The 2001 Kentucky Children's Oral Health Survey: Findings for Children Ages 24 to 59 months and Their Caregivers

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Abstract

Purpose: This study was performed to provide a 2001 benchmark of oral health status of children in Kentucky with a comparison to the most recent state (1987) and national surveys.

Methods: Using Basic Screening Survey protocols for visual screenings, a sample of 572 children ages 24 to 59 months was screened in health department clinics and physicians' and pediatric dentists' offices across Kentucky after caregivers completed a questionnaire. Screeners were provided modified Association of State and Territorial Dental Directors training materials. Analyses on the sample and population estimates were done with SAS and SUDAAN software. This weighted population estimate analysis is based on the assumption that sampled children at participating sites are representative of other children at that site, as well as children at refusing sites.

Results: Sample data and adjusted population estimates closely approximated each other. Population estimates indicated that 43% had untreated caries, 47% had caries experience (early childhood caries), and 31% had severe early childhood caries. Thirty-seven percent of the children needed early care, 9% needed urgent care, 39% had never been to the dentist, 44% had a history of "bad bottle behaviors," and 35% of the parents had not been to the dentist within the last year.

Conclusions: Dental caries is a major health and early childhood development problem in high-risk preschool children in Kentucky. (*Pediatr Dent*. 2003;25:365-372)

KEYWORDS: EARLY CHILDHOOD CARIES, CARIES, PRESCHOOL CHILDREN, KENTUCKY ORAL HEALTH SURVEY

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Dental caries has been described as a public health problem, especially among children of low socioeconomic status (SES).[1] Brown et al[2] found that the 56% decline in untreated decay in primary teeth which occurred in the United States over the period 1974-1994 was not experienced by children aged 24 to 59 months who were at or below the federal poverty level. Manski et al[3] and Tang et al[4] indicated that children of poverty do not use dental services as frequently as their nonpoor peers. The association of baby bottle tooth decay with low SES is strong, and the need for more primary prevention in those children at risk was advocated by Smith and Moffatt.[5] Pitts[6] noted that, in the United Kingdom as in the United States, disparities existed in the prevalence of dental caries between low SES children and higher SES children.

The American Academy of Pediatric Dentistry (AAPD)[7] recommends that a dentist examine all children by 1 year of age. Edelstein and Douglass[8] reviewed numerous policy papers and journal articles in which it was suggested that there was a significant underreporting of caries in the primary dentition. They attempted to dispel the myth that 50% of school children in the United States have never had a cavity. Edelstein

and Douglass argued that dental caries remains the most common disease of childhood. "It is neither self-limiting nor amenable to short-term pharmacologic management. Childhood caries remains a sizable and significant personal and public health problem that will continue for the foreseeable future."

Early childhood caries (ECC) has been defined by Drury et al[9] as "the presence of 1 or more decayed (noncavitated or cavitated lesions), missing (due to caries), or filled tooth surfaces in any primary tooth" in a child 71 months of age or younger. The AAPD Council on Clinical Affairs adopted this definition in May 2000.[7] They have defined severe early childhood caries (S-ECC) in children younger than 3 years of age as any sign of smooth surface caries. S-ECC is defined for children ages 3 through 5 years as 1 or more cavitated, missing (due to caries), or filled smooth surfaces in primary maxillary teeth, or a decayed, missing, or filled surface score ≥4 at age 3, ≥5 at age 4, or ≥6 at age 5.

The last survey of the oral health status of Kentuckians was completed in 1987 and found that:

1. 28% of the 0 to 4 age group had at least 1 decayed surface;
2. 30% of this group had evidence of caries history.

In 1998, recognizing the need for current information, the Kentucky Department for Public Health convened a steering committee to design, develop, and implement a new survey. There were 3 main goals:

1. provide a "point-in-time" benchmark that is representative of the oral health status of Kentucky's children;
2. serve as the baseline for the initiation of the children's portion of a statewide oral health surveillance system to measure objectives for Healthy Kentuckians 2010;
3. allow comparisons to the 1987 state oral health survey and other state and national data sets.

During the 2000-01 school year, the University of Kentucky College of Dentistry was contracted to conduct the Kentucky Children's Oral Health Survey (KCOHS). The KCOHS targeted: (1) preschool children 24 to 59 months old; and (2) third, sixth, and eighth graders. The survey consisted of a questionnaire for caregivers and a clinical screening for all children except eighth-grade students who completed a questionnaire and were not screened clinically. The school survey was conducted using a stratified cluster sample drawn by the Biostatistical Unit of the University of Kentucky Medical Center to represent 5 regions of the commonwealth. The same counties drawn for the school sample were used for the preschool portion. This article reports findings from the preschool component of the survey.

