

A Multi-level, Multi-Sector Oral Health Literacy Initiative to Reduce Oral Health Disparities and Achieve Health Equity: Early Lessons from the Maryland Model

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Abstract The state of Maryland's oral health literacy initiative experience serves as a case study. This experience was stimulated by the tragic death of Deamonte Driver in 2007 and highlights actions taken and lessons learned. It is a story of one state's response, one that received strong support from state congressional and state legislative leaders, senior government leadership, multiple community and professional groups, foundations, and funding agencies. It is the hope that this experience can be used to inform other states that are working to enhance oral health promotion and disease prevention strategies, or other health conditions, for vulnerable populations.

Keywords Oral health literacy · Dental disease prevention · Oral health promotion · Maryland model

Introduction

The 2007 tragic death of Deamonte Driver, a 12-year-old resident of Prince George's County, Maryland, catapulted the state and the nation into immediate action [1]. Since his death, Maryland health, social service, education, and community-

based organizations have been working together to promote oral health promotion and disease prevention, with a focus on vulnerable populations and children. The state's pre-2007 work led by the state oral health department and other partners provided a fertile foundation for needed policy actions, health services enhancements, educational efforts, and research. Concurrently, there was a growth in evidence-based research illuminating the roles health literacy, including oral health literacy, plays in reducing health disparities [2]. These efforts were given further visibility by related Institute of Medicine reports as well as federal Calls to Action and tool kits to assess and enhance health literacy [3–5]. The science of health literacy has provided guidance for how health promotion, disease prevention and public health, and private practice are approached, with a renewed focus on achieving health equity. This paper provides an overview of an ongoing oral health literacy initiative that integrates the collective work of key players at all levels in the state to achieve common impact: the single goal whose aim is reducing oral health disparities and achieving health literacy. The current and evolving definition of health literacy/oral health literacy provides the essential backdrop to this overview.

In 2004, the Institute of Medicine's sentinel report, *Health Literacy: A Prescription to End Confusion*, defined health literacy as the "degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions." [3] It also characterized health literacy as the "interaction of the skills of individuals and demands of the health care system" which highlights the skills needed to navigate the health-care system and environment and the skills required for clear communication between health-care providers and their patients. The definition of oral health literacy has paralleled the definition of health literacy, incorporating the full range of complexities reflected in health promotion and care specific

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to enhancing oral health as well as the ability to function in the context of care delivery. “Oral health literacy is the degree to which individuals have the capacity to obtain, process, and understand basic oral health information and services.” [2].

National data have revealed that, although oral health in the USA has improved significantly in recent decades, preventable and treatable oral disease remains common, especially among the poor, those with low levels of education and the underserved [6, 7]. Given that approximately 90 million adults have limited health literacy, it is clear that a large proportion of our population cannot fully benefit from oral/dental research findings and from navigating the growing complexity of health care and reimbursement systems [8]. This is particularly important when the adults are the prime caregivers. In addition to the health literacy skills of the public, studies have shown that the health literacy skills of providers and related attributes of the health-care systems, also require attention and play an important role in supporting access to, and use of, health care, especially for underserved populations, and in eliminating health disparities. The 2000 Surgeon General’s report on oral health, the 2003 National Call to Action to Promote Oral Health, and the National Institute of Dental Research’s research agenda for oral health literacy called for integrating oral health literacy into health promotion and disease prevention efforts [5, 9, 10]. While work toward understanding and addressing oral health literacy to improve health outcomes continued, it was not until Deamonte Driver’s death that more structured approaches evolved. Prior to 2007, the oral health of poor children in Maryland received limited attention. With the death of Deamonte Driver, national attention focused on the need to address the devastating oral health conditions of underserved populations, and the state of Maryland took immediate action. The initial events that led to the formation of the Maryland Dental Action Coalition and the 5-year state oral health plan, and selected highlights of actions taken by each of the key players as well as lessons learned, are described.

Creating the Foundation

Deamonte Driver’s death in February 2007 shocked the dental community and catalyzed the entire state into action. In May of that year, at the request of the Secretary, Maryland Department of Health and Mental Hygiene (DHMH), the Dental Action Committee (DAC) was formed and charged to provide recommendations to enhance oral health access in order to ensure that another such tragedy never again occur. Four months later, the DAC presented its recommendations to the secretary [11]. These recommendations were aimed at addressing barriers to health care and health promotion and were swiftly and seriously incorporated into actionable plans. It is important to note that efforts undertaken beginning in the late

1990s, such as the creation of the Office of Oral Health (OOH) in DHMH, extension of partnerships, and several state legislative efforts that provided resources to support dental public health initiatives created a fertile basis to address these recommendations. Examples of these earlier initiatives include the initiation of a statewide oral disease surveillance system, oral cancer prevention initiatives targeting medical and dental professionals as well as the public, and the dentist loan assistance repayment program. As a result, by the time the DAC was convened, a shovel-ready plan had already been established as an outcome of these initiatives and, given further deliberations by OOH and its many partners, would form the predominant platform for actions to be taken for most of the DAC’s eventual recommendations.

