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Recruiting Adolescents from Medicaid Enrollment Files into a Neighborhood Oral Health Study

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Abstract: Introduction: Strategies are needed to improve recruitment of low-income adolescents into oral health studies.

Objectives: In this study, we assessed the feasibility of recruiting Medicaid-enrolled adolescents into a neighborhood-level oral health study using Medicaid enrollment files and to evaluate the degree of bias in the final recruited study population.

Methods: We obtained Medicaid enrollment files from the Oregon Health Authority for 15,440 Medicaid enrollees aged 12 to 17 y from Multnomah, Hood River, and Tillamook counties. We attempted to contact the primary caregiver of each adolescent by telephone, and we tracked contact, recruitment, enrollment, and study completion rates. We further assessed if these rates were different across county-level rurality, neighborhood-level

income, and caregiver-level language preference (Spanish vs. English). The Pearson chi-square test was used to compare rates ($\alpha = 0.05$). We contacted 6,202 caregivers (40.2%), recruited 738 adolescents (11.9%), enrolled 335 (45.4%), and had complete data for 284 (84.8%). The overall enrollment yield from contacted caregivers was 5.4%. Contact rates did not differ significantly by rurality ($P = 0.897$), but they were significantly lower in the lowest-income neighborhoods ($P = 0.023$). Recruitment rates were significantly higher for adolescents from rural counties ($P = 0.001$), but they did not differ by income or language preference. Enrollment rates were significantly higher among adolescents from rural counties ($P < 0.001$) and were significantly associated with income ($P = 0.041$), but they were not different by language preference ($P = 0.083$). Among participants with complete data, there were no differences by

rurality or income, but a significantly larger proportion of adolescents with complete data had caregivers with a language preference for Spanish ($P = 0.043$).

Results and Conclusions: It is feasible to recruit Medicaid-enrolled adolescents into a neighborhood oral health study through the use of Medicaid files. County-, neighborhood-, and caregiver-level factors may influence characteristics of the final study population. Additional research is needed to improve recruitment of Medicaid enrollees into neighborhood oral health studies.

Knowledge Transfer Statement:

Researchers can use the results of this study to plan neighborhood-level oral health studies involving recruitment of low-income adolescents. Findings further underscore the importance of assessing factors related to recruitment to evaluate participant bias and the generalizability of study findings.

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Introduction

Nearly 13% of Americans are low-income individuals, many of whom are at increased risk for health inequalities (Fenstien 1993; Begley et al. 2011; Sepehri and Guliani 2015; American Fact Finder 2016; Quick Facts 2016). Low socioeconomic status (SES) is associated with poor oral health outcomes (Warren et al. 2009; Chi et al. 2014) and is a leading cause of oral health inequalities (Mouradian et al. 2000; Chankanka et al. 2011; Fontana et al. 2011). One goal of clinical research is to identify underlying reasons for health inequalities to help inform intervention development and policy solutions. However, recruiting low-income individuals into clinical studies has been a long-standing challenge in public health (Durant et al. 2007; National Institutes of Health 1996; Ness et al. 1997; Levkoff and Sanchez 2003; Wu et al. 2010; Kadam et al. 2016).

Low-income individuals participate in studies at lower rates and drop out at higher rates than do those with a higher income (Baker et al. 2011; Vermaire et al. 2011). For instance, parents from low SES neighborhoods were significantly less likely to participate in a clinical prevention study than parents from high SES neighborhoods (Heinrichs et al. 2005). Other studies found that neighborhood characteristics, such as unemployment, high school dropout rates, and neighborhood density, correlate with lower levels of participation in clinical research (Byrnes et al. 2012; Robinson et al. 2016). Inadequate representation of vulnerable individuals can limit the generalizability of population-based studies and lead to misspecified interventions. Thus, it is important to improve recruitment strategies for clinical studies involving low-income children (Weintraub and Breland 2015).