Methods

Project team members used a modified Delphi process to determine what data would be collected during the survey. Survey design materials from the Association of State and Territorial Dental Directors (ASTDD) were used as an initial framework for the questions and screening items.[10,11] The survey goals mentioned previously created a framework for selecting data items to be included. All survey procedures and documents were approved by the University of Kentucky Medical Institutional Review Board (IRB) prior to use. As modifications or amendments to the initial approval became necessary, documentation was provided to the IRB. The questionnaire and screening protocol is similar to that documented by Beltran, Malvitz, and Eklund.[12]

A purposive sample with random elements of selection was used to select 250 health care sites where children 24 to 59 months are typically seen. These included family practice physicians, pediatricians, county health clinics, and pediatric dental offices. Approximately 50 sites in each region were sampled. The state's department of public health provided data regarding the distribution of all visits by preschool children to primary medical providers. Pediatricians and family practice physicians in those counties were invited to participate using the ratio of visits to determine the number of each to be included in each county.

The list of physicians used to draw the sample was the most recent listing available in Fall 2000 from the Kentucky Medical Association. A systematic sampling procedure from the alphabetized lists (generally regarded as equivalent to random sampling)[13,14] was employed to select the sites to be recruited for the study. The local health departments in each of the sampled counties were also asked to participate. Due to the shortage of pediatric dentists in the state, all of the pediatric dentists in the sampled counties except for those in Fayette and Jefferson counties were asked to screen children in this age range. Ten pediatric dentists each from Fayette and Jefferson counties were randomly selected because of the disproportionately large number of pediatric dentists in these counties.

Explanatory packets requesting participation in the program were sent to all care providers/clinics drawn in the sample for preschool children. Follow-up mailings and telephone contacts were used to increase participation. If a provider/clinic agreed to participate, he/she submitted a signed letter of agreement indicating his/her willingness to participate, perform the screening examinations, and follow the IRB procedures and protocols. The dental screening exams for preschool children were designed to be performed by dental or nondental health care providers. Training materials based on ASTDD's Standard Training Project (STP) model were supplied to individuals doing the screenings. Each screener received a manual (with color illustrations) and laminated cards (obtained from the Ohio Department of Health[15]) with images depicting case definitions. After reviewing the training manual and completing the exercises, the screener returned an assessment form demonstrating mastery of the material. For the purposes of this study, a score of ≥80% was set as "mastery." Scores for the returned forms ranged from 85% to 100%, which the investigators deemed to be satisfactory for data reliability.

Once screeners successfully completed the training, they received a packet specifying the protocols and sequence of

Table 1. Participation of Providers for the Preschool Survey

Provider	No. sent	No. undelivered*	No. participated†	Participation rate‡
Family practice	151	15	1	1%
Health department	24	0	13	54%
Pediatricians	74	8	1	2%
Pediatric dentists	34	0	11	32%
Total	283	23	26	10%

*These included those who had moved, died, were unable to be contacted, etc.
†Those who returned consent and any completed screening forms.
‡Number contacted, number returned, number that participated.

activities they were to follow. (The instructions and full case definitions with explanations are available from the authors upon request.) All data was collected from May 8 through June 8, 2001. Forms were returned to the survey staff for data entry.

A Microsoft Access database created for the survey was used for data entry. The computer data screens were designed to have the same appearance as the paper forms. Logic routines were built into the program to ensure that all required data were collected and to minimize data entry errors. Survey staff entered all of the data from the survey forms. Decision rules for data entry for the preschool portion of the survey were created prior to the survey and employed as needed during data entry. No significant problems were experienced in data entry.

Table 2. Demographic Characteristics of Survey Group vs Comparative Data

Characteristic	% 2 to 4 year olds in KCOHS sample	Comparative state data (%)
Age: 2/3/4	32/35/33	Not available
Gender: male/female	50/50	49/51*
Race: white/black/ other/multi	85/9/1/3	90/7/2/1*
Ethnicity: Hispanic or Latino	4	2*
Medicaid eligible	40	27†
KCHIP	16	6‡
% mothers <high school degree	22	22§

*US Census Bureau, 2000 National Census. Estimate of percentage of 2 to 4 year olds based on 2000 Census data for population <5 years.
†2000 Kids Count, Annie E. Casey Foundation (% of Medicaid eligible population <18).
‡2000 Kids Count, Annie E. Casey Foundation (% of KCHIP eligible population <18).
§2000 Kids Count, Annie E. Casey Foundation.

