

# Assessing the Impact of Preventative Dental and Vision Care Programs on Community Health Outcomes in The State of California

Ezra O Otieno\*

School of Population, Health, Nutrition & Wellness  
Andrews University, U S A.

Corresponding Author: Ezra O Otieno, School of Population,  
Health, Nutrition & Wellness Andrews University, U S A.

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## Abstract

**Background:** Free preventative dental and vision care programs aim to address disparities in health access among underserved populations in California. Many individuals in low-income communities' face barriers to accessing regular oral and visual health services due to cost, transportation, and lack of insurance.

**Methods:** This practice-based project employed a mixed-methods design, including surveys, health records, GIS mapping, and interviews. Quantitative data were analyzed using SPSS for descriptive and inferential statistics, including chi-square tests, paired t-tests, and multinomial logistic regression. Qualitative interviews were coded thematically using NVivo.

**Results:** A total of 207 participants were included in the study. Most were female (55.6%) and aged between 26–35 years (30%). About 67.2% reported incomes below \$40,000, and only 35.3% had health insurance. Utilization rates were 62.8% for dental services and 30.0% for vision services.

Statistically significant improvements were observed in dental (pre:  $M = 3.01$ ,  $SD = 1.42$ ; post:  $M = 3.55$ ,  $SD = 1.34$ ;  $t = -4.10$ ,  $p < .001$ ) and vision (pre:  $M = 2.92$ ,  $SD = 1.50$ ; post:  $M = 3.58$ ,  $SD = 1.21$ ;  $t = -4.95$ ,  $p < .001$ ) outcomes. Chi-square tests showed that dental program usage was associated with income ( $\chi^2(3) = 24.32$ ,  $p < .001$ ) and insurance ( $\chi^2(1) = 5.58$ ,  $p = .018$ ). Multinomial regression revealed that non-users were significantly more likely to report "No Improvement" in vision ( $OR = 24.71$ ,  $p < .001$ ).

**Conclusions:** The study supports the effectiveness of mobile preventative care programs in improving health outcomes and addressing access disparities. The findings suggest that scaling these programs can enhance community health equity and reduce reliance on emergency services.

**Keywords:** Preventative care, dental services, vision services, underserved populations, mobile clinics, health equity, California

## 1. Introduction

Oral and visual health are integral components of overall well-being, yet significant disparities persist in access to preventative dental and vision care among underserved communities in California. These populations—often defined by low socioeconomic status, lack of insurance coverage, and geographic isolation—encounter multiple structural and financial barriers that impede regular health care utilization [1,2]. Consequently, preventable oral diseases and vision impairments frequently go untreated, contributing to diminished quality of life and increased health system burdens. In response to these disparities, mobile health clinics and community-based preventative care programs have emerged as innovative strategies to expand access to care. These programs are designed to deliver low-cost or free preventative services directly to high-need populations, thereby addressing geographic and economic barriers [3].

While these initiatives have shown promise in anecdotal reports and early evaluations, there remains a critical need for systematic, data-driven assessments of their effectiveness, particularly in relation to long-term health outcomes and service utilization patterns. This study aims to assess the impact of free preventative dental and vision care programs on community health outcomes within underserved populations across California. Employing a mixed-methods approach, the study analyzes trends in service utilization, self-reported health outcomes, cost-related outcomes, and the influence of demographic factors. Additionally, the project explores common barriers to access and levels of satisfaction with the services provided.

### Key objectives include:

- **Evaluate Program Utilization:** To assess the utilization rates of preventative dental and vision care services across

demographic groups (e.g., age, gender, income, and ethnicity).

- **Assess Health Outcomes:** To measure the impact of participation in preventative dental and vision care programs on specific health outcomes, such as the prevalence of dental diseases (e.g., cavities, periodontal disease) and vision impairments.
- **Identify Barriers to Access:** To identify and analyze financial, geographic, cultural, and educational barriers that limit access to preventative care services.
- **Measure Cost-Effectiveness:** To evaluate the cost-effectiveness of preventative care programs by comparing the costs associated with preventative services versus the costs of advanced treatments.
- **Examine Program Equity:** To investigate whether preventative care programs are equitably distributed and accessible to vulnerable populations, including low-income, rural, and elderly communities.

Through this inquiry, the research contributes evidence to support public health decision-making and informs the development of scalable, community-centered care models.

### 1.1. Study Purpose

The purpose of this study is to assess how free preventative dental and vision care programs influence community health outcomes among underserved populations in California. The research specifically aims to examine program effectiveness, usage trends, barriers to access, and perceived health benefits.

### 1.2. Literature Review

Significant disparities in access to dental and vision care have long been documented in underserved populations across the United States. According to the Centers for Disease Control and Prevention (CDC, 2022), adults from lower-income households and those without insurance are far less likely to receive regular preventative services. These disparities are especially prevalent among racial and ethnic minorities, individuals experiencing homelessness, and rural populations.

Preventative dental care has been shown to reduce the burden of oral disease through early detection, timely intervention, and health education [4]. However, barriers such as cost, fear, language differences, and lack of transportation often limit access, particularly for Medicaid recipients or uninsured individuals [2]. Similarly, lack of access to routine vision care contributes to higher rates of untreated conditions like diabetic retinopathy, glaucoma, and refractive error, which have significant implications for quality of life and economic productivity [5].

Mobile health clinics are increasingly recognized as a practical solution for mitigating these access barriers. Evidence shows that mobile units can deliver high-quality services to underserved areas, improve screening and prevention, and reduce unnecessary emergency visits [3,6]. In particular, mobile dental and vision programs have demonstrated improvements in both clinical outcomes and patient satisfaction when services are provided free

of charge and embedded within the community. Despite these findings, there remains limited literature evaluating integrated mobile models that combine dental and vision care, especially in the context of real-world community outreach. Furthermore, while some studies address short-term clinical outcomes, few investigate self-reported health improvement, satisfaction, and regional health equity using mixed-methods and GIS mapping. This research contributes to the existing body of knowledge by evaluating a combined dental and vision mobile clinic program using a mixed-methods approach and geographically targeted data. It also fills gaps by capturing both quantitative improvements in care access and qualitative insights into community-identified barriers and suggestions for improvement.

## 2. Methods

### 2.1. Study Design

This research utilized a mixed-methods design to evaluate the impact of mobile preventative dental and vision care programs on underserved populations across California. Both quantitative and qualitative data were collected to assess utilization patterns, health outcomes, and perceived barriers to care.

### 2.2. Participants and Sampling

The study included a sample of 207 adult participants (ages 18 and above) who received services from mobile clinic events between 2022 and 2025. Participants were recruited from underserved neighborhoods during outreach events coordinated by Life and Health Network and its partners. A non-probability convenience sampling method was used, and eligibility criteria required participants to have received at least one preventative dental or vision service in the last three years.

### 2.3. Data Collection Procedures

Quantitative data were gathered through structured self-administered surveys and health service records. The survey captured demographic variables (age, gender, income, insurance status), types of services used, self-reported pre- and post-health ratings, cost-related outcomes, and satisfaction with care. GIS data, including ZIP codes, were collected to assess geographic distribution of service delivery. Qualitative data were collected via semi-structured interviews conducted with both patients and service providers. These interviews explored barriers to access, perceived program benefits, satisfaction, and recommendations for improvement. Interviews were transcribed and anonymized prior to analysis.

### 2.4. Instrumentation

Surveys were developed in collaboration with program coordinators and tested for clarity. Interview guides were reviewed by public health professionals for thematic alignment. All instruments were approved as part of the IRB protocol.

### 2.5. Data Analysis

Quantitative data were analyzed using SPSS. Descriptive

statistics summarized demographic characteristics and service use. Chi-square tests and paired t-tests evaluated associations between demographics and program utilization and assessed pre- and post-intervention changes. Multinomial logistic regression was used to predict health improvement based on service use and demographics. Qualitative interview transcripts were coded in NVivo using a thematic analysis framework. Themes were pre-identified based on project objectives and refined iteratively through team-based coding. Coding reliability was ensured through dual-coder comparisons.

## 2.6. GIS Mapping

ZIP code data were visualized using ArcGIS to evaluate regional access gaps and service equity. Maps displaying dental, vision, and underserved population metrics were

produced for the entire state and two specific focus regions. GIS data interpretation was triangulated with participant demographics and service utilization to assess geographic disparities.