By 2011, actions for most of the DAC recommendations were well underway. Table 1 provides highlights of actions taken as of spring 2016 for each of these recommendations. Immediate steps were taken to award Medicaid dental services to a single vendor, thereby streamlining administration and outreach efforts. The initial increase of the state’s Medicaid reimbursement rate, which at one point in the late 1990s had been among the lowest in the country, also contributed to enlarging the pool of participating dentists and decreasing barriers to oral health care. An experienced state dental director was hired in 2008, providing stability in leadership, and further helped decrease barriers to oral health care and expand community-based preventive regimens. By 2010, and with the proactive efforts of the state’s professional dental association, approximately a thousand new dentists joined the new Maryland Healthy Smiles Medicaid dental program, and access for Medicaid-enrolled children began to increase in 2010, with continuing increases through 2015. In addition, the dental public health workforce was expanded because of enabling legislation passed by the Maryland Legislature—the Public Health Dental Hygiene Act of 2008—to allow dental hygienists to practice what they are licensed to do in public health settings without the direct supervision of a dentist and the need for the dentist to see the patient first. In addition, outreach to educate non-dental providers to address oral health needs and give them support to provide preventive services added to workforce capacity and services for the underserved.

The state benefited from the commitment and perseverance of the DAC members who continued to work together overseeing the actions taken and who played a key role in the formation of the Maryland Dental Action Coalition (MDAC). With initial seed funds from the OOH, the formal transition of DAC to the independent 501c3 MDAC in 2010 provided an environment for all sectors to aggregate and to develop the 5-year Maryland oral health plan (MOHP), launched in 2011 [12]. The MOHP, with a strong focus on oral health literacy and education, provided partners at different levels of government, in academia, in social service, and private sectors to work together toward the same goals and

Table 1 DAC's recommendations in 2007 and current status

DAC'S recommendation	Current status
1. Initiate a statewide single vendor dental administrative Services only Provider for Maryland	In 2009, Medicaid dental services were “carved out” of the managed care Medicaid program and awarded to a single vendor. A new single vendor was selected in 2015 continuing the established and streamlined credentialing, application process, and administrative management
2. Increase dental reimbursement rates to the 50th percentile for the American Dental Associations' South Atlantic region charges, indexed to inflation, for all dental codes.	Support for rate increases was provided by the governor's budget in 2008 to include increases for each of three fiscal years at the ADA 50th percentile median fee. To date, only two of the initially three increases were enacted due to continued economic challenges in the state. However, efforts continue to enact all three promised rate increases
3. Maintain and enhance the dental public health infrastructure by ensuring that each local jurisdiction has a local health department dental clinic or a community oral health safety-net clinic serving low-income populations.	The Office of Oral Health (OOD), DHMH budget, included funds to increase the capacity of the safety net, resulting in residents in every Maryland county having access to a public health dental clinical program. In addition, since 2008, the OOH has been awarded federal grants to continue with expanding the infrastructure and services provided by these clinics. To provide additional support for low-income school children, the OOH and the UMD School of Dentistry conducted a School Dental Sealant Demonstration Program in 2010 that led to the current school dental sealant statewide initiative
4. Establish a public health level dental hygienist to provide services within their scope of practice without a dentist present or having to see the patient first.	The 2008 enabling legislation created the Public Health Dental Hygienist (PHDH) category, to expand the workforce capacity to address dental needs of low-income populations. This addition to the workforce contributed to public health programs providing increased preventive regimens. The 2013 report of the evaluation of this legislation, funded by APHA, concluded that using PHDH in state oral health prevention programs resulted in the following outcomes: (1) increase in the number of children screened in schools; (2) increase in the number of children in schools who receive sealants and/or fluoride varnish; (3) increased sense of value felt by dental hygienists; (4) increased value placed on dental hygienists by dentists, administrators, and the general public; (5) increased restorative care services provided by dentists; (6) increased number of oral cancer screenings conducted for seniors; (7) decreased spending on services that can now be administered by hygienists, as opposed to dentists; and (8) increased number of patients (of all ages) seen by a dentist and/or a dental hygienist
5. Develop a unified oral health message for use throughout the state to educate parents, caregivers, and health care providers of young children about oral health and the prevention of oral disease.	A partnership among the MDAC, OOH, DHMH, and academic institutions, with funding from state, federal, and non-profit sources, has contributed to systematic ongoing message development and dissemination to all audiences. A statewide oral health literacy assessment, led by the UMD School of Public Health (launched in 2012 and ongoing), among adults with young children, health care, and social service provider groups, and safety-net clinic environments informs unified and targeted educational messages. These are, and continue to be, delivered through diverse media forms (list, pamphlets, video, workshop...) and through the Oral Health Literacy Campaign (launched in 2012 and ongoing)

