

Smart Connected Oral Health Community (SMARTeeth): Using AI and Digital Technologies

to Close the Gap in Oral Health Disparity

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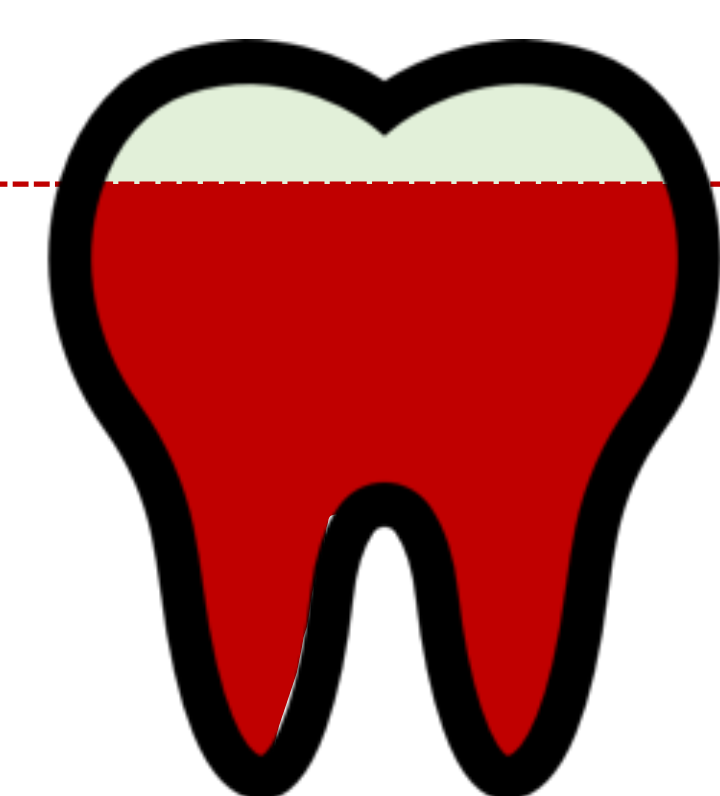
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Project Challenges

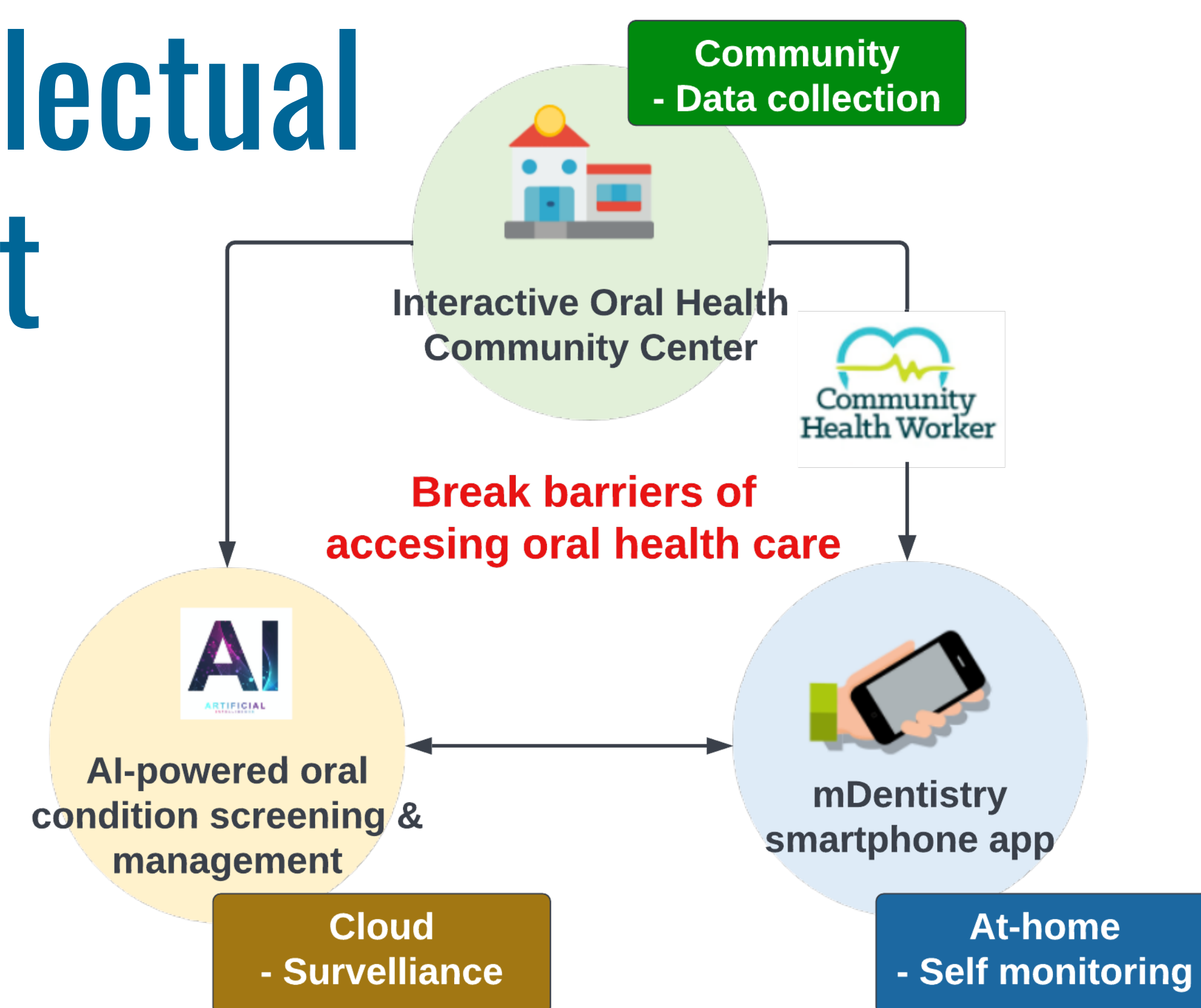
75 % of **Underserved individuals** have experienced **Barriers to Accessing Dental Care**