## 3. Results

### 3.1. Participant Demographics and Service Utilization

Of the 207 participants surveyed, 55.6% identified as female, and the majority fell within the 26–35-year age group (30%). Approximately 67.2% reported household incomes below \$40,000, and only 35.3% had active health insurance coverage. As shown in Table 1 participants represented diverse age groups, income levels, and insurance statuses, with a predominance of uninsured, low-income individuals. Table 2 presents associations between demographic factors and program utilization.

Variable	Category	n (%) or M (SD)	Missing n (%)
Age	18-25 years	30 (14.5%)	
	26-35 years	62 (30.0%)	
	36-45 years	42 (20.3%)	
	46-55 years	27 (13.0%)	
	56+ years	46 (22.2%)	
Gender	Male	89 (43.0%)	
	Female	115 (55.6%)	
	Other	1 (0.5%)	
	Prefer not say	2 (1.0%)	
Income	<\$20,000	61 (29.5%)	
	\$20,000-\$40,000	78 (37.7%)	
	\$40,000-\$60,000	55 (26.6%)	
	> \$60,000	13 (6.3%)	
Insurance status	Yes	73 (35.3%)	
Dental program usage	Yes	130 (62.8%)	
Vision program usage	Yes	62 (30.0%)	18 (8.7%)
Satisfaction Score a	Mean (SD)	3.96 (1.00)	28 (13.5%)
Satisfaction Rating	Very dissatisfied	5 (2.4%)	
	Dissatisfied	1 (0.5%)	
	Neutral	59 (28.5%)	
	Satisfied	45 (21.7%)	
	Very Satisfied	69 (33.3%)	
Dental health improvement	Yes	143 (69.1%)	28 (13.5%)
	Unsure	28 (13.5%)	
	No	8 (3.9%)	
Visual health improvement	Yes	48 (23.2%)	28 (13.5%)
	Unsure	88 (42.5%)	
	No	43 (20.8%)	
Estimated cost without program	\$0-\$100	6 (2.9%)	
	\$101-\$250	41 (19.8%)	

	\$251-\$500	95 (45.9%)	
	\$501-\$750	46 (22.2%)	
	> \$750	19 (9.2%)	
Estimated cost saved	<\$100	16 (7.7%)	
	\$100-\$300	78 (37.7%)	
	\$300-\$600	84 (40.6%)	
	>\$600	29 (14.0%)	
ER visit avoided	Yes	101 (48.8%)	
	Not sure	43 (20.8%)	
	No	63 (30.4%)	

**Notes:** The superscript "a" represents a continuous variable. Satisfaction score is reported as mean (M) and standard deviation (SD). Missing percentages are indicated where applicable.

**Table 1: Participant Demographics (N =207)**

Demographic Variable	Dental program utilization	P-value	Visual program utilization	P-value
Age	$\chi^2(4) = 7.49$	0.112	$\chi^2(4) = 1.18$	0.882
Gender	$\chi^2(3) = 1.13$	0.770	$\chi^2(3) = 2.00$	0.573
Income	$\chi^2(3) = 24.32$	<0.001	$\chi^2(3) = 3.97$	0.265
Insurance status	$\chi^2(1) = 5.58$	0.018	$\chi^2(1) = 0.93$	0.335

**Note:** Chi-square tests were performed to explore the associations between demographic factors and dental and visual health care program utilization. For dental programs, income level showed a strong significant relationship ( $\chi^2(3) = 24.32, p < .001, \phi = .34$ ), with higher utilization among certain income groups. Insurance status was also significantly associated with dental program use ( $\chi^2(1) = 5.58, p = .018, \phi = .16$ ). Further pairwise comparisons revealed that participants with incomes of \$20,000-\$40,000 had significantly higher utilization rates of free dental care (62 participants, 47.7%) compared to other groups. Participants with incomes of more than \$60,000 had significantly lower utilization rates of free dental care (2, 1.5%) compared to other groups (37 participants in less than \$20,000 and 29 participants in \$40,000-\$60,000). Significant relationships ( $p < .05$ ) were found between income and dental program use, and between insurance status and dental program use.

**Table 2: Health Program Utilization by Demographic Variables (N = 207)**

### 3.2. Pre- and Post-Program Health Outcomes

To evaluate changes in perceived health outcomes following participation in mobile dental and vision services, paired-samples t-tests were conducted.

This statistical test was appropriate because it compares the means of two related groups (the same participants' health scores before and after the intervention).

The paired-samples t-test revealed significant improvements in both dental and vision health scores. For dental health, mean scores increased from **M = 3.01 (SD = 1.42)** pre-program to **M = 3.55 (SD = 1.34)** post-program, **t(206) = -4.10, p < .001**, indicating a large effect size (**Cohen's d = 1.88**). Similarly, vision health scores improved from **M = 2.92 (SD = 1.50)** pre-program to **M = 3.58 (SD = 1.21)** post-program, **t(206) = -4.95, p < .001**, with a large effect size (**Cohen's d = 1.92**) (see Table 3).

	Pre-Program M (SD)	Post-Program M (SD)	t (df)	P-value	Cohen's d
Dental program	3.01, 1.42	3.55, 1.34	-4.10 (206)	< .001	1.88
Visual program	2.92, 1.50	3.58, 1.21	-4.95 (206)	< .001	1.92

**Note:** Paired samples t-tests revealed significant improvements in both dental and visual program utilization following healthcare. For dental programs, scores increased from pre-intervention (M=3.01, SD=1.42) to post-intervention (M=3.55, SD=1.34),  $t(206) = -4.10, p < .001$ , with a large effect size ( $d = 1.88$ ). Similarly, visual program scores showed significant improvement from pre-intervention (M=2.92, SD=1.50) to post-intervention (M=3.58, SD=1.21),  $t(206) = -4.95, p < .001$ , also with a large effect size ( $d = 1.92$ ). These results demonstrate substantial and statistically significant gains in both healthcare programs.

**Table 3: Pre- and Post-Program Health Outcome Scores (N = 207)**

### 3.3. Associations Between Demographics and Utilization

To examine the relationship between demographic variables (income, insurance status) and service utilization, chi-square tests of independence were conducted.

This test was selected because it assesses whether two categorical variables are associated.

Chi-square analysis revealed a significant association between income level and dental service utilization,  $\chi^2(3) = 24.32, p < .001$ , with individuals earning less than \$40,000 utilizing services more frequently. Insurance status was also significantly associated with dental service use,  $\chi^2(1) = 5.58, p = .018$ . Vision service use trends followed a similar pattern but did not reach statistical significance (see Table 2).

### 3.4. Predictors of Health Improvement

To predict participants' likelihood of reporting health improvement based on demographics and service use, a multinomial logistic regression analysis was performed. This method was appropriate because the dependent variable (health improvement) had three nominal categories ("Yes," "No," and "Unsure"). The analysis revealed that participants who did not use vision services were significantly more likely to report "No Improvement" in vision outcomes (OR = 24.71, 95% CI [7.44, 82.07],  $p < .001$ ), highlighting service utilization as a key predictor of positive outcomes (see Table 4, and Table 5).

	No vs. Yes			Unsure vs. Yes		
	B (SE)	OR [95% CI]	p	B (SE)	OR [95% CI]	p
Age						
18-25	0.98 (1.50)	2.65 [0.14, 50.59]	0.52	0.65 (0.89)	1.92 [0.33, 11.04]	0.46
26-35	1.17 (1.24)	3.22 [0.28, 36.55]	0.35	0.64 (0.79)	1.90 [0.40, 8.97]	0.42
36-45	1.44 (1.32)	4.21 [0.32, 55.59]	0.28	0.64 (0.83)	1.90 [0.38, 9.55]	0.44
46-55	0.83 (1.53)	2.28 [0.11, 45.50]	0.59	-0.73 (1.27)	0.48 [0.04, 5.85]	0.57
56	Reference group					
Gender (Male)	-0.37 (0.81)	0.69 [0.14, 3.34]	0.64	1.03 (0.55)	2.80 [0.95, 8.21]	0.06
Income						
Less than \$20,000	19.53 (1.38)	302159690.57				
[20186391.74, 4522872624.93]	< .001	-1.57 (1.24)	0.21 [0.02, 2.37]	0.21		
\$20,000-\$40,000	19.21 (1.28)	219146537.66				
[17996478.78, 2668588980.45]	< .001	-2.50 (1.24)	0.08 [0.01, 0.95]	0.05		
\$40,000-\$60,000	17.40 (0.00)	35911151.02	/	-1.6 (1.11)	0.20 [0.02, 1.78]	0.15
More than \$60,000	Reference group					
Insurance status (yes)	1.05 (0.96)	2.86 [0.44, 18.85]	0.27	0.63 (0.65)	1.87 [0.53, 6.65]	0.34
Dental program usage (no)	1.53 (0.78)	4.63 [1.00, 21.53]	0.05	1.01 (0.54)	2.76 [0.96, 7.92]	0.06
Cost barrier (no)	-0.39 (1.18)	0.68 [0.07, 6.87]	0.74	1.44 (0.56)	4.21 [1.41, 12.53]	0.01