Weights were applied to the data from the sampled children to reflect the disproportionate sampling from the different regions. Sampled children were weighted so that the weighted total for children from a health region equaled the total number of 24- to 59-month-old children in the region based on state data. Using these weights, population estimates for the state were done with SUDAAN[16] using the Variance Estimation Method: Taylor Series (WR). These adjusted population estimates are then based on the assumption that, for each region, the sampled children represent a random cluster sample of children visiting similar sites for medical or dental care.

Table 3. Findings From the Parental Questionnaire (N=572)

Finding	Sample	Weighted estimate (SE)
Teething pain	36%	33% (3)
"Other" dental pain	12%	10% (2)
Child had previously been to dentist	59%	60% (5)
Of those who had been to dentist previously, the reason for going was "something was wrong, bothering, or hurting"	23%	23% (3)
Mother listed as primary caregiver	71%	71% (6)
Caregiver had been told how to care for child's teeth	78%	78% (2)
Caregiver had been to dentist in last 12 months	61%	60% (2)
Child "ate sweets or snacks" every day	62%	60% (3)
Child "ate sweets or snacks" 3 to 4 times a week	25%	27% (2)
Child "ate sweets or snacks" several times a day	41%	41% (3)
Child's teeth had been brushed <daily	7%	7% (1)
"Bad bottle behaviors"*	49%	44% (4)

*Bad bottle behaviors were grouped to include positive responses to any of the following: go to bed with a bottle filled with milk, formula, juice, soda, or something sweet; drink from a bottle with liquid other than water throughout the day; sleep all night at the breast; use a pacifier dipped in something sweet; use routine practice of propping the bottle.

Results

Two hundred seventy-four children were screened in 11 pediatric dental offices, and 298 children were screened at 15 medical sites (N=572). Table 1 shows the number of potential sites contacted by provider type and the final response rate. The most common reasons given for refusal by physician offices were "not enough time," "we don't look at teeth/do dental exams," or "dental exams are done by dentists." Table 2 compares some of the demographic characteristics of those sampled with comparative data sets. The population included generally conformed closely to state data. The authors

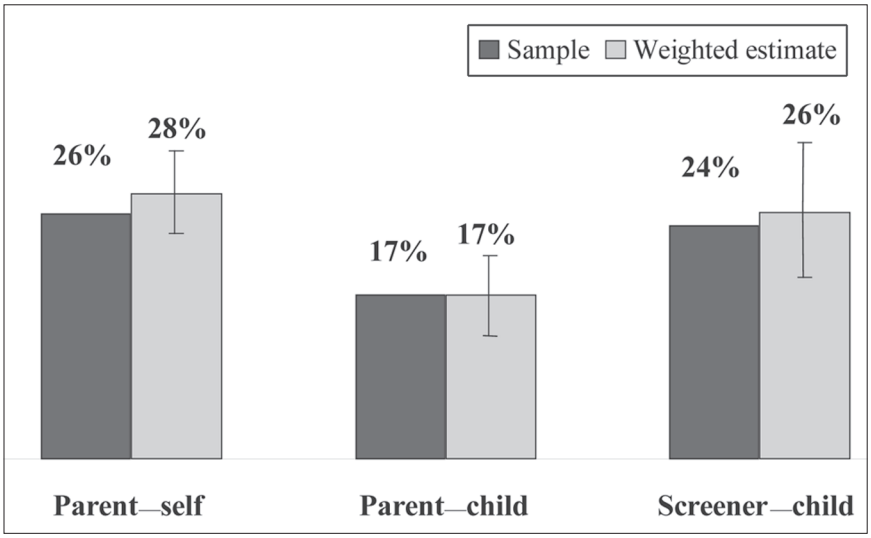

Figure 1. Dental condition reported as "fair/poor."
Parent—self=parent/guardian's self-report of own dental condition.
Parent—child=parent/guardian's report of child's dental condition.
Screener—child=screener's report of child's dental condition.