In this study, we examined the feasibility of using state Medicaid

enrollment files to recruit low-income adolescents into an observational neighborhood-level oral health study. We hypothesized no differences in study participation by county-level rurality, neighborhood-level income, or caregiver-level language preference. Our long-term goal is to improve strategies of recruiting publicly insured adolescents into clinical oral health studies that will generate the data needed to develop neighborhood-based interventions aimed at improving the oral health of vulnerable adolescents.

Methods

Study Population and Data

Our cross-sectional study focused on Medicaid-enrolled adolescents aged 12 to 17 y living in 1 of 3 counties in Oregon (Hood River, Multnomah, or Tillamook). Potential participants were identified from 2013 Medicaid enrollment files obtained from the Oregon Health Authority. The inclusion criteria were as follows: enrollment in the Oregon Medicaid program in 2013 for at least 1 mo; mailing address in a study county; residence in a neighborhood with at least 50 Medicaid-enrolled adolescents aged 12 to 17 y, to allow for recruitment of sufficient numbers of adolescents; a phone number in the enrollment file; and 12 to 17 y old at the time of the study visit. Because this was a neighborhood-level study, we needed sufficient numbers of potentially recruitable participants in each neighborhood. The goal was to recruit 13 to 15 adolescents from each neighborhood. Assuming a 25% participation rate meant that each neighborhood needed at least 50 potential recruits. Our initial goal was to enroll 1 randomly selected adolescent per family. However, because of greater-than-expected interest from families, we opened enrollment to multiple participants from the same family. There were no observed differences in participation by number of eligible children per family, but these were not formally assessed. Neighborhoods were defined as census tracts consistent with the US Census Bureau (Krieger 1992). The study was approved by the

University of Washington Institutional Review Board.

Participant Recruitment

Trained study staff members attempted to contact the primary caregiver for each eligible adolescent by telephone. Calls were made in English or Spanish. Up to 10 attempts were made to contact each caregiver. We recorded the status of each call attempt (e.g., phone number disconnected, no answer, wrong number, voicemail). Once a caregiver was reached, we briefly explained the purpose of the study (i.e., to understand how neighborhood factors influence adolescent oral health outcomes) and described the study procedures. Caregivers were informed that they would receive a gift card for participation. Interested and eligible adolescents were scheduled for a study visit. We subsequently tracked whether each adolescent showed up for her or his study visit, enrolled in the study, and completed data collection procedures. The goal was to recruit about 330 adolescents, the number for which the study was funded.

Study Procedures

All study visits took place at local dental offices in Oregon between December 2015 and December 2016 and lasted approximately 1 h. We explained the study procedures, answered questions, and obtained written consent from the caregiver and assent from the adolescent. Caregivers completed a paper survey; adolescents completed a paper survey; caregivers and adolescents were both asked to provide a small hair sample for cortisol analyses; and adolescents were screened for dental disease. Study materials were available in English and Spanish. Participants could skip any portion of the study. At the end of the study visit, caregivers and adolescents received \$20 and \$15 gift cards, respectively, as a thank-you for participation.

Independent Variables

There were 3 independent variables. The first was county-level rurality, as

defined by the Oregon Office of Rural Health's (n.d.) classification of rural as a geographic area >10 miles from a population center of ≥40,000 people. Study counties were classified as rural (Hood River and Tillamook) or urban (Multnomah). The second variable was neighborhood-level annual median income, as derived from the 2012–2016 American Community Survey generated by the US Census Bureau (n.d.). We converted income into quartiles: 1) ≤\$42,447.60, 2) \$42,447.70 to \$48,702.40, 3) \$48,702.50 to \$58,698.00, and 4) ≥\$58,698.10. The third variable was a caregiver-level measure of one's preferred language (Spanish vs. English).

Outcome Variables

There were 4 binary outcome variables (no/yes): 1) contacted (whether a study staff was able to reach the caregiver by telephone); 2) recruited (whether the adolescent was scheduled for a study appointment); 3) enrolled (whether the scheduled adolescent showed up for the study visit); and 4) completed data collection (whether all data elements were collected).