Table 1 (continued)

DAC'S recommendation	Current status
6. Systematically provide dental screenings and case management for public school children.	As an initial step, the MDAC piloted a grant-funded school-linked screening and case management program in one county. To monitor the needs of Maryland public school children with sufficient information to note the demographic and geographic differences, clinical dental surveys of K and third grades have been conducted in 2001, 2005, 2011, and one is currently in progress. As successful as this pilot project was, it concluded for there to be systematic oral health screening of schoolchildren prior to school enrollment, it must be tied to a systematic system of case management that currently is not in place in Maryland. There have been efforts to credential and reimburse case workers and develop competencies that include oral health but to date there has not been any sustained success in these efforts
7. Provide training to dental and medical providers to enhance their skills in establishing a dental home for children.	Maryland Medicaid began reimbursing medical providers for applying fluoride varnish in 2009. As a result, Maryland mouths matter was established to train medical and dental providers how to counsel parents of children 0–3 about oral health, how to apply fluoride varnish, and how to bill Medicaid for the procedures. As of March 2016, there are over active 900 providers who have applied nearly 165,000 fluoride varnish applications

objectives. MDAC facilitated the creation of multiple partnerships to address the plans' key focus areas: (1) access to oral health care, (2) oral disease and injury prevention, and (3) health literacy and education. Thus, by 2010, key immediate actions were taken to address the most urgent structural barriers, a state community coalition was formalized, and a plan with measurable outcomes was in place. MDAC commemorated this stage by hosting its first state oral health summit in 2011, co-sponsored by the Santa Fe Group (a leading independent think tank on oral health policy and practice), to reflect on accomplishments to date and to set the course for the coming years guided by the MOHP. Peer-reviewed papers describing key state programs and initiatives, combined with expert reviews and reactions informed the summit and, together with the proceedings, were published [13]. In 2013, MDAC held a second oral health summit to highlight progress in the mid-point of the MOHP. MDAC served to house educational initiatives, develop implementation plans for the MOHP goals and objectives, and successfully competed for various projects. One example includes MDAC which launched the Maryland Oral Health Learning Alliance in 2012, an initiative that further extended the partnerships to non-traditional stakeholders, such as the Maryland Public Libraries and the Maryland Chapter of the Academy of Pediatrics. With its focus on improving oral health of underserved pregnant women and their children, the alliance directed its efforts to increase oral health literacy and medical-dental collaboration.

During this early stage, the Maryland governor provided resources and support for the Deamonte Driver Dental Project, a mobile unit unveiled in May 2010 to provide dental screenings and services to low-income elementary school students in Prince Georges County. School children are provided oral examinations, some preventive and restorative treatment, one-on-one instruction on how to brush their teeth, and educational materials and toothbrushes and toothpaste to take home. Students with urgent needs are referred to local dentists for treatment. Currently, the mobile unit is based at the Prince Georges County Health Department. The University of Maryland School of Dentistry, the National Maternal and Child Oral Health Resource Center (OHRC), and the OOH were the leads for oral health trainings of physicians and nurse practitioners, including the provision of fluoride varnish for at-risk children, so they would be eligible to receive approved reimbursement for these services and increase the health-care workforce accessible to young children. Maryland mouths matter consists of four modules of training for non-dental providers with the purpose of preventing dental caries in children up to 3 years of age. The course was developed by a multidisciplinary team of experts including UMD dental school faculty, OHRC personnel, and OOH staff. Originally, the course was offered in person; today, it is an online course that provides free CEU credit. Other key partners also began taking action and provided guidance for the subsequent progress.