**Note:** Multinomial logistic regression analyses revealed significant demographic predictors of dental health improvement perceptions. Most strikingly, income showed absolute effects - participants earning less than 60K were universally more likely to report "No improvement" compared to >60K earners (ORs >219 million, all  $p < .001$ ), though these extreme effects likely reflect data separation. Non-free-program users had 4.63 times higher odds of reporting no improvement (95% CI [1.00, 21.53],  $p = .05$ ), while those without cost barriers showed greater uncertainty about improvement (OR=4.21, 95% CI [1.41, 12.53],  $p = .01$ ). No significant age effects emerged (all  $ps > .28$ ), and gender differences showed a marginal significance for outcome uncertainty (OR=2.80,  $p = .06$ ). These findings highlight income disparities and program participation as critical factors in dental health outcomes, though the extreme income effects warrant cautious interpretation and further investigation.

**Table 4: Dental Health Improvement Among Different Demographic Groups (N = 207)**

	No vs. Yes			Unsure vs. Yes		
	B (SE)	OR [95% CI]	p	B (SE)	OR [95% CI]	p
Age						
18-25	-0.25 (0.86)	0.98 [0.18, 5.21]	0.98	0.19 (0.74)	1.21 [0.29, 5.15]	0.79
26-35	-0.52 (0.76)	0.59 [0.13, 2.64]	0.49	-0.36 (0.65)	0.70 [0.20, 2.50]	0.58
36-45	0.34 (0.80)	1.40 [0.29, 6.73]	0.68	0.41 (0.70)	1.51 [0.38, 5.91]	0.56
46-55	-0.25 (0.83)	0.78 [0.15, 3.97]	0.76	-0.98 (0.77)	0.38 [0.08, 1.70]	0.20
56	Reference group					
Gender (Male)	0.21 (0.52)	1.23 [0.45, 3.39]	0.68	0.15 (0.44)	1.17 [0.49, 2.77]	0.73
Income						
Less than \$20,000	17.09 (0.78)	26318415.54 [5726161.22, 120963935.39]	< .001	-0.78 (1.15)	0.46 [0.05, 4.38]	0.50
\$20,000-\$40,000	18.00 (0.69)	65682593.05 [16906279.25, 255183471.60]	< .001	0.32 (1.12)	1.37 [0.15, 12.42]	0.78
\$40,000-\$60,000	18.20 (0.00)	79838244.564	/	0.60 (1.01)	1.82 [0.21, 15.72]	0.59
More than \$60,000	Reference group					
Insurance status (yes)	-0.11 (0.67)	0.90 [0.24, 3.35]	0.87	-0.08 (0.57)	0.92 [0.30, 2.81]	0.89
Visual program usage (no)	3.21 (0.61)	24.71 [7.44, 82.07]	< .001	2.32 (0.46)	10.13 [4.12, 24.87]	< .001
Cost barrier (no)	-0.02 (0.65)	0.98 [0.28, 3.52]	0.98	-0.44 (0.56)	0.65 [0.21, 1.95]	0.44

**Note:** Multinomial logistic regression analyses examining predictors of visual health improvement showed two key findings. First, non-users of visual programs had higher odds of reporting both “No improvement” (OR=24.71, 95% CI [7.44,82.07],  $p < .001$ ) and “Unsure” status (OR=10.13, 95% CI [4.12,24.87],  $p < .001$ ) compared to free program users. No other demographic factors - including age (all  $ps > .20$ ), gender ( $p > .68$ ), insurance status ( $p > .87$ ), or cost barriers ( $p > .44$ ) - showed significant associations with improvement perceptions. The results highlight visual program participation as the strongest modifiable predictor of positive health outcomes.

**Table 5: Visual health Improvement Among Different Demographic Groups (N = 207)**

	Emergency care Usage (No vs. Yes)		
	B (SE)	OR [95% CI]	p
Cost without program			
Under \$100	19.80 (0.00)	395745335.51	/
\$101-\$250	0.43 (0.74)	1.54 [0.36, 6.54]	0.56
\$251-\$500	0.16 (0.65)	1.17 [0.33, 4.17]	0.81
\$501-\$750	0.87 (0.76)	2.39 [0.52, 10.89]	0.26
Over \$750	Reference group		
Cost saved			
Under \$100	-0.07 (0.84)	0.93 [0.18, 4.87]	0.93

\$100-\$300	-0.42 (0.59)	0.66 [0.21, 2.07]	0.47
\$300-\$600	0.63 (0.62)	1.88 [0.56, 6.37]	0.31
Over \$600	Reference group		
ER visit avoided			
No	0.26 (0.47)	1.30 [0.52, 3.25]	0.57
Not sure	-0.16 (0.46)	0.85 [0.35, 2.09]	0.73
Yes	Reference group		

**Note:** Logistic regression was conducted to examine the association between cost-related variables and emergency care usage. No significant associations were found between estimated cost without the program, cost savings, or emergency room (ER) visit avoidance and emergency care usage (all  $p$ s > .05).

**Table 6: Cost effectiveness Difference of Emergency Care Usage (N = 179)**

#### 4. GIS Mapping Results

Geospatial data provided strong visual evidence of service equity and access gaps. Maps showed high overlap between underserved population indices and areas with reported improvement in dental and vision outcomes. Region-specific maps highlighted disparities in care density and identified ZIP codes that may benefit from expanded outreach (see Appendix D).

##### 4.1. Qualitative Findings

All statistical tables, bar charts, and GIS maps referenced in this section are provided in Appendix F. These visual aids include detailed demographic breakdowns, program usage frequencies, pre- and post-program score comparisons, and regional service distribution maps derived from ZIP code data. NVivo analysis revealed four dominant themes: Barriers to Access, Perceived Benefits, Satisfaction with Services, and Suggestions for Improvement. Barriers included cost, lack of insurance, transportation, and fear of diagnosis. Benefits cited included early detection, better hygiene, and emotional relief. Satisfaction was high, with participants describing the experience as respectful and comprehensive. Suggestions included adding mental health services and more bilingual staff. A representative quote: "I haven't seen a dentist in years. This program made me feel seen and helped me take control of my health."

#### 5. Discussion

This study demonstrates that mobile preventative dental and vision care programs have a measurable impact on improving perceived health outcomes among underserved populations in California. The statistically significant improvements in self-reported dental and vision health scores, alongside high service utilization rates among low-income and uninsured participants, affirm the effectiveness of mobile health interventions in promoting health equity.

##### 5.1. Interpretation of Results

The observed improvements in both dental and vision health outcomes following mobile clinic participation are consistent with findings by Ghanbarzadegan et al. who emphasized the role of mobile clinics in reducing access disparities and improving preventative care outcomes in

underserved populations [3]. Similarly, Elani et al. found that expansion of dental access under Medicaid led to better oral health outcomes, supporting our results showing significant dental improvements post-intervention [4]. Income level and insurance status were significantly associated with dental service utilization in this study. This mirrors findings by Okunev et al. who reported that individuals with lower incomes and no insurance consistently underutilize preventative dental care, and benefit substantially when accessible, free services are provided [2]. Our chi-square results align with this pattern, showing that mobile programs successfully target and benefit high-need groups. Additionally, the multinomial logistic regression revealed that participants who did not use vision services were far more likely to report no health improvement, reinforcing the direct relationship between service utilization and positive health outcomes. This finding is supported by Ghoneim et al. whose scoping review noted that participation in community dental and vision programs is strongly predictive of better self-reported and clinical outcomes [5]. Qualitative interviews also revealed key barriers—such as fear, cost, and transportation issues—that were identified previously by Tiwari and Franstve-Hawley and Ghoneim et al. The consistency between our findings and the existing literature enhances the credibility of the program's design and suggests that mobile models are effectively addressing known structural barriers.

##### 5.2. GIS and Access Equity

GIS mapping further corroborated these findings by showing a strong overlap between service coverage and areas with high underserved density indices. This is in line with Yu et al. who emphasized the importance of geographically targeted mobile health interventions in enhancing accessibility for vulnerable populations [7].

