College of Public Health

Evaluating Barriers that Audiologists Perceive to Providing Care Under Medicaid

By Lauren Luecke, William Marzen, and Zach Goldstein

July 17, 2025

College of Public Health

Introduction

Medicaid & Audiology

- Medicaid guarantees hearing aid coverage for children.
- However, it can be difficult for families to find a nearby audiologist who is accepting new Medicaid patients.
- We are looking at survey responses from 118 audiologists who answered questions on barriers and attitudes towards Medicaid.
- Our objective is to use their survey responses to predict Medicaid acceptance and participation levels.
- By getting data on barriers to Medicaid, advocacy groups can work to address them to increase acceptance and participation.

National Survey of Audiologists

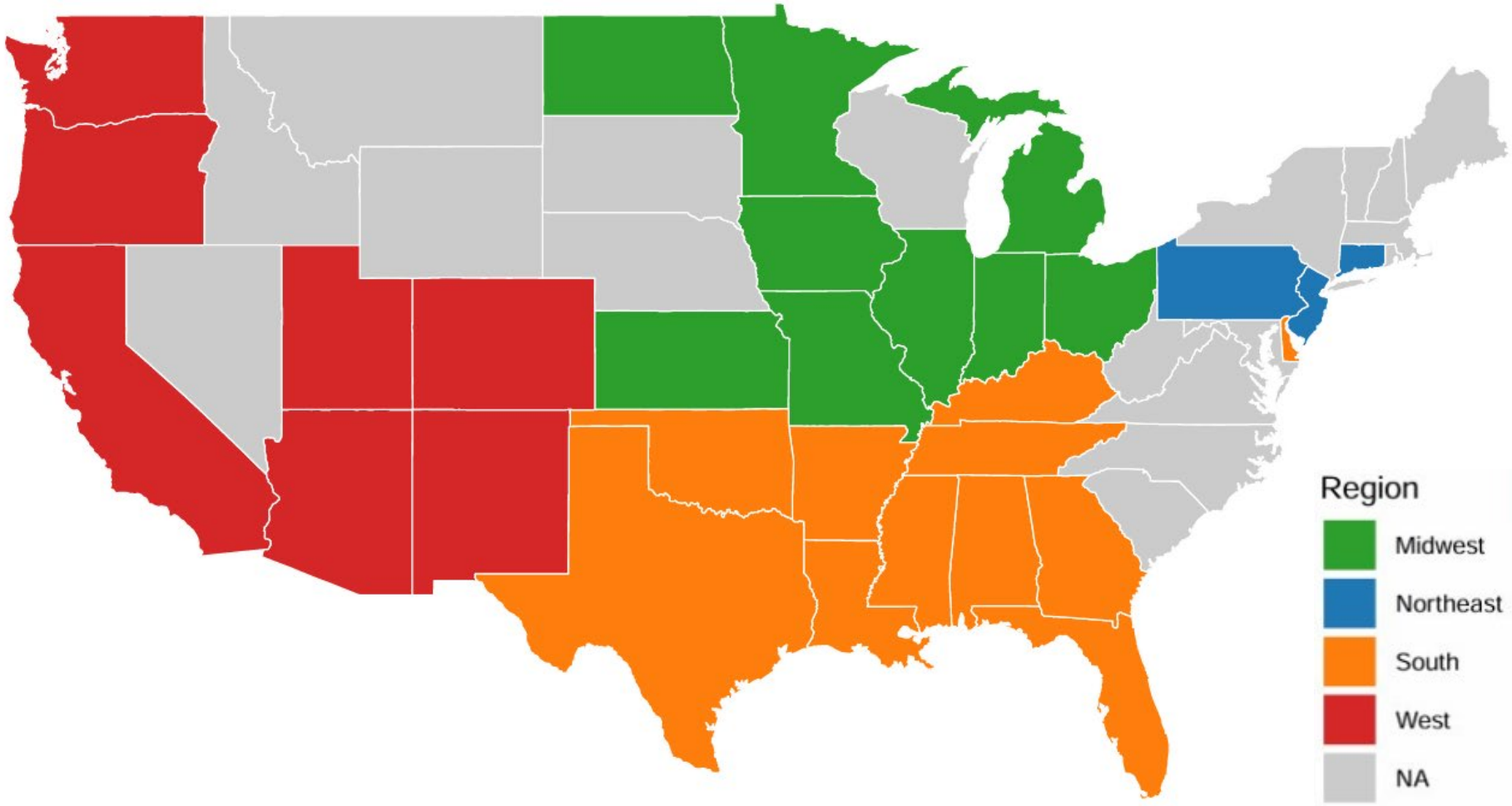
- **Target Population:** We distributed a national survey to licensed audiologists in the U.S. who treat either pediatric-only or mixed (pediatric and adult) patient populations.
- **Recruitment Methods:** We used a multi-pronged approach to reach potential participants.
  - Initial recruitment was conducted via social media, targeting a dedicated pediatric audiologist group and sharing through mutual professional contacts.
  - We also mailed 1,000 recruitment flyers to a national sample of audiologists provided by the American Speech-Language-Hearing Association (ASHA).
  - There was no upper limit on the number of participants for the survey.

Survey Instruments