Building Upon the Foundation Using an Oral Health Literacy Lens

One of the DAC report's seven major recommendations called for the development and implementation of a statewide unified oral health education program aimed at parents, care givers, and health-care providers. This recommendation, together with the state's oral health plan, stimulated an oral health literacy approach to reduce disparities and increase oral health equity among vulnerable populations, with a focus on children ages 0–6 and their mothers. Specific goals for the health literacy and education focus area in the state's plan included (1) enhancing individuals' awareness of the relationship between oral health and general health and wellness to empower them to adopt good oral health behaviors supported by evidence-based practice; (2) enhancing individuals' ability to navigate the oral health-care system and to establish dental homes; (3) promoting primary care health professionals' and specialists' awareness and knowledge of the importance of oral health interventions for medically compromised individuals; and (4) enhancing oral health professionals' ability to work with diverse populations [12]. Objectives in this goal area highlighted the need to increase knowledge and skills of both the public and health professionals about oral health promotion and disease prevention. Highlights of the academically led efforts and the campaign led by the OOH provide examples of how activities informed one another.

The evolving health literacy science-base and health literacy principles and practices led to Maryland's unique approach to address health promotion and disease prevention. Informed by the 2004 IOM report, Maryland's oral health literacy strategy included reducing oral health disparities by maximizing the capability and role of the many stakeholders who contribute to population health and reducing barriers the public encounters when interacting with the health-care system(s). Maryland's approach also was informed by a national call to action to promote oral health (2003) that integrated health literacy into each of its five actions and highlighted similar strategies to increase collaborations and to replicate effective programs and proven efforts to overcome barriers [5]. This call to action also emphasized the need to change public, policy-maker, and health professionals' perceptions of oral health; increase oral health workforce diversity, capacity, and flexibility; and the need to continue to build the science base and accelerate science transfer. Early on, it was recognized, to achieve optimum oral health, that baseline data were needed on knowledge, attitudes and practices, and evidence-based interventions and practices to inform initiatives that would enhance the capacity of and inform self-care, care of others, professional care, community programs, policies, laws, regulations, and reimbursement structures. Specific emphasis was placed on reaching young children and their caretakers/parents in order to design programs directed toward

prevention rather than treatment, and a primary focus was on the prevention of dental caries.

In 2008–2009, the University of Maryland School of Public Health (UMD SPH) initiated a statewide oral health literacy assessment of health providers (dentists, dental hygienists, pediatric dentists, general dental practitioners, family medicine specialists, and nurse practitioners) and the public. Using a mixed methods approach, primary data were captured through mail and telephone surveys and complemented by focus groups to gain further insights. Together with OOH, DHMH, additional surveys were extended to Head Start and Women, Infants and Children (WIC) Program staff and administrators. This comprehensive baseline assessment of diverse stakeholders provided an understanding of the knowledge, attitudes, and practices related to dental caries prevention as well as experiences and skills with communication techniques. [14–20]. For the latter, providers and administrators were asked about their use of the American Medical Association's (AMA) [21] recommended communications techniques, and for the public assessment, the Agency for Health Research and Quality's [22] questions regarding perceptions of their dental provider's ability to communicate were incorporated.

Baseline results from these stakeholder groups informed members of MDAC, and other stakeholders in their efforts to address the health literacy and education focus area. The findings for the public demonstrated that the general public, especially those with lower levels of education, was less likely to understand how to prevent dental caries, to know the purpose of fluoride, and less likely to practice known preventive regimens like drinking tap water that is fluoridated. Further, those with lower levels of education, or whose child was insured by Medicaid, were less satisfied than those who were privately insured with the communication skills of their dental providers and felt their provider did not spend enough time with them [20]. The findings for health-care providers revealed that more work needed to be done to inform all health-care provider types.

Dentists and dental hygienists were more knowledgeable than the physicians and nurse practitioners regarding caries prevention. However, nurse practitioners reported using recommended communication techniques more than the other three provider groups [17]. Nevertheless, it was clear that most providers did not, on a routine basis, use most of the recommended communication techniques. Results from low-income families whose children were enrolled in WIC and Head Start programs were similar and reflected the need for enhanced understanding of caries prevention. Neither group considered the use of fluorides as particularly important for caries prevention. An additional effort to plan health literacy programs included focus groups with Maryland Medicaid-eligible pregnant women. Findings revealed that these women often do not get dental care during pregnancy for a variety of reasons: some are not aware

that they are eligible for dental care during pregnancy, others believe incorrectly that it is unsafe for women to see a dentist while pregnant, and still others are afraid of going to the dentist.