Data Management and Analysis

All data were entered into an Excel spreadsheet and verified for accuracy. Participants with missing data were excluded from the analyses. After generating descriptive statistics, we calculated percentages for each outcome measured and used the Pearson chi-square test to compare percentages across each independent variable ($\alpha = 0.05$). All data were analyzed with SPSS 19.0 for Windows (IBM Corporation).

Results

Descriptive Statistics

A total of 15,440 participants who met the inclusion criteria were part of the original call list. Ninety-one percent lived in Multnomah County, 5.2% in Hood River County, and 3.8% in Tillamook County. We recruited from all 4 neighborhoods in Hood River County, all 8 neighborhoods in Tillamook County,

and 67 out of 171 neighborhoods in Multnomah County. From these neighborhoods, we enrolled at least 1 adolescent from 72 neighborhoods: all 4 neighborhoods in Hood River County, 7 of 8 neighborhoods in Tillamook County, and 61 of 67 neighborhoods in Multnomah County. Most neighborhoods in Multnomah County from which participants were enrolled were located along the northern and eastern parts of the county. The mean $\pm$ SD number of adolescents recruited from each neighborhood was 4.65 ± 3.77 (range, 1 to 14 adolescents). Neighborhood-level mean income was $\$51,435.60 \pm \$11,495.30$. Among contacted families, 4.5% of caregivers preferred to communicate in Spanish.

Participation Rates

From the 15,440 adolescents on the call list, we were able to contact 6,202 caregivers by telephone (40.2%; Table). Among the caregivers whom we were unable to contact, 94% did not answer the phone; 5.7% had a disconnected phone number; and 0.3% moved to a different neighborhood (Fig.). Among contacted families, 738 adolescents were recruited (11.9%). Most adolescents who were not recruited were siblings of recruited participants. Of those recruited, 335 were enrolled (45.4%). The overall enrollment yield from contacted caregivers was 5.4%. Of those enrolled, we obtained complete data from 284 adolescents (84.8%).

County-Level Rurality

The contact rate was not significantly different by rurality ($P = 0.897$; Table). A significant difference was observed in the proportions of adolescents who were recruited ($P = 0.001$) and enrolled ($P < 0.001$) by rurality. Overall, 16% of rural adolescents who were contacted were subsequently recruited and 64.4% enrolled, as compared with 11.5% of urban adolescents who were subsequently recruited and 41.8% enrolled. There was no significant difference in data completion rates by rurality ($P = 0.124$). The majority of

participants with incomplete data were missing a hair sample from either the child or the caregiver (96%).

Neighborhood-Level Income

Across the income quartiles, there was a significant difference in the proportion of contacted caregivers (Table). Contact rates were highest for adolescents in the highest-income neighborhoods (42%) and lowest for those in the lowest-income neighborhoods (39.3%). There was no significant difference in recruitment by income ($P = 0.058$), but enrollment rates were significantly higher in the higher-income neighborhoods ($P = 0.041$). There was no significant association between neighborhood income and data completion rates ($P = 0.091$).

Caregiver-Level Language Preference

Of the 6,202 caregivers who were contacted, 277 preferred to speak in Spanish, of which 158 adolescents were recruited. There was no significant difference in the proportions of adolescents recruited ($P = 0.301$) or enrolled ($P = 0.083$) by Spanish language preference. There was a significant difference in the proportion of adolescents with complete data collection ($P = 0.043$), with completion rates higher for adolescents with a caregiver who preferred to speak Spanish.

Discussion

In this study, we assessed the feasibility of recruiting Medicaid-enrolled adolescents into a neighborhood oral health study. The overall enrollment yield was 5.4% based on caregivers who were contacted from Medicaid enrollment files. Factors such as county rurality, neighborhood income, and caregiver language preference were associated with recruitment, enrollment, and data completion rates. Adolescents from rural counties and higher-income neighborhoods were more likely to be part of our final study population, and adolescents with caregivers who preferred to speak Spanish were more

Table.

Demographic Characteristics of Oregon Medicaid-Enrolled Adolescents in Original Call List and Subsequent Subgroups.