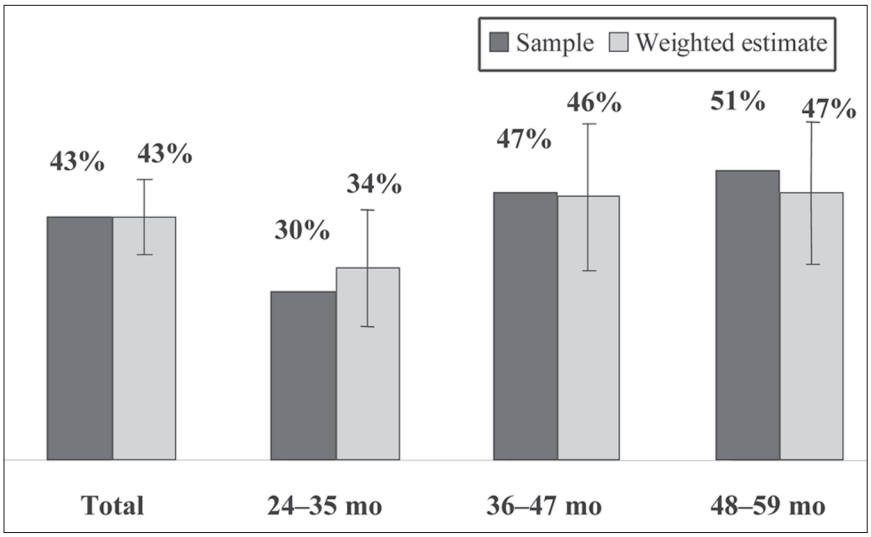

Figure 2. Percentage of children with untreated dental caries (any teeth) by age group.

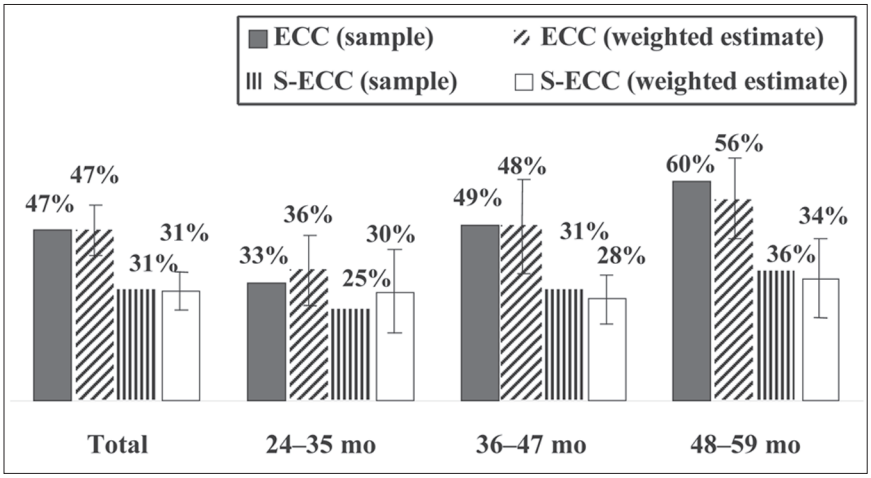

Figure 3. Percentage of children with ECC (caries experience) and S-ECC (caries on any maxillary primary teeth) by age group.
ECC is any caries experience and S-ECC is any child with at least 1 of the 6 upper front teeth decayed, filled, or missing due to caries.

oversampled minorities and lower SES as indicated by higher rates of Medicaid and KCHIP eligibility.

Sample data and population estimates for some of the major findings from the parental questionnaire are shown in Table 3. Differences between the sample data and the population estimates were small and ranged from 0 to approximately 10% of the sample percentages. Approximately one third of the children had teething pain and 10% had "other" dental pain. Most of the children (60%) had been to the dentist previously with almost one fourth reporting that the reason was "something wrong, bothering, or hurting." Approximately the same percentage (60%) of caregivers had been to the dentist in the last 12 months. Over three fourths (78%) of the caregivers had been told how to care for their child's teeth. Most of the children had snacks every day (60%). Several nonnutritive feeding behaviors were listed, and almost half (44%) of those surveyed indicated that 1 or more of these were current or former practices.