Emerging findings of baseline, follow-up, and other assessments informed the MDAC/OOH's efforts who entered into a strategic partnership to develop and launch a Maryland-based oral health literacy social marketing campaign, which remains in place. With funding support primarily from federal sources, the Healthy Teeth, Healthy Kids (HTHK) campaign began in 2012 and was designed to reach mothers of at-risk children age 0–6 with powerful, creative, and consistent oral health messaging. The campaign goals were to increase oral health awareness, improving preventive oral health behaviors, and drive access to dental care. Television, radio, and transit advertising was used, as well as print materials, social media, community outreach, and a website to communicate its message. Early findings reveal that the campaign was successful in reaching its target audience and led to a significant increase in awareness of key campaign messaging as well as an increase in children's dental visits.

Since the launch of the initial HTHK campaign, the MDAC/OOH has been able to replicate its success, using oral health literacy social marketing campaigns to increase awareness and improve preventative oral health behaviors, in a variety of target audiences. In 2014, and again in 2015, two Spanish language versions were launched: *Dientes Sanos, Niños Sanos*. Both of these latter campaigns ran for a 9-week period targeting Latinas with young children age 0–6. The campaigns were also successful in reaching their target audience. Based on comparisons of pre- and post-campaign surveys, more Latinas understood the importance of oral health and took action to practice preventive oral health behaviors for themselves and their children following the campaigns. In February and March of 2016, the MDAC/OOH ran the *Mighty Tooth* social marketing campaign targeting African-American women, educating them about the importance of dental sealants for children. Near future plans include a fall 2016 social marketing campaign directed to Latinas that will focus on the importance of oral health during pregnancy. Additional of such campaigns are planned for 2017. One will focus on educating Latinas about the importance of drinking fluoridated tap water in preventing tooth decay, and a subsequent 2017–2018 campaign is planned to educate African-American women about the relationship of oral health to overall health and the dentist's role in screening and referring for hypertension.

The development and distribution of a broad array of tailored educational interventions paralleled the campaign and were designed to be used in a range of programs and for different populations and stages of child care. These interventions were based on the findings from the baseline assessments. These included leaflets, videos and posters, and the conduct of formal in-service training and provided additional resources to support promotion of oral health literacy. MDAC,

OOH, and UMD SPH collaborated on several continuing education courses for health and health-related providers designed to increase oral health literacy among the participants including the increase of recommended communication techniques. Participants in these CE courses included dentists, dental hygienists, physicians, nurses, nutritionists, social workers, public health workers, and administrators.

To overcome some of the health-care access barriers noted by pregnant women, two *oral health passports* were developed to assist low-income gravid women and women who have young children to make appropriate choices regarding their own oral health and that of their children. The first passport focuses on how to have a healthy pregnancy and prepares her to raise a healthy, cavity-free child. It provides education on how to attain and maintain good oral health, help her understand how her oral health impacts her infant's oral health, and guide her to dental appointments during pregnancy. This passport has general health guidelines embedded in it. The second passport focuses on the oral health of her infant from birth through age 2. This interactive tool is designed to track important general and oral health information. This passport also provides guidance on the importance of good oral health for her child and timing of critical oral home-care for the infant including cleaning the infant's mouth, checking for white spot lesions on primary teeth, brushing the child's teeth, and timing of dental visits. EPSDT program guidelines serve as the basis for the timing of well-baby checks to ensure that oral health is included in the overall health [23].

To align the health literacy literature with the importance of addressing the interaction of the public with the demands of the health-care system, UMD SPH expanded its baseline assessment and conducted health literacy environmental scans of 26 of the 32 community-based dental clinics in Maryland. This additional effort emerged from comments made as part of the surveys and focus group process which recommended that there be an emphasis placed on vulnerable populations, as well as the recognition of the need to build health literate health facilities [24•, 25, 26•, 27]. These environmental scans were based on AHRQ's Health Literacy Universal Precautions Tool Kit [28], a guide based on Rudd's work [29], and were conducted with the concurrence of the dental director and the facility's chief executive officer. The purpose of these scans was to identify facility characteristics and provider practices that impact dental services access and education about dental caries prevention. The scans assessed signage, accessibility, written communication, such as consent forms and educational materials, and phone and websites presentations.

The findings from the environmental scans revealed considerable variation among the clinics regarding clinic facilities, operations, and type and content of educational materials. Overall, patient consent forms, health intake, and post-treatment instruction were rated between the 9th and 16th grade level using the SMOG readability formula, none of

which are keeping in recommendations of using plain language. This assessment included interviews of patients regarding their opinions of the dental provider's communication skills and surveys of all dentists and dental hygienists regarding their reported use of the AMA recommended communication techniques. Providers who had taken a communication skills course were more likely than those who had not to use recommended communication techniques. These findings will be used to inform approaches to eliminate health literacy-related barriers in the state's community-based dental clinic environments, and discussions are ongoing with dental directors and community health clinic administrators [30••].