##### 5.3. Limitations

This project is not without limitations. Data were self-reported, which may introduce bias. The sample was based on convenience sampling at clinic events, limiting generalizability. Longitudinal outcomes were not measured, and it is unclear how long improvements in self-perceived health will last. Lastly, some ZIP codes may have been

underrepresented in GIS analysis.

#### 5.4. Implications and Recommendations

The results suggest that expanding mobile preventative care programs could have wide-reaching public health benefits. Public and private healthcare partners should consider replicating or scaling these models in other high-need areas. Future evaluations should include longitudinal tracking and explore integration with behavioral and chronic care services. In summary, the study supports the role of mobile preventative care in promoting equity, reducing barriers, and enhancing health outcomes among California's underserved communities [6-15].

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**Appendices****Appendix A: Survey and Questionnaires****Participant Survey: Dental and Vision Care Programs**

Thank you for taking the time to complete this survey! Your feedback is important in helping us understand your experience with the program.

This survey aims to learn about:

- Your access to dental and vision care
- How often you use the program
- How the program has impacted your health

Your responses will remain confidential and will be used to improve our services. The questions are designed to be clear and easy to answer, with some adapted from established healthcare research.

We appreciate your participation! Let's get started.

Patient Record Number: \_\_\_\_\_

Date of Visit: \_\_\_\_\_

**Demographic Information**

1. Date of Birth/ Age? \_\_\_\_\_

2. What is Your Gender?

- Male
- Female
- Other
- Prefer not to say

3. What is Your Income Level?

- Less than \$20,000
- \$20,000–\$40,000
- \$40,000–\$60,000
- More than \$60,000

4. Do You Have Health Insurance?

- Yes
- No

**Type of Service Received During Visit**

5. What Type of Service (s) did You Receive During Your Visit? (Check all that Apply)

- Dental Cleaning
- Dental Exam
- Cavity Filling
- Tooth Extraction
- Vision Exam
- Prescription Glasses
- Eye Disease Screening (e.g., glaucoma, cataracts)
- Other: \_\_\_\_\_

Access to Preventative Care (Adapted from Aday & Andersen, 1974)

6. How often do you visit a dentist?

- Twice a year
- Once a year
- Rarely
- Never

7. How Often do You Have an Eye Examination?

- Once a year
- Every two years
- Rarely
- Never

8. What are the Main Barriers Preventing You From Accessing Dental and Vision Care? (Check all that apply)

- Cost
- Lack of transportation
- Lack of awareness
- Fear/anxiety
- Limited appointment availability
- Other: \_\_\_\_\_

**Program Utilization**

9. Have You Used the Free Preventative Dental Care Program Before Today?

- Yes
- No

10. Have You Used the Free Vision Care Program Before Today?

- Yes
- No

11. How Satisfied Were You with the Services Provided? (1 = Very Dissatisfied, 5 = Very Satisfied)

- 1
- 2
- 3
- 4
- 5

**Health Outcomes (Adapted from Aday & Andersen, 1974)**

12. Have you Noticed any Improvement in your Dental Health After Using the Program?

- Yes
- No
- Unsure

13. Have you Noticed any Improvement in Your Vision After Using the Program?

- Yes
- No
- Unsure

14. Since Receiving Services From this Program, have you Required Emergency Care for Dental or Vision Issues?

- Yes
- No

15. What Additional Services Would You Like to see Offered in the Program? \_\_\_\_\_

**Appendix B: In-Depth Interview Questionnaires**

The following in-depth interview questions will be used to collect qualitative data from service providers and program

participants regarding their experiences with preventative dental and vision care services.

#### For Service Providers:

1. What are the most significant barriers to preventative dental and vision care access that you have observed among underserved populations?
2. Can you describe any common trends in patient behaviors regarding preventative healthcare utilization?
3. How do you think the current preventative care programs are addressing patient needs?
4. Have you observed any improvements in patients' dental and vision health due to the program? If so, please elaborate.
5. What additional support or resources do you believe would enhance the effectiveness of preventative healthcare services?
6. How do you assess the program's impact on reducing emergency visits related to dental and vision health?
7. Are there any specific policies or funding gaps that limit the effectiveness of preventative care services?

#### For Program Participants:

1. Can you describe your overall experience with the free preventative dental and vision care program?
2. What were the main challenges you faced in accessing dental and vision care before participating in the program?
3. Have you noticed any changes in your dental or vision

health since utilizing the program? If so, please describe.

4. What aspects of the program do you find most beneficial?
5. Are there any services you believe should be added or improved within the program?
6. How has access to preventative dental and vision care impacted your daily life or overall well-being?
7. What suggestions do you have for increasing community awareness and participation in preventative healthcare programs?
8. Would you recommend this program to others in your community? Why or why not?

#### Appendix C: Nvivo Coding Framework

Qualitative data were analyzed using thematic coding in NVivo 11 Plus. Interviews with both patients and healthcare providers were coded into four pre-identified themes based on the research questions: Barriers to Access, Perceived Benefits, Satisfaction with Services, and Suggestions for Improvement. Each participant response was reviewed and coded accordingly. Themes were extracted to summarize key patterns in experiences and perceptions related to preventative dental and vision care programs.

#### Results: Theme Frequencies

The number of coded references for each theme is summarized in Table 1.

Theme	Subthemes	# of References	Quotes
Barriers to Access	Cost, lack of insurance, transportation, fear, language barriers	16	"I couldn't afford a dentist before. This was the first time in years I got my teeth checked."
Perceived Benefits	Early detection, hygiene improvement, vision clarity, emotional relief	23	"The glasses helped me see again—it made going to work easier."
Satisfaction with Services	Staff professionalism, clear communication, cultural sensitivity, efficiency	12	"Everyone was kind, respectful, and made me feel comfortable."
Suggestions for Improvement	Bilingual staff, mental health services, follow-up care, expanded access	20	"It would help to have someone who speaks Spanish and more frequent clinic days."

**Table 1 : Frequency of Themes Identified in Qualitative Analysis**

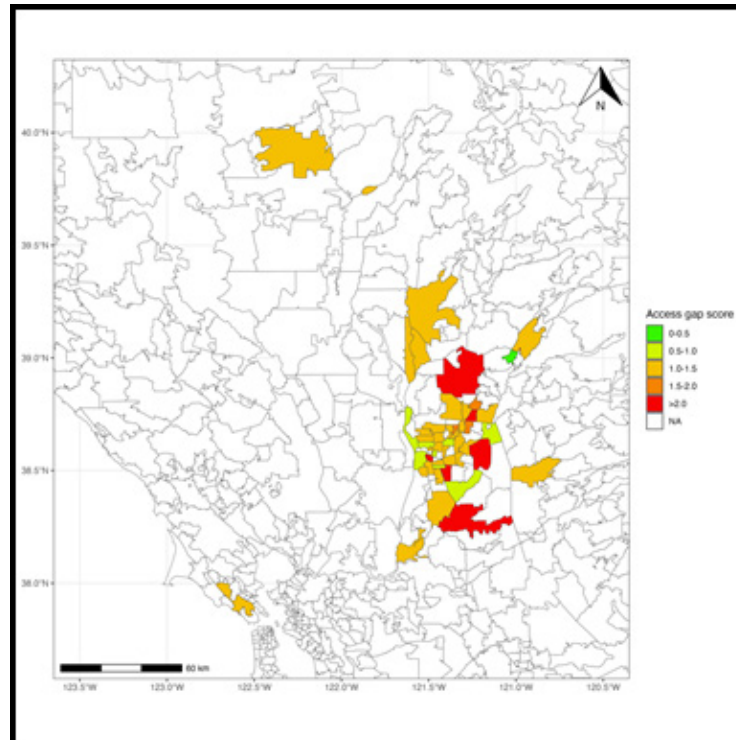
#### Appendix D: GIS Visual Summary Charts

Q Data Sources and Variable Definitions

- ZIP Code and County Shapefiles: <https://www.census.gov/cgi-bin/geo/shapefiles/index.php>
- Poverty Data: Due to unavailability of ZIP code-level data in B17002, county-level estimates were utilized. <https://data.census.gov/all?q=B17002>
- Underserved Density Index = (% uninsured individuals) + (% below 200% of Federal Poverty Level) / 2 (provided by client)
- Access Gap Score = % of respondents in ZIP who report barriers / % who received services in that ZIP (provided by