Cost
Insurance coverage
Available dental providers

Tooth decay is a pandemic disease that affects 35% of the global population, or 2.4 billion people. Dental caries (tooth decay) particularly impacts children and adults living in poverty, who have poor access to dental care. Current biomedical approaches to controlling the dental caries pandemic have had limited success.

Intellectual Merit



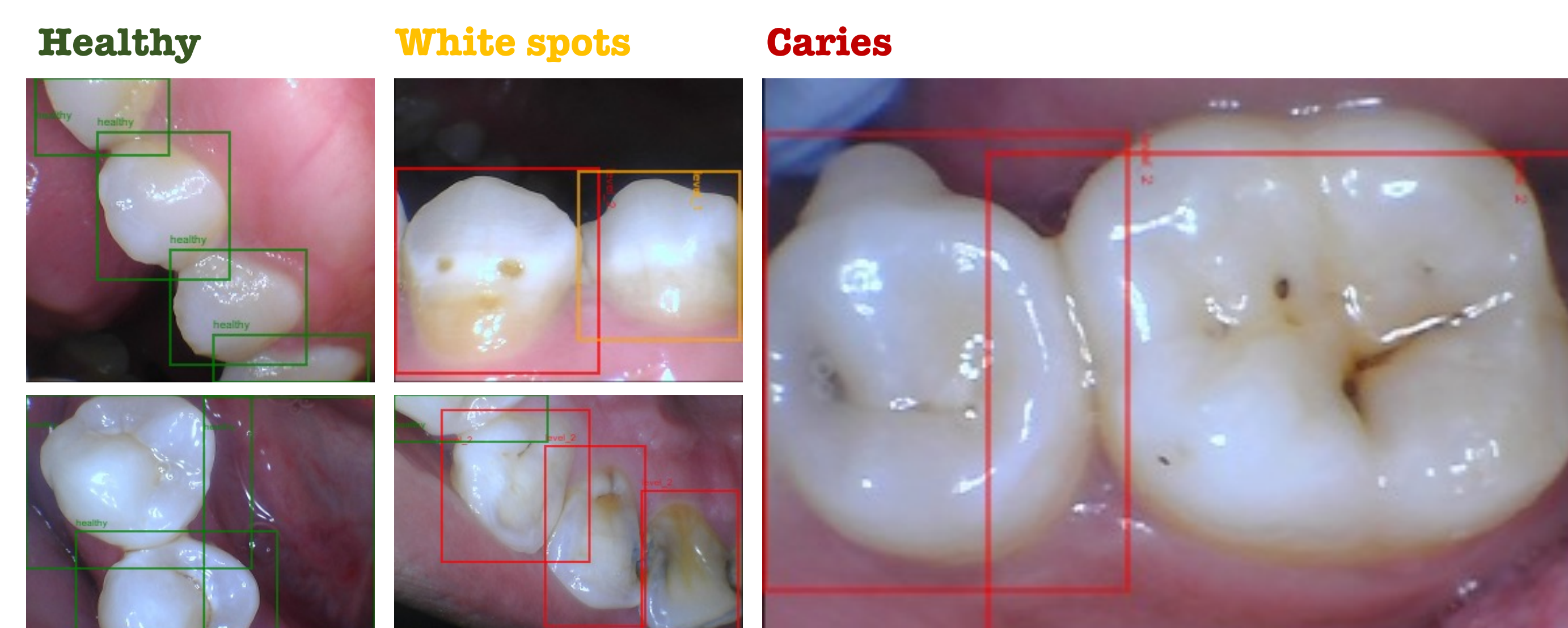
This **SMARTeeth** project will create a smart connected oral health community with improved access to care and greater oral health equity. The investigators are developing and testing a community-based infrastructure that combines use of artificial intelligence (AI) technology, facilitated by home use of smartphones, with community engagement through Interactive Oral Health Community Centers (IOCC) and community health workers.