Figure 1 illustrates the differences between the assessment of dental conditions for caregivers of themselves, caregivers of their children, and screeners of the children. Parents/guardians considered their own dental health to be worse than their children's. As a group, the screeners judged about one fourth of the children to be in "fair or poor" condition. The caregivers had indicated that condition for only approximately 17% of those screened. Between one third and nearly one half of the children had untreated dental caries (Figure 2). The adjusted population estimates increase with each age group: 34% for age 2, 46% for age 3, and 47% for age 4. The total for all ages combined was 43%.

The high percentage of children surveyed with ECC and S-ECC are shown in Figure 3. The adjusted population estimates increase with each age group: 36% for age 2, 48% for age 3, and 56% for age 4. The total for all ages combined was 47%. The percentage of S-ECC as compared to the total percentage of ECC for the total caries experience is illustrated in Figure 4. The

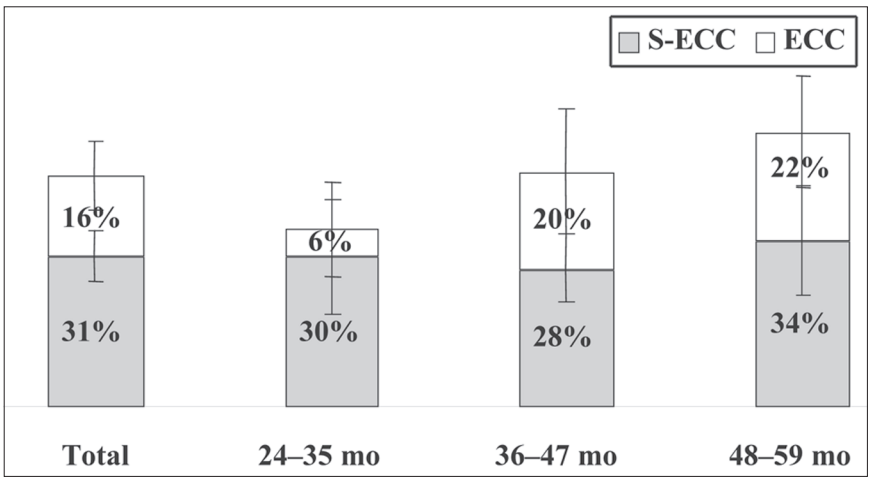

Figure 4. Proportion of S-ECC to ECC by age group (weighted estimate). Combined totals for each age group=caries experience in Figure 3.

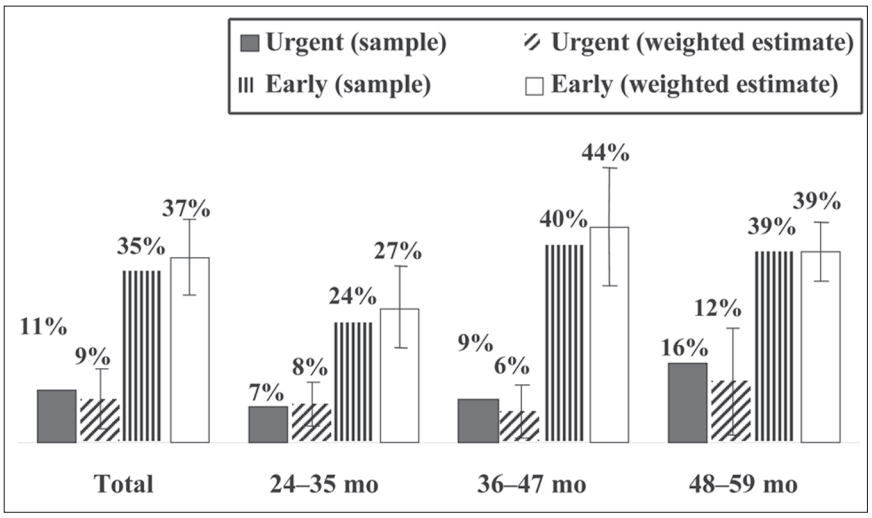

Figure 5. Treatment urgency as reported by the screeners by age group. Urgent=pain, infection, swelling, soft tissue ulceration of longer than 2 weeks duration. Next dental visit needs to be within 24 hours. Early=caries without accompanying signs/symptoms, spontaneous bleeding gums, suspicious white/red soft tissue. Next dental visit should be within the next several weeks.