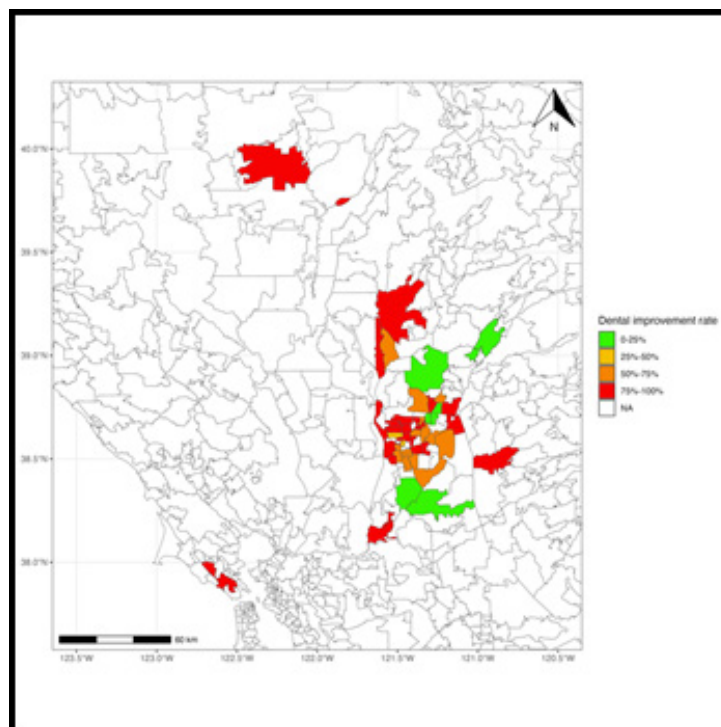
client)

- Program reach = count of respondents who reported receiving services (provided by client)
- Barriers were defined based on respondents who either reported encountering "Cost," "Lack of Transportation," or "Limited Appointment Availability" barriers, or who did not utilize any vision or dental care services.
- Dental and vision improvement rates were determined as the percentage of respondents within each ZIP code who answered "Yes" to experiencing improvement.
- All spatial visualizations were generated using the R packages "sf" and "ggspatial".

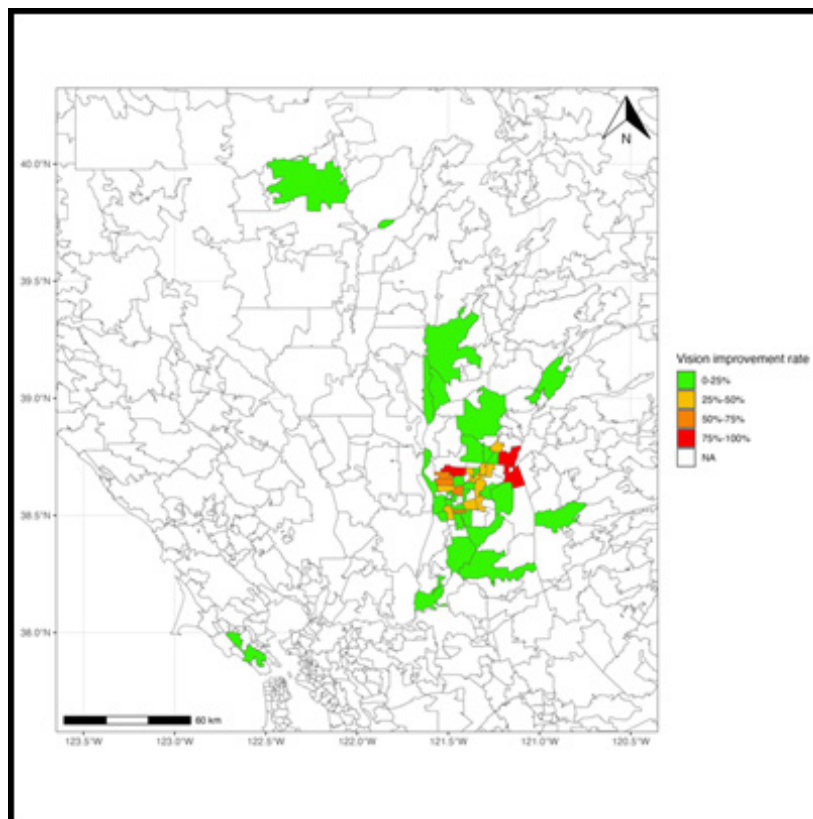


**Figure 1: Access Gap Score in California (Sacramento City)**

**Note:** As shown in Figure 1, access gap scores were lower among respondents residing near the Sacramento city center, suggesting better accessibility to preventative dental and vision care programs in urban core areas compared to more outer regions.

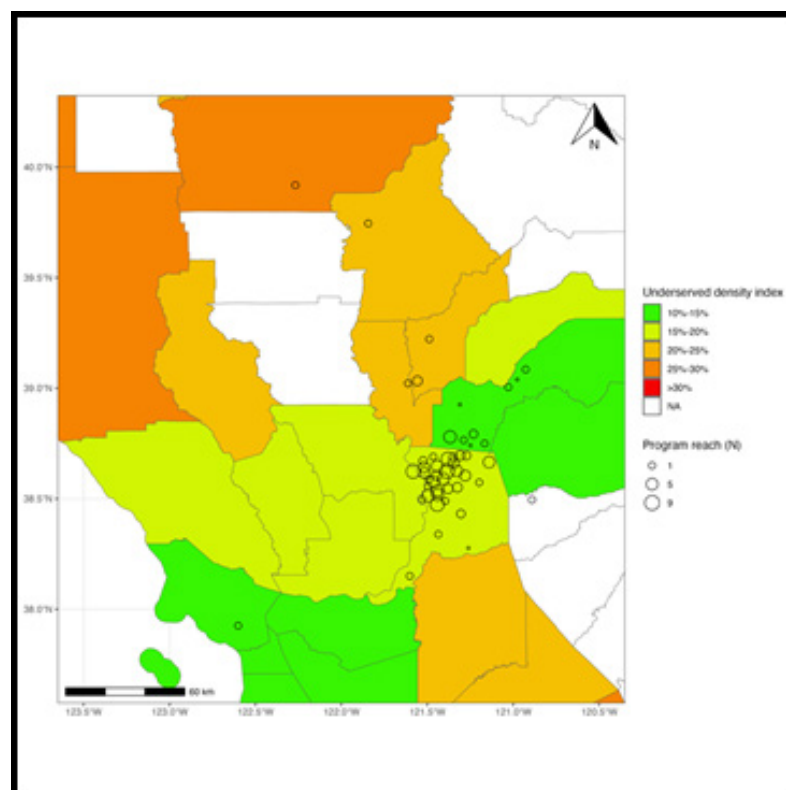


**Figure 2: Dental Improvement Rates in California (Sacramento City)**



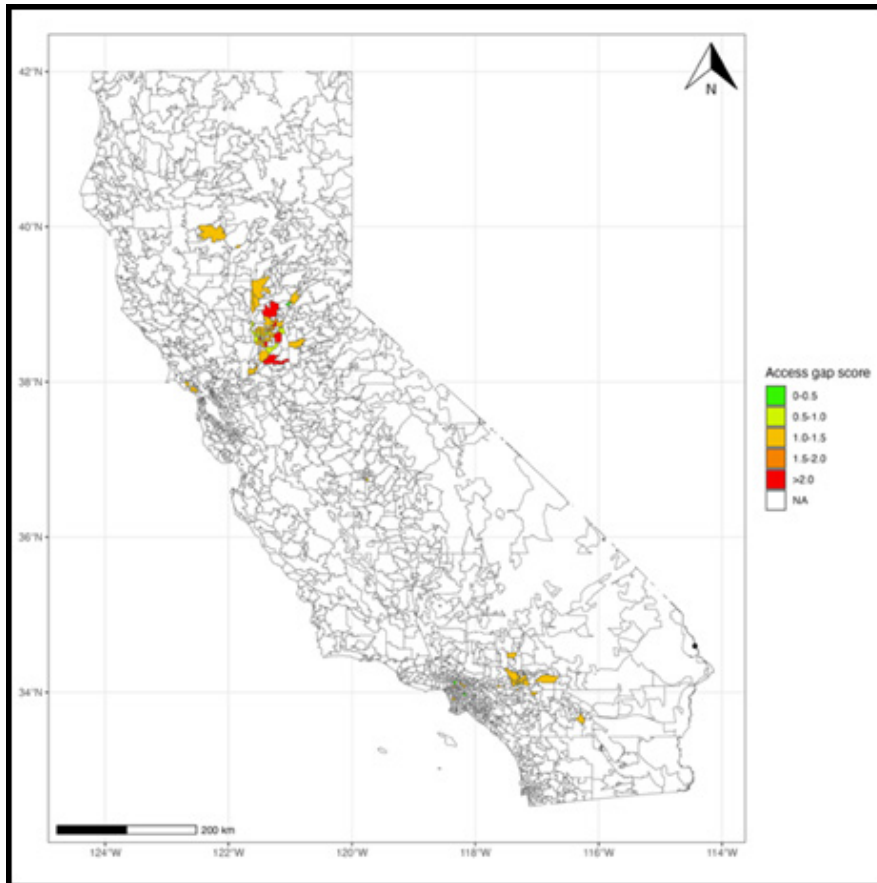
**Figure 3: Vision Improvement Rates in California (Sacramento City)**

**Note:** As shown in Figure 2 and Figure 3, both dental and vision improvement rates appeared higher in areas closer to the Sacramento city center. The spatial pattern was more pronounced for vision health outcomes than for dental health.