The OOH has successfully competed for key federal grant awards that extend their technical assistance, program direction, and leadership. With these grants, through their partnerships, the office has been able to better address health promotion and disease prevention of vulnerable populations and enhance oral health literacy. The HRSA oral health workforce and CDC state oral disease prevention infrastructure grants support the enhancement of dental sealants, community water fluoridation, and the oral health literacy campaign, among other activities. In 2014, OOH in partnership with the Maryland Rural Water Association, coordinated the first full-day fluoridation training course for water operators in the state. In addition, the most recent grant HRSA award include plans to continue these activities and also to proceed with integrating oral and primary care medical delivery systems for underserved communities, conducting an evaluation of the state's fluoride varnish program, and providing further support for MDAC's infrastructure and sustainability, including support for a new state oral health plan. These and other grants have allowed the office to extend their work related to mothers and infants and to older adults.

The HRSA perinatal and infant oral health quality improvement expansion grant award is aimed at reducing the prevalence of oral disease, through improved access to quality oral health care, for both pregnant women and infants most at risk of the disease. In partnership with the UMD SPH and other partners, this project aims to reduce early childhood caries and dental expenditures, by increasing preventive care utilization of pregnant women and establishing a dental home for their infants by age 1. OOH's continued commitment to periodic surveys has provided the state with the ability to monitor progress, in partnership with UMD School of Dentistry. Findings from the 2011 Oral Health Survey of Maryland schoolchildren have found a 41 % decrease in untreated dental caries since 2001 and reported data dental caries experience, untreated dental caries, and dental sealant utilization for Maryland school children have surpassed the Healthy People 2020 objectives [31]. Nevertheless, there are regional differences and populations that still need additional attention. Also, while children have been a primary population of interest, OOH also has undertaken an initial step to address the

needs of older adults and, with support from state and professional organization grants, has conducted the Maryland Basic Screening Survey of Older Adults in nursing homes, assisted living venues, day care centers, and congregate meal sites.

Early Lessons Learned

It has been almost a decade since Deamonte Driver's passing and, while there is still much to be accomplished, several early lessons have been learned through this phase of Maryland's experience. The catalytic effect of the efficient deliberations and targeted report of the Dental Action Committee charged by the DHMH Secretary cannot be overestimated. It gave Maryland an imperative for action witnessed and supported by senior state leaders, and the report's recommendations still serve to guide the state's activities. It shone the national spotlight on the state, adding to the accountability of the actions. Further, the DAC report revealed the complex set of root causes that contributed to Deamonte Driver's untimely death. These included barriers to care related to the health-care delivery system (workforce, reimbursement mechanisms, care settings, etc.); barriers to the lack of dental disease prevention knowledge communicated to and received by the public; barriers resulting from competing financial and time challenges of addressing basic lifestyle needs and barriers due to lack of care continuity and referral among the health professions and among health and other sectors.

The use of an "oral health literacy lens" to address the root causes and the recommended DAC actions and follow-up steps is creating an evidence-based foundation that supports the design, dissemination, and assessment of interventions. It also has served to attract new partners to oral health promotion efforts.

Striving for oral health literacy is not synonymous with optimally implementing oral health education/awareness interventions. This was not initially understood by some MDAC partners. Incorporating health literacy into public health programs and interventions requires proactive design and integration of health literacy principles through the complex pathways that underpins health literacy capacity and actions at the individual, clinical, and system(s) levels.

Strong sustained leadership for oral health is needed at all levels but is especially critical at the level of the state health department. A strong, committed, and well-funded state oral health program with a director well-versed both in public health and dentistry as well as dedicated office staff is essential. Having such support at the highest level of state government facilitates partnerships among other state disease prevention programs, public financing delivery systems, and with the legislative branch.

The establishment and perpetuation of a statewide coalition and the state plan take time, but are worth the investment.

They provide an integral forum for collective action. An in-depth plan developed and agreed upon by all partners is instrumental and worth the effort to establish. Having a common vision, mission, goals, and objectives helps direct the efforts of diverse groups.