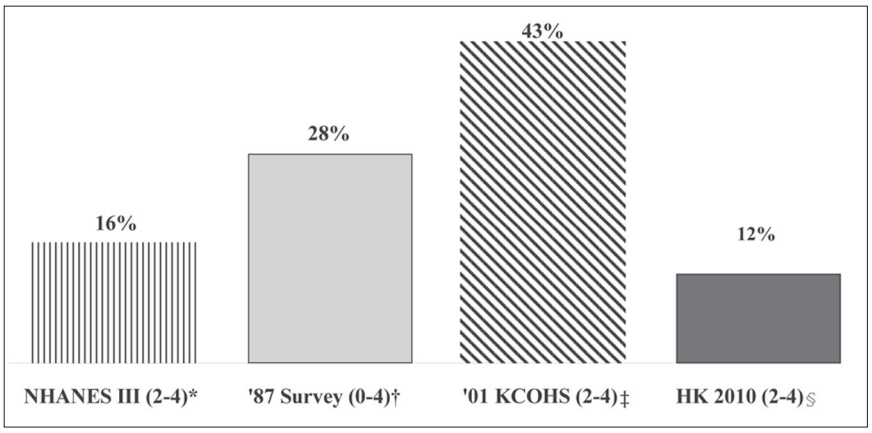

Figure 6. Untreated dental decay—primary dentition (ages).
*NHANES III (1988–1994) 2 to 4 year olds.
†1987 Kentucky Oral Health Survey (surface level data).
‡2001 Kentucky Children's Oral Health Survey.
§Healthy Kentuckians 2010 objectives.

ratio of S-ECC to ECC was 5.3:1 for 2 year olds, 1.4:1 for 3 year olds, 1.6:1 for 4 year olds, and 1.9:1 overall.

The urgency of treatment needed, as judged by the screeners, is shown in Figure 5. The definitions for each status are those used by ASTDD. No obvious problem=self explanatory (the suggested timing for the next dental visit is the next regular check-up). Early dental care=caries without accompanying signs or symptoms, spontaneous bleeding gums, or suspicious white/red soft tissue lesions (next dental visit=within several weeks). Urgent care=pain, infection, swelling, or soft tissue ulceration of longer than 2 weeks duration (needs care within 24 hours). Early care was needed by more than one third and urgent care was needed by nearly 10% overall.

Discussion

Although there is little in the literature about dental pain in preschool children, Slade recently published a literature review of dental pain in children and adolescents.[17] He reported a prevalence in 5 year olds of 5% to 33% for dental pain (for any reason); the authors' findings are consistent with this. Over three fourths of the participants in the authors' survey acknowledged having been given oral care instructions for their children. Children in this age group are very dependent on their primary caregivers for their oral hygiene.[18] Bullen demonstrated improvements in preschool children's oral hygiene when the parent had received professional instruction and demonstrated proficiency,[19] in contrast to an earlier study that failed to demonstrate improvement after a 1-hour lecture.[20]

The percentage of children reported in this study as having been to the dentist is within the range of other reports.[21-28] However, the total number in this sample may be inflated since approximately half of the children were seen in a dental office and parents may have responded "yes" to having visited the dentist even if this was the child's first visit. The 60% of parents reporting that they had been to the dentist

within the last year was very close to the 63% of Kentuckians over age 18 that reported "yes" for the same question in the 1999 Kentucky Behavioral Risk Factor Surveillance System Survey.[29]

Reports extending over many years[30-40] have addressed the effects of frequency, duration, and type of diet on dental caries in young children. Over half of the children in the authors' study consumed "sweets or snacks" every day with 59% of them eating those snacks "several times a day." Between one third and one half of the parents also reported employing bottle behaviors known to promote dental caries.

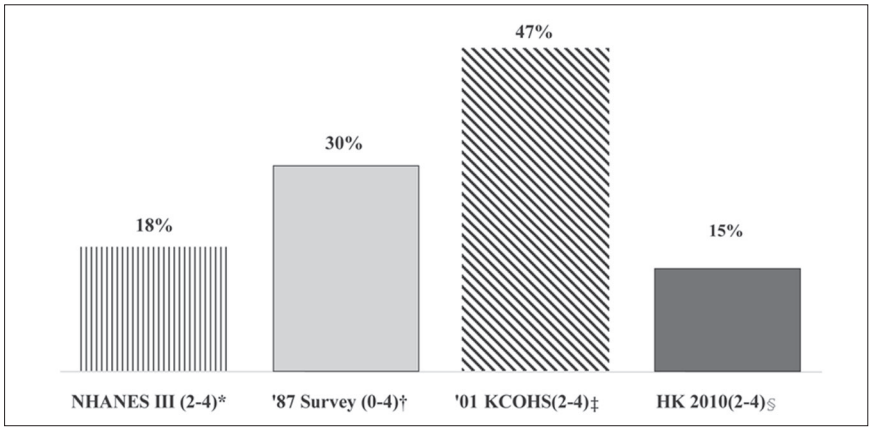

Figure 7. Caries experience (ECC)—primary dentition (ages).
*NHANES III (1988–1994) 2 to 4 year olds.
†1987 Kentucky Oral Health Survey.
‡2001 Kentucky Children's Oral Health Survey.
§Healthy Kentuckians 2010 objectives.