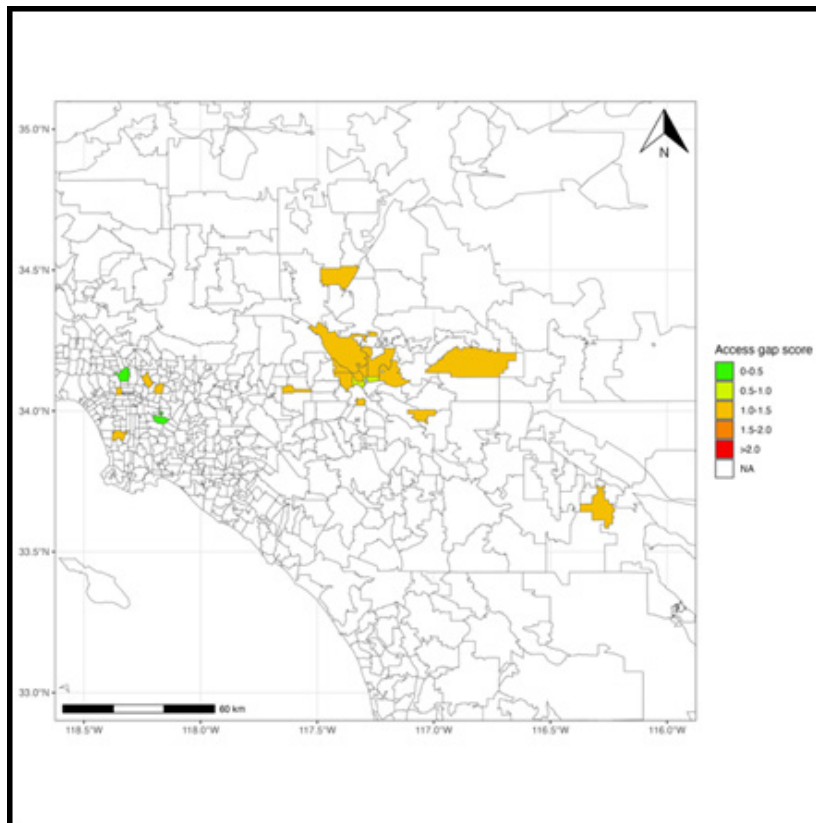
**Figure 4: Underserved Density Index and Number of Program Reach in California (Sacramento City)**

**Note:** As shown in Figure 4, the overlay of the underserved density index and program reach showed that respondents who received services were more concentrated in the city center than in outlying areas. However, the trend was not as noticeable compared to access gap or health improvement scores.



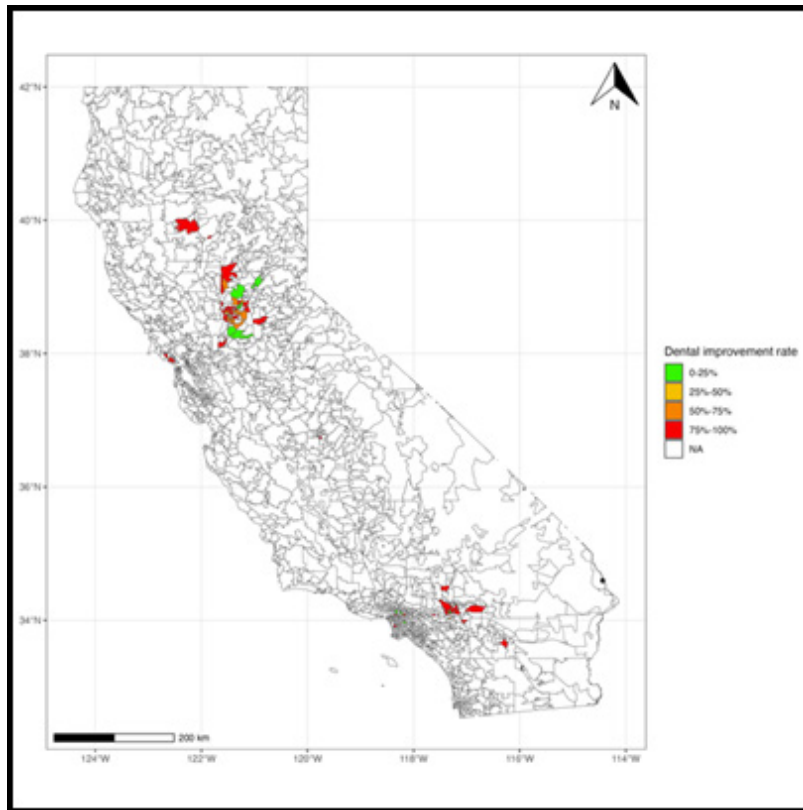
**Figure 5.a: Expanded Regional Maps**

**Note:** This is the whole figure including Figure 1 and Figure A1b.



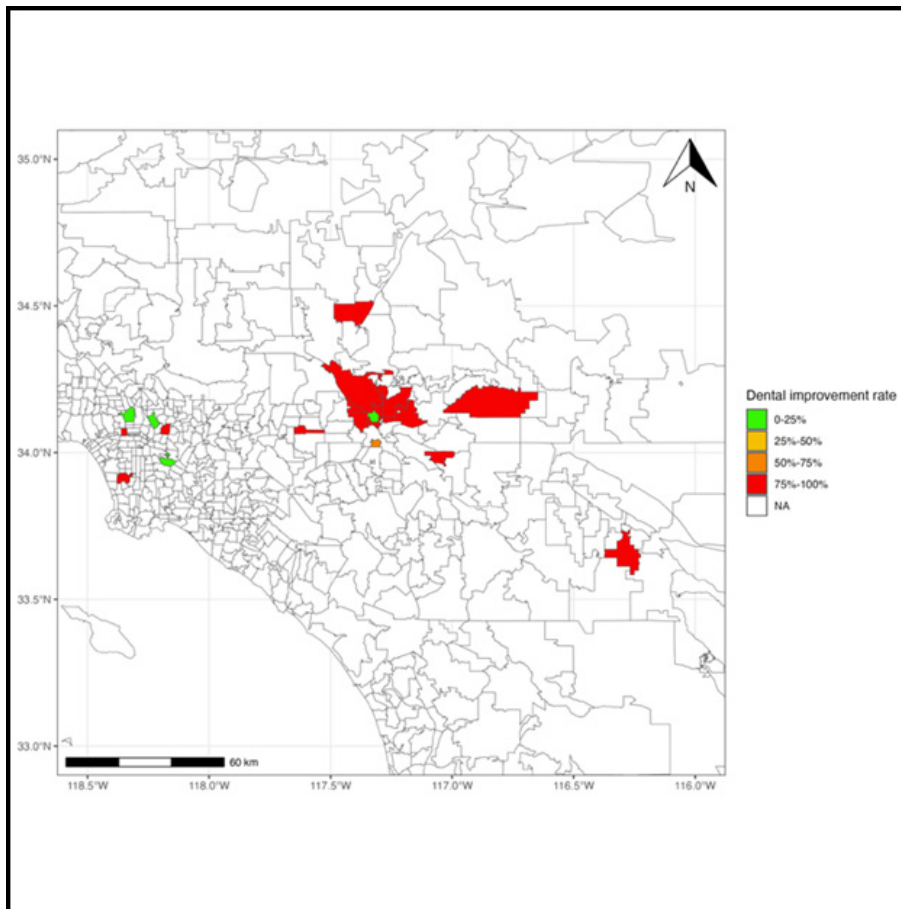
**Figure 5.b: Access Gap Score in California (Southern Region)**