Major outcomes/Progresses



Interactive Oral Health Community Center: Through community studio and cross-sector discussions, community members have expressed strong support for the SMARTeeth initiative. A training manual for community health workers (CHW) has been developed, alongside a fidelity checklist to ensure consistent implementation. Trained CHWs in the SMARTeeth program were capable of taking diagnostic intraoral photos for patients.

We launched the SMARTeeth oral health screenings at an Obstetrics and Gynecology clinic. As of December 31, 2023, this program has screened 200 pregnant women, collecting over 7,000 intraoral images. These images are ready for evaluation using our AI-driven Caries Detection Algorithm.



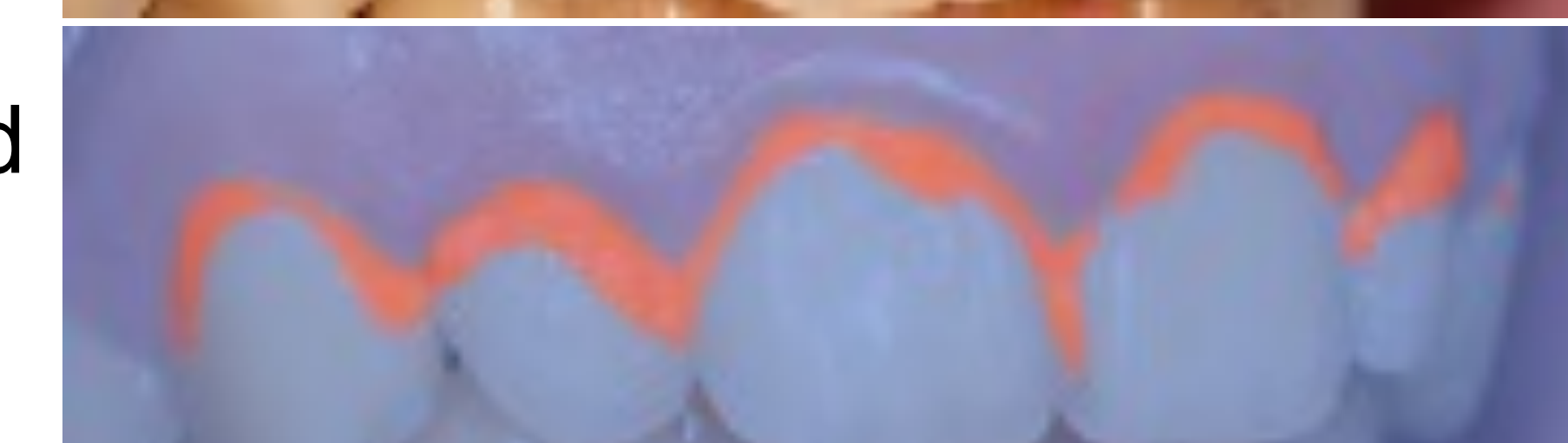
A. AI-Caries model: We evaluated 12,099 tooth images taken at the Interactive Oral Health Community Center using an independently trained BiT-R50x1 model. The AI model demonstrated excellent performance with a 98.16% sensitivity and 83.96% specificity when compared to gold standard (trained dentist).

B. AI-Plaque model: a preliminary model has been developed from 203 intraoral images using a U-Net with a ResNet-50 encoder. The model predicts dental plaque areas close to dentists' annotation (Fig B) and will be further refined in the next phase.

B1. Original image



B2. AI predicted dental plaque area



B3. Dentist marked dental plaque



Broad Impact

The SMARTeeth project has the following broader impacts: a) Reform the oral health care delivery system. b) Empower community with digital tools. c) Model cross-sector efforts to overcome systemic and individual barriers contributing to oral health disparities.

Future goals