Acquiring comprehensive baseline and ongoing assessment data is essential both for knowing where we are and where we need to go, but also for securing additional funding. The state has benefited from extensive baseline assessments, as well as from pre- and post-intervention assessments. We are well informed of the oral health promotion and disease prevention information and communication needs of the public and of the health care and social service providers, and these data have the development of “unified messages.” The data also have guided Maryland’s campaign and educational product development and distribution. Investments in periodic surveys of oral health outcomes and oral health-related items integrated into state and county surveys provide an essential record of progress and inform program designs.

The experience with applying an oral health literacy lens to promote oral health promotion has revealed the benefits of, and the need for, incorporating health literacy principles as an essential element of program development, implementation, and assessment. We also realize that the continuing evolution of our population demographics and the rapidity of changes in the landscape of health-care services and delivery systems will require having health literacy and the application of AHRQ’s Health Literacy Universal Precautions as an integral part of public health practice. The challenge is in how to support this integration. This will require training of the leadership overseeing public health programs and additional funding for surveillance and program assessment.

Maintaining momentum of an overall state oral health literacy effort requires consistent and continuous attention on the part of all partners. Overall, there must be a “we are all in this together” mentality to foster progress and prevent partnership fatigue.

Funding for the multiple initiatives was complex and a continual challenge. However, with concurrent efforts by the state, counties, academic partners, and MDAC, resources were awarded and partnerships served to implement programs. Special recognition must be given to the Maryland Medical Assistance (Medicaid) program and the non-profit DentaQuest Foundation and its corporate entity, DentaQuest Inc. that served as the initial single vendor for their roles in supporting activities.

Conclusions

While health literacy is a relatively new and evolving field, especially in connection with oral health, the Maryland experience shows the extent and scope of investment and effort

needed to enhance oral health literacy within a public health context. The state has benefited from extensive support at all levels. Maryland state legislators have provided direct support for local programs and initiatives. Maryland’s congressional leaders have proactively supported state activities throughout this process and have continued to lead national legislative efforts to integrate dental care provision and coverage for the nation.

The work is not done; we will have further lessons to share in the coming years. However, to date, this experience has generated tools for assessment, education, and social marketing products and program strategies that could be adapted by other states.

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References

Papers of particular interest, published recently, have been highlighted as:

- Of importance
- Of major importance

1. Otto M. For want of a dentist. The Washington Post URL: <http://www.washingtonpost.com/wp-dyn/content/article/2007/02/27/AR2007022702116.html>. Accessed 2/4/2016
2. U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. (2000) Healthy people 2010. Washington, DC: Author. Accessed 2/4/16
3. IOM(Institute of Medicine). Health literacy: a prescription to end confusion. In: Nielsen-Bohlman L, Panzer AM, Kindig DA, editors. Health literacy: a prescription to end confusion. Washington DC: The National Academies Press; 2004.
4. U.S. Department of Health and Human Services, Office of Disease Prevention and Health Promotion. (2010). National action plan to improve health literacy. Washington, DC: Author. Accessed 2/4/2016 <http://health.gov/communication/initiatives/health-literacy-action-plan.asp>