Level	Total (N = 15,440)	Contacted			Recruited			Enrolled			Completed Data Collection		
		No (n = 9,238)	Yes (n = 6,202)	P Value	No (n = 5,464)	Yes (n = 738)	P Value	No (n = 403)	Yes (n = 335)	P Value	No (n = 51)	Yes (n = 284)	P Value
County rurality				0.90			0.001			<0.001			0.12
Rural	1,391 (9.0)	830 (59.7)	561 (40.3)		471 (84.0)	90 (16.0)		32 (35.6)	58 (64.4)		5 (8.6)	53 (91.4)	
Urban	14,049 (91.0)	8,408 (59.8)	5,641 (40.2)		4,993 (88.5)	648 (11.5)		385 (58.2)	277 (41.8)		46 (16.6)	231 (83.4)	
Missing	0 (0.0)												
Neighborhood income ^a				0.02			0.06			0.041			0.09
Q1 (lowest)	3,276 (21.2)	1,990 (60.7)	1,286 (39.3)		1,086 (84.4)	200 (15.6)		107 (53.5)	93 (46.5)		17 (18.3)	76 (81.7)	
Q2	4,519 (29.3)	2,738 (60.6)	1,781 (39.4)		1,599 (89.8)	182 (10.2)		102 (56.0)	80 (44.0)		14 (17.5)	66 (82.5)	
Q3	3,198 (20.7)	1,894 (59.2)	1,304 (40.8)		1,140 (87.4)	164 (12.6)		83 (50.6)	81 (49.4)		12 (14.8)	69 (85.2)	
Q4 (highest)	3,610 (23.4)	2,093 (58.0)	1,517 (42.0)		1,336 (88.1)	181 (11.9)		100 (55.2)	81 (44.8)		8 (9.9)	73 (90.1)	
Missing	837 (5.4)												
Caregiver language preference ^b							0.30			0.083			0.04
Spanish					119 (43.0)	158 (57.0)		99 (62.7)	59 (37.3)		7 (11.9)	52 (88.1)	
English					5,345 (90.2)	580 (9.8)		304 (52.4)	276 (47.6)		44 (15.9)	232 (84.1)	

^aQuartile 1: ≤\$42,447.60. Quartile 2: \$42,447.70 to \$48,702.40. Quartile 3: \$48,702.50 to \$58,698.00. Quartile 4: ≥\$58,698.10.^bContact rates not assessed for Spanish language preference, because phone contact was required to assess caregiver language preference.

likely to have provided complete data. These findings indicate that it is feasible to recruit adolescents into an observational neighborhood-level oral health study with Medicaid enrollment and that contextual factors influence participation.

While we demonstrated feasibility of recruiting Medicaid-enrolled adolescents into a clinical study with enrollment files, the overall enrollment yield of 5.4% may appear low. Our yield was slightly

higher than the 4.2% reported in a similar study in Washington of Medicaid-enrolled children aged 7 to 17 y with special health care needs (Yoo and Chi 2018). There are 2 potential explanations. First, caregivers of children with special health care needs may be less inclined to participate because of logistical difficulties in getting to a study visit or concerns about their children's ability to cooperate. Second, in the current study, we were able to contact a slightly

larger proportion of caregivers from the original Medicaid enrollment files (40.2% in Oregon vs. 34.6% in Washington). The main barrier to contact was the number of caregivers who did not answer our phone call. Caregivers could have screened calls or may not have been available during the times at which our team made recruitment phone calls. To address these barriers, we left an initial voicemail message for caregivers, made multiple call attempts, varied the times

Figure. Study flow chart describing contact, recruitment, enrollment, and data completion for Medicaid-enrolled adolescents in an observational neighborhood oral health study.

at which phone calls were made, and offered opportunities to reschedule (Goldman et al. 2018). More broadly, it is important to recognize that single-digit response rates raise concerns about response bias. Future studies should continue to develop protocols that help to maximize participation when Medicaid enrollment files are used to recruit.

