health care among US children: variation by ethnicity and insurance status. *Am J Psychiatry* 2002; 129(9): 1548–1555.
- Yu SM, Bellamy HA, Kogan MD, et al. Factors that influence receipt of recommended preventive pediatric health and dental care. *Pediatrics* 2002; 110(6): e73.
- Bloom B, Cohen RA, Freeman G. Summary health statistics for U.S. children: National Health Interview Survey, 2010. *Vital Health Stat* 2011; 250: 1–80.
- Kassebaum NJ, Bernabé E, Dahiya M, et al. Global burden of untreated caries: a systematic review and metaregression. *J Dent Res* 2015; 94: 650–658.
- Dye BA, Thornton-Evans G, Li X, et al. Dental caries and sealant prevalence in children and adolescents in the United States, 2011–2012. *NCHS Data Brief* 2015; 191: 1–8.
- Ko H. Unmet healthcare needs and health status: panel evidence from Korea. *Health Policy* 2016; 120(6): 646–653.
- Gupta N, Vujicic M, Yarbrough C, et al. Disparities in untreated caries among children and adults in the U.S., 2011–2014. *BMC Oral Health* 2018; 18(1): 30.
- Dye BA, Tan S, Smith V, et al. Trends in oral health status: United States, 1988–1994 and 1999–2004. *Vital Health Stat* 2007; 248: 1–92.
- Albino JE, Inglehart MR, Tedesco LA. Dental education and changing oral health care needs: disparities and demands. *J Dent Educ* 2012; 76(1): 75–88.
- Como DH, Stein Duker LI, Polido JC, et al. The persistence of oral health disparities for African American children: a scoping review. *Int J Environ Res Public Health* 2019; 16(5): 710.

12. Akintobi TH, Hoffman LM, McAllister C, et al. Assessing the oral health needs of African American men in low-income, urban communities. *Am J Mens Health* 2018; 12: 326–337.
13. Dietrich T, Culler C, Garcia RI, et al. Racial and ethnic disparities in children's oral health: the National Survey of Children's Health. *J Am Dent Assoc* 2008; 139: 1507–1517.
14. Edelstein BL, Chinn CH. Update on disparities in oral health and access to dental care for America's children. *Acad Pediatr* 2009; 9: 415–419.
15. National Center for Health Statistics. Data file documentation. National Health Interview Survey 2016 [cited 30.05.2020]. Available from URL: <https://www.cdc.gov/nchs/nhis.htm>.
16. Gorman BK, Braverman J. Family structure differences in health care utilization among U.S. children. *Soc Sci Med* 2008; 67(11): 1766–1775.
17. Toomey SL, Chien AT, Elliott MN, et al. Disparities in unmet need for care coordination: the National Survey of Children's Health. *Am J Pediatrics* 2013; 131(2): 217–223.
18. Irvin K, Fahim F, Alshehri S, et al. Family structure and children's unmet health-care needs. *J Child Health Care* 2018; 22: 57–67.
19. Kumar S, Tadakamadla J, Kroon J, et al. Impact of parent-related factors on dental caries in the permanent dentition of 6–12-year-old children: a systematic review. *J Dent* 2016; 46: 1–11.
20. Ghafari M, Bahadivand-Chegini S, Nadi T, et al. The global prevalence of dental healthcare needs and unmet dental needs among adolescents: a systematic review and meta-analysis. *Epidemiol Health* 2019; 41: e2019046.
21. Masood M, Sheiham A, Bernabé E. Household expenditure for dental care in low and middle income countries. *PLoS One* 2015; 10: e0123075.
22. Amiresmaili M, Amini S, Shahravan A, et al. Relation between socioeconomic indicators and children dental caries in Iran: a systematic review and meta-analysis. *Int J Prev Med* 2018; 9: 71.
23. Wang Z, Deng Y, Liu SW, et al. Prevalence and years of life lost due to disability from dental caries among children and adolescents in Western China, 1990–2015. *Biomed Environ Sci* 2017; 30(10): 701–707.

Tables: 2

Figures: 1

References: 23

Received: 31.05.2020

Reviewed: 11.06.2020

Accepted: 4.02.2021

Address for correspondence:

Irene Rethemiotaki, MSc

Technical University of Crete

Campus Kounoupidiana

GR-73100 Chania

Greece

Tel.: +30 6948588518

E-mail: [irinireth@yahoo.gr](mailto:irinireth@yahoo.gr)