5. U.S. Department of health and Human Services. A national call to action to promote oral health. Rockville, MD: U.S. Department of health and Human Services, Public Health Service, Centers for Disease control and Prevention and the National Institutes of Health, National institute of Dental and Craniofacial Research. NIH Publication No. 03–5303, May 2003.
6. Dye BA, Arevalo O, Vargas CM. Trends in paediatric dental caries by poverty status in the United States, 1988–1994 and 1999–2004. *Int J Paediatr Dent.* 2010;20:132–43.
7. Dye BA, Thornton-Evans G, Li X, Iafolla TJ. Dental caries and sealant prevalence in children and adolescents in the United States, 2011–2012 NCHS data brief, no 191. Hyattsville, MD: National Center for Health Statistics. 2015.
8. Kutner M, Greenberg E, Jin Y, Paulsen C. The Health literacy of America's adults: results from the 2003 National Assessment of Adult Literacy Washington, DC: National Center for Education Statistics:2006.
9. Department of Health and Human Services. Oral health in America: a report of the surgeon general. Rockville, MD: US Department of Health and Human Services, National Institute of Dental and Craniofacial Research, National Institutes of Health, 2000.
10. National Institute of Dental and Craniofacial Research, National Institutes of Health, US Public Health Service, US Department of Health and Human Services. The invisible barrier: literacy and its relationship with oral health. A report of a workgroup sponsored by the national institute of dental and craniofacial research. National institutes of health. US public health service. US department of health and human services. *J Public Health Dent.* 2005;65:174–82.
11. Casper J, Goodman HS. Access to Dental services for Medicaid children in Maryland. Report of the Dental Action Committee. 2007. <http://phpa.dhmf.maryland.gov/oralhealth/Documents/DACFullReport2007.pdf>. Accessed 2/4/2016
12. Maryland Oral Health Plan Committee: Holt K, ed. 2011. Maryland oral health plan:2011–2015. Columbia, MD: Maryland Dental Action Coalition.
13. Maryland Oral Health summit: Pathways to Common Ground & Action. Background papers and commentaries. *J Public Health Dent.* 2012;72:S1–68.
14. Clovis JB, Horowitz AM, Kleinman DV, et al. Maryland dental hygienists' knowledge, opinions and practices regarding dental caries prevention and early detection. *J Dent Hyg.* 2012;86(4):292–305.
15. Matsuo G, Horowitz AM, Beck KH, Wang MQ, Kleinman DV. What Maryland dentists know and do about preventing dental caries in children. *J Theory Pract Dent Public Health.* 2015; 2(3&4)
16. Weatherspoon DJ, Horowitz AM, Kleinman DV. Maryland physicians' knowledge, opinions, and practices related to dental caries etiology and prevention in children. *Pediatr Dent.* 2016;38(1):61–7.
17. Koo LW, Horowitz AM, Radice SD, Wang MQ, Kleinman DV. Nurse practitioners' use of communication techniques: results of a Maryland oral health literacy survey. *PLoS One.* 2016; 11(1).
18. Horowitz AM, Kleinman DV, Child W, Maybury C. Perspectives of Maryland adults regarding caries prevention. *Am J Public Health.* 2015;105(5):e58–64.
19. Horowitz AM, Kleinman DV, Wang MQ. What Maryland adults with young children know and do about preventing dental caries. *Am J Public Health.* 2013;103(6):e69–76.
20. Horowitz AM, Wang MQ, Kleinman DV. Opinions of Maryland adults regarding communication practices of dentists and staff. *J Health Commun.* 2012;17:1204–14.
21. Schwartzberg JG, Cowett A, VanGeest J, Wolf MS. Communication techniques for patients with low health literacy: a survey of physicians, nurses, and pharmacists. *Am J Health Behav.* 2007;31 suppl 1:S96–104.
22. Consumer Assessment of Health Care Providers and Systems. <https://cahps.ahrq.gov/> accessed: 5/3/16
23. Early and periodic screening, diagnostic and treatment. <https://www.medicaid.gov/Medicaid-CHIP-Program-inform> accessed 5/2/16
24. IOM (Institute of Medicine). Oral health literacy: workshop summary. Washington DC: The National Academies Press; 2013. **This manuscript represents the results of the first IOM Round Table on Oral Health Literacy.**
25. IOM (Institute of Medicine) and NRC (National Research Council). Improving access to oral health care for vulnerable and underserved populations. Washington, DC: The National Academies Press; 2011.
26. IOM (Institute of Medicine). Implication of health literacy for public health: workshop summary. Washington, DC: The National Academies Press; 2014. **This publication represents an excellent overview of the role of health literacy in public health.**
27. Brach C, Deyer B, Schyve P, et al. Attributes of a health literate organization. Washington, DC: Institute of Medicine; 2012 January. <http://www.iom.edu/healthlit10attributes>. Accessed 4/25/16.
28. DeWalt DA, Callahan LF, Hawk VH, Broucksou K, Hink A, Rudd R. Health literacy universal precautions toolkit. Prepared by North Carolina Network Consortium, The Cecil G. Sheps Center for Health Services Research, The University of North Carolina at Chapel Hill, under contract no. HHSA290200710014, Rockville, MD Agency for Healthcare Research and Quality;2010. AHRQ publication no. 10-0046-E.
29. Rudd RE, Anderson J. The health literacy environment of hospitals and health centers. Partners for action: making your healthcare facility literacy-friendly. Boston, MA: Harvard School of Public Health. 2006. Available at: <http://www.hsph.harvard.edu/healthliteracy/files/2012/09/healthliteracyenvironment.pdf>. Accessed 4/27/16
30. Horowitz AM, Maybury C, Kleinman DV, Radice SD, Wang MQ, Child W, Rudd RE. Health literacy environmental scans of community-based dental clinics in Maryland. *Am J Public Health.* 2014;104:e85–e93. **This manuscript represents the first description of conducting health literacy environmental scans in dental settings.**
31. Oral Health improves for Maryland school children. <http://phpa.dhmf.maryland.gov/oralhealth/Documents/SchoolSurveySummary.pdf>. Accessed 4/2/16