In terms of recruitment strategies for neighborhood-based oral health studies, it may be worth exploring school-based, clinic-based, and neighborhood-canvassing strategies to identify and recruit low-income children (Fitzgibbon et al. 1998; Schilpzand et al. 2015). However, there are potential challenges, including the need for school permission

and buy-in, distrust on the part of communities toward outside researchers, and bias of enrolling utilizers of health care services. Community-based approaches with local partnerships can help to improve recruitment of vulnerable populations into clinical research (Ladia et al. 2018).

Our study findings were mixed as compared with previous research on factors that influence participant recruitment. One study found that participants living in rural communities in Maryland were significantly less likely to participate in clinical trials (Baquet et al. 2006), which is opposite from our enrollment findings (64.4% rural vs. 41.8% urban). We organized study visits

during school breaks and weekends, which could have been more convenient for families in rural counties. A study from Germany that recruited parents into a prevention training program found that families whose children attended preschool in low- or middle-income neighborhoods were significantly less likely to participate (Heinrichs et al. 2005). Less participation from lower-income neighborhoods is partially consistent with our findings, which indicated highest recruitment rates from children in quartile 3—the second-highest income neighborhoods. A study examining the recruitment success of families into a preventive parent-training intervention found that mothers who preferred speaking Spanish were significantly more likely to be recruited into the study (Dumka et al. 1997). We found no difference in recruitment or enrollment rates by caregiver language preference. However, adolescents with caregivers who preferred to speak Spanish had higher rates of complete data. Future studies should collect key demographics during recruitment of participants, with the goal of evaluating the degree of bias that exists in the final recruited study population.

There were 3 main study limitations. First, our findings are generalizable to adolescents from lower-income neighborhoods in the 3 study counties. We compared median income for neighborhoods represented in the study with that of neighborhoods in the study counties that were not included. The median neighborhood-level income was significantly lower in the study neighborhoods than in nonstudy neighborhoods (\$54,590.97 vs. \$85,343.90, $P < 0.0001$). Income-related differences are expected given the inclusion criteria of ≥ 50 Medicaid-enrolled adolescents in a neighborhood. Medicaid-enrolled adolescents living in the lower-income neighborhoods to which our findings are generalized are likely to be the most in need in terms of oral health interventions. It is not possible to assess the extent to which our findings are more

broadly generalizable to lower-income neighborhoods in other counties and states. Factors that could influence study participation rates across states include Medicaid income eligibility levels as well as Medicaid expansion, which would increase program enrollment numbers by relaxing income criteria. Social and cultural attributes also may vary across Medicaid populations, such as the perceived role in participating in research that could help to improve the program for future enrollees and the value attributed to scientific research.

Second, contact, recruitment, enrollment, and data completion rates could differ across variables other than the 3 that we examined in the current study. Furthermore, we were not able to completely examine the effects of language preference, because this could not be assessed on 60% of potential recruits who could not be contacted. Future clinical studies should identify factors that influence recruitment rates, and they should assess the degree of selection bias that exists with recruited study participants.

Third, factors related to the study, such as respondent burden and incentives, are likely to affect whether families participate in clinical research. The goals are to minimize burden by keeping study visits noninvasive and as short as possible. Incentives for participation should be commensurate with the amount of time and effort required. Our study required about 1 h, and the data collection protocol was noninvasive. The caregiver and adolescent incentives were set at or above the hourly minimum wage rate in Seattle. Future research should continue to explore additional ways to encourage participation in clinical research.

Conclusion

In conclusion, we examined the feasibility of using Medicaid enrollment files to recruit Medicaid-enrolled adolescents into a neighborhood oral health study, and we assessed the degree to which our final recruited study population was biased on key variables.

Our approach was feasible. However, factors such as rurality, income, and caregiver language preferences were associated with participant recruitment. Future research should continue to explore strategies to improve recruitment rates of low-income adolescents into clinical oral health studies.

Author Contributions

A.A. Basson, contributed to conception and data analysis, drafted and critically revised the manuscript; M. Yoo, contributed to conception, data acquisition, and analysis, drafted and critically revised the manuscript; D.L. Chi, contributed to conception, design, data acquisition, analysis, and interpretation, drafted and critically revised the manuscript. All authors gave final approval and agree to be accountable for all aspects of the work.

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