**Note:** As shown in Figure A1a and Figure A1b, no strong spatial patterns observed in southern or outer regions.



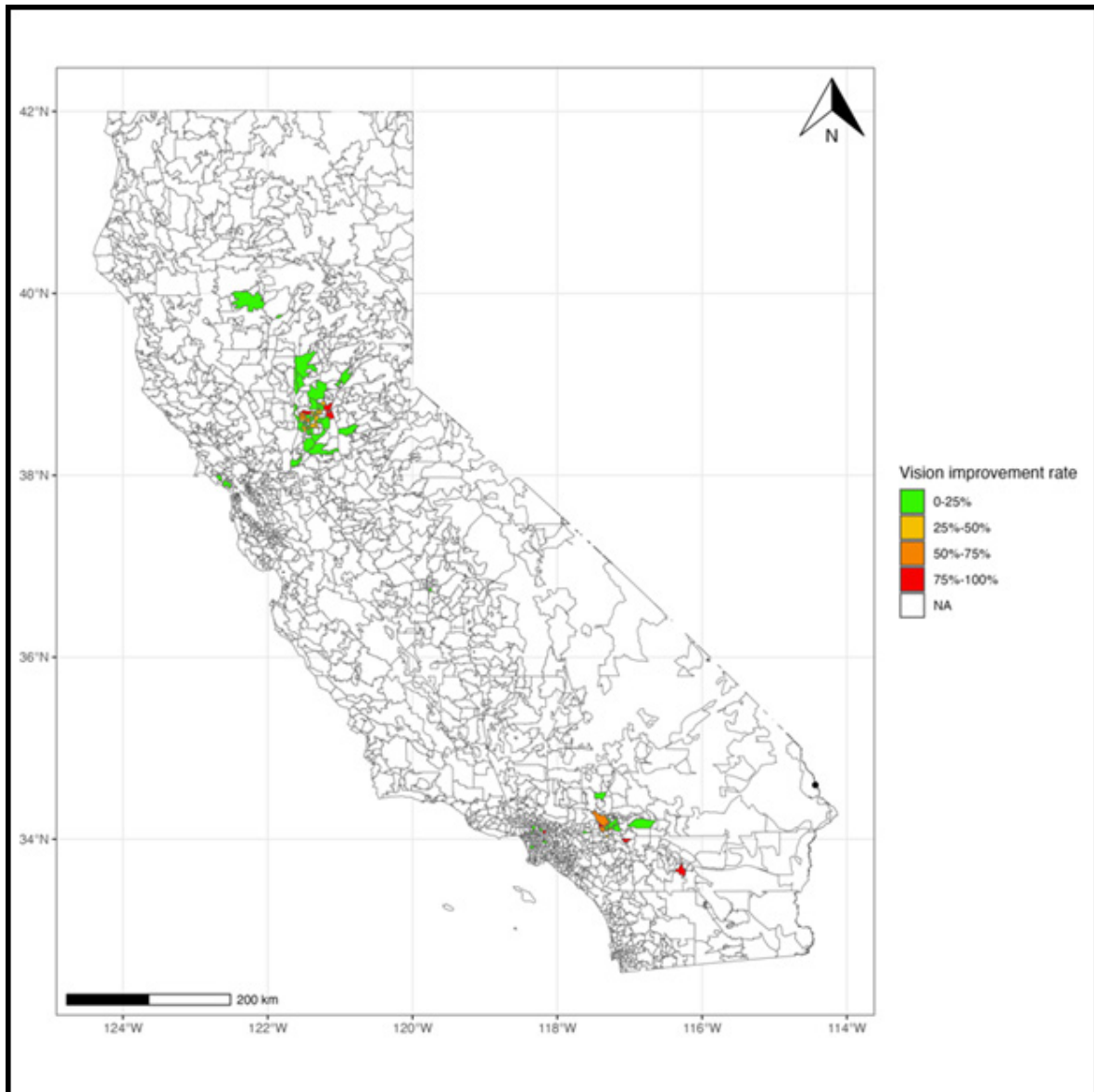
**Figure 5.c: Dental Improvement Rate in California (Whole Region)**

*Note: This is the figure including Figure 5 and Figure 5c.*

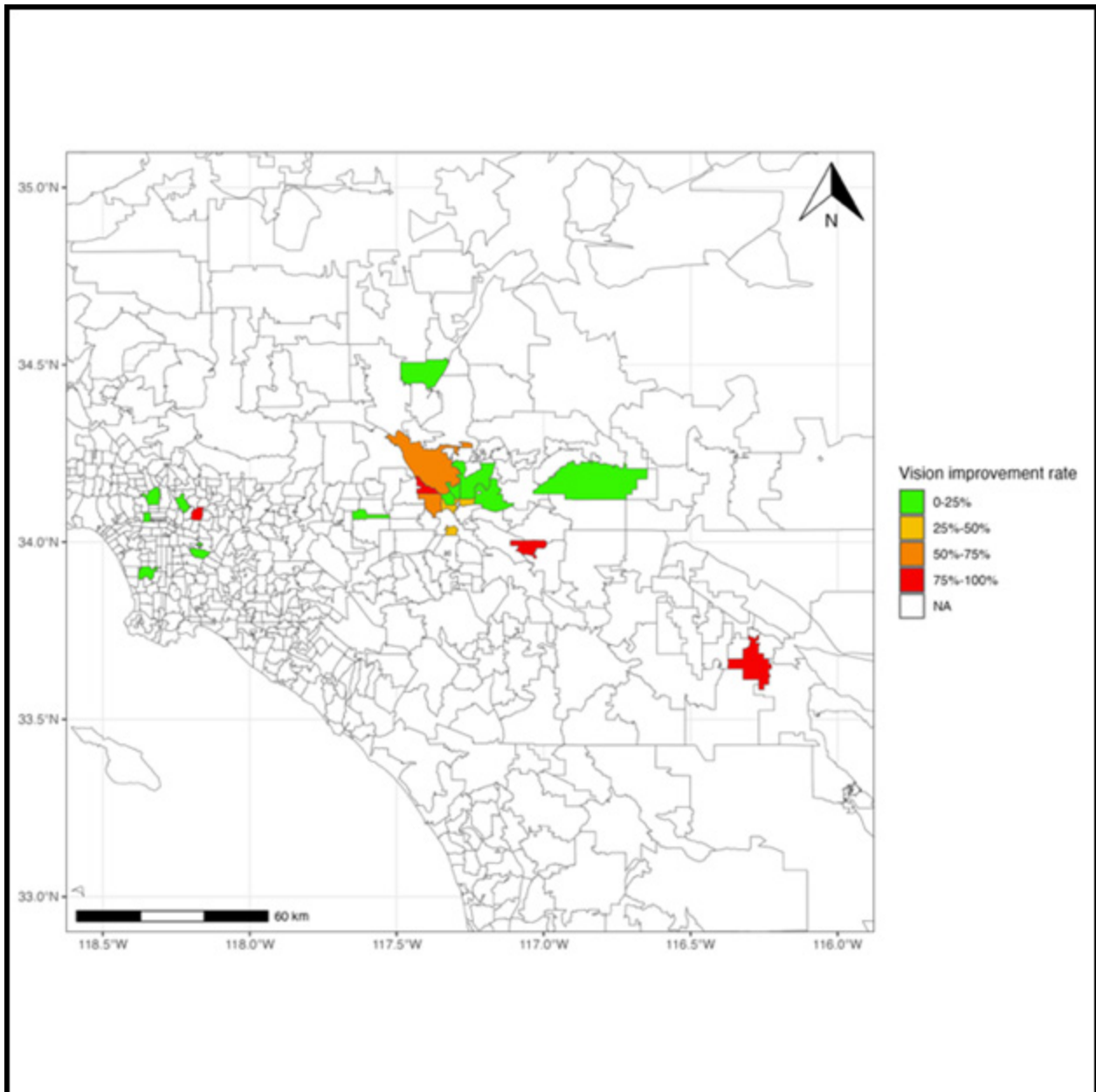


**Figure 5.d: Dental Improvement Rate in California (Southern Region)**

**Note:** As shown in Figure A2a and Figure A2b, only minimal variation existed outside of the Sacramento metropolitan area. No clear pattern was observed.