The 17% of children whose dental condition was indicated by parents/caregivers as "fair/poor" is notable since parents generally underestimate the presence or severity of dental caries.[41-44] Slightly more than one fourth of the parents responding to the survey described the condition of their own teeth as being "fair/poor." This is less than the aggregate 36% for "fair" and "poor" from NHANES III, as reported by Gift et al.[45] One of every 4 of the children was rated by the screeners as having a dental condition of "fair/poor."

Figures 6 and 7 compare survey results for untreated decay and caries experience with national and state data. (Note: The 1987 survey results include children less than 2 years old.) The definition used for untreated dental caries in the authors' study meets the current definition of ECC.[7,9] Dental caries has a disproportionate impact on children from lower income populations,[1,46,47] which is an important demographic issue for Kentucky. It has also been demonstrated that maxillary anterior caries in the primary dentition is associated with an increased risk of future dental caries.[48,49] White et al recently demonstrated the significantly higher costs of treating children with ECC compared to those with less severe disease.[50] The large discrepancy between the findings in this study and the stated goals for Healthy Kentuckians 2010 accentuates the tremendous amount of work that needs to be accomplished in the current decade.

A large proportion of the children with ECC in the authors' study has the more severe form of the disease (Figure 4). Because the authors only looked at smooth surface caries on maxillary anterior teeth, their figures for S-ECC probably underestimated the actual prevalence. A little less than half of those screened needed care, with 1 in 5 of those requiring urgent care.

Possible differences between screenings by dental and medical staff must be acknowledged. Nurses have been used previously in similar oral screenings with results similar to dental personnel.[12] Factors in this survey that minimize differences between dental and medical screeners include:

1. identical training;
2. a requirement to reference the same criteria using the same visual reference guides;
3. a requirement for only gross levels of distinction (eg, caries was "yes" or "no" on a patient level as opposed to having to make a determination for each surface).

The very low participation rate of family practitioners and pediatricians was disappointing. Concerns about time and questions/comments about the relative importance of oral health make it clear that the dental profession must continue to educate our medical colleagues about the significance of oral health as part of overall health.

This study is subject to the same set of limitations to accuracy as any other self-report survey, although Filstrup et al recently reported results of a study of parents of children 22 to 72 months old that indicated those parents' ". . .perceptions are significantly correlated with the clinical exam outcomes."[51] Since the screening examination used very conservative definitions and did not employ tactile, radiographic, or other more sensitive measures of dental caries, there is almost certainly an underestimation of the true prevalence of this condition. Because the percentage of Medicaid and KCHIP eligible participants in the survey was higher than the state average and many of the participants were clients at county health clinics, it is likely that the authors' sample is biased towards lower income individuals who sought medical or dental care. These results should be viewed as indicating the status of those seeking medical or dental care and, therefore, possibly having greater needs (particularly those going to pediatric dentists due to specific needs).

Though probability methods were employed in the sampling, the group screened was not a true probability sample of all 25- to 59-month-old Kentuckians. Therefore, the validity of the assumptions used in generating analysis weights and deriving the population estimates can be questioned, and the results should be viewed accordingly. The

weights do reflect the population distribution of children across the 5 regions. Variations in outcome variables by region do result in some differences between the sample numbers and the population estimates, but the generally small differences indicate that variations between regions in the survey sample are not great. It is also possible that the relatively short time frame (1 month) might have influenced which children were included in this study.

Conclusions

1. The 2001 Kentucky Children's Oral Health Survey demonstrates a severe dental disease problem in children ages 24 to 59 months.
2. Though there is possible sample bias toward those with more dental needs, it appears that both untreated decay and caries experience have increased since the state's 1987 survey. The state's levels also appear to be much worse than national levels for these same indices.

Acknowledgments

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