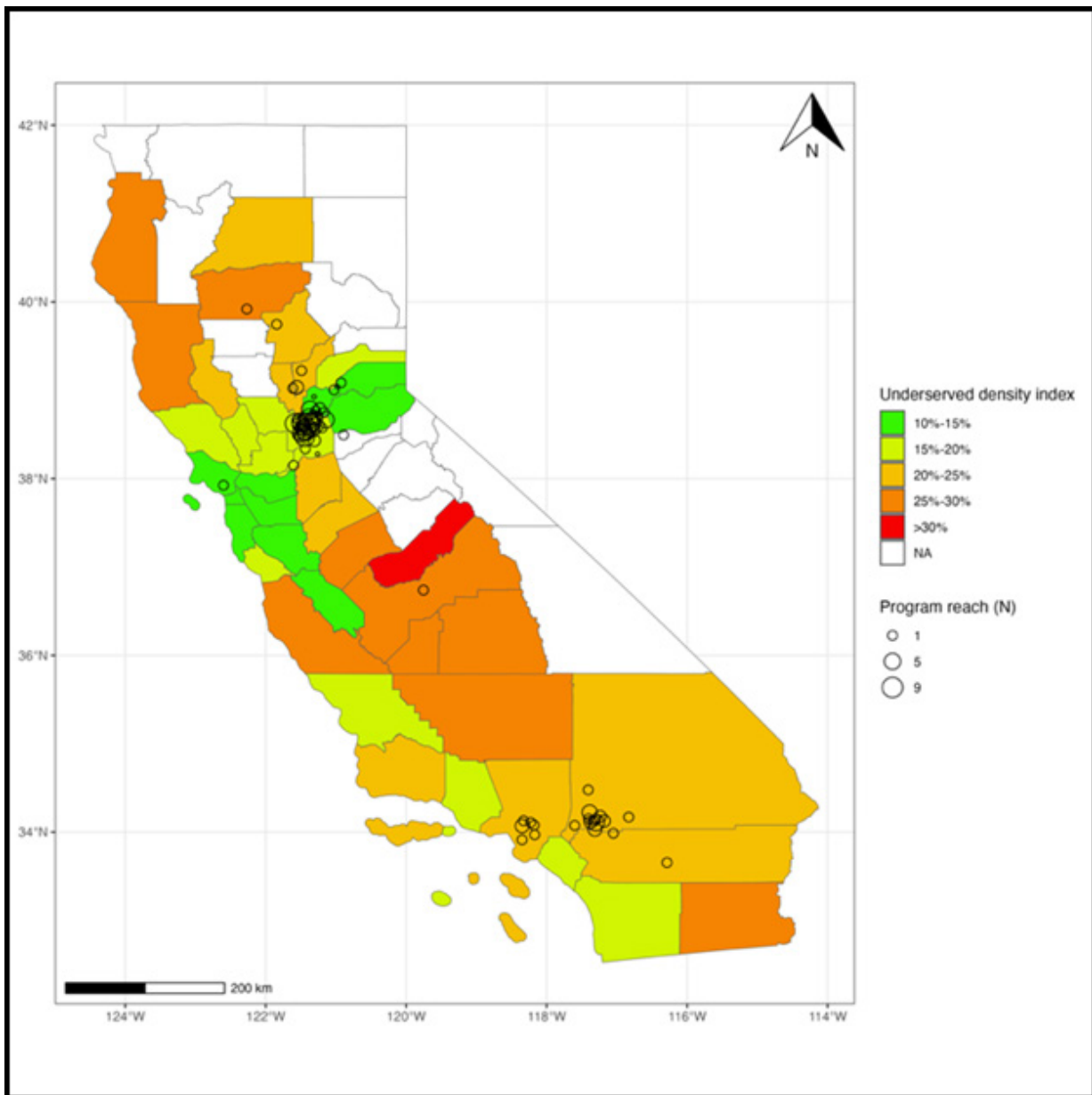


**Figure A3a: Vision Improvement Rate in California (Whole Region)**  
**Note:** This is the figure including Figure 3 and Figure A3b.

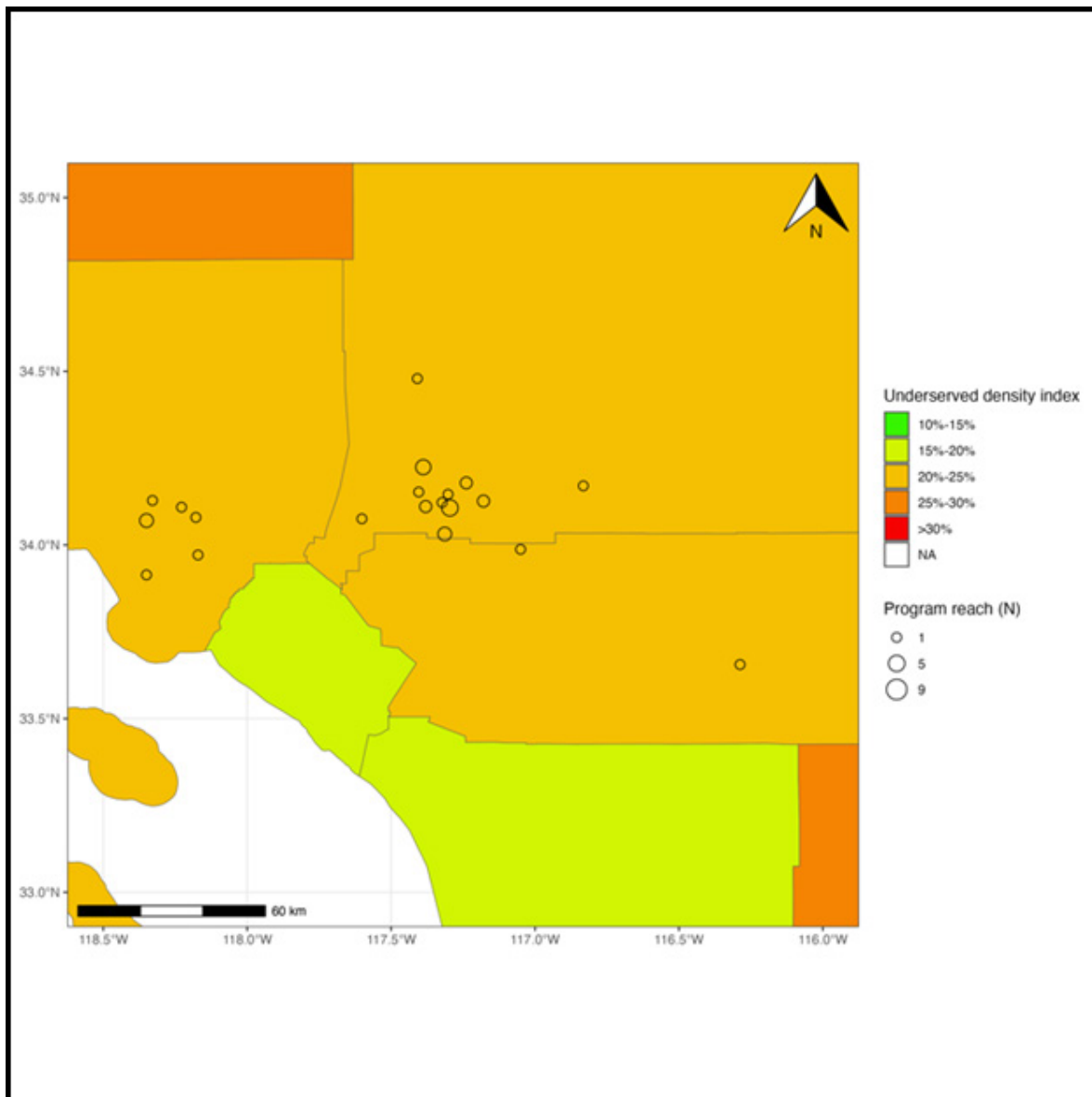


**Figure A3b: Dental Improvement rate in California (Southern Region)**

**Note:** As shown in Figure A3a and Figure A3b, no consistent patterns were identified outside of core city regions.



**Figure A4a: Underserved Density Index and Number of Program Reach in California (Whole Region)**  
 Note: This is the figure including Figure 4 and Figure A4b.



**Figure A4b: Underserved Density index and Number of Program reach in California (Southern Region)**  
**Note:** As shown in Figure A4a and Figure A4b, no consistent patterns were identified outside of core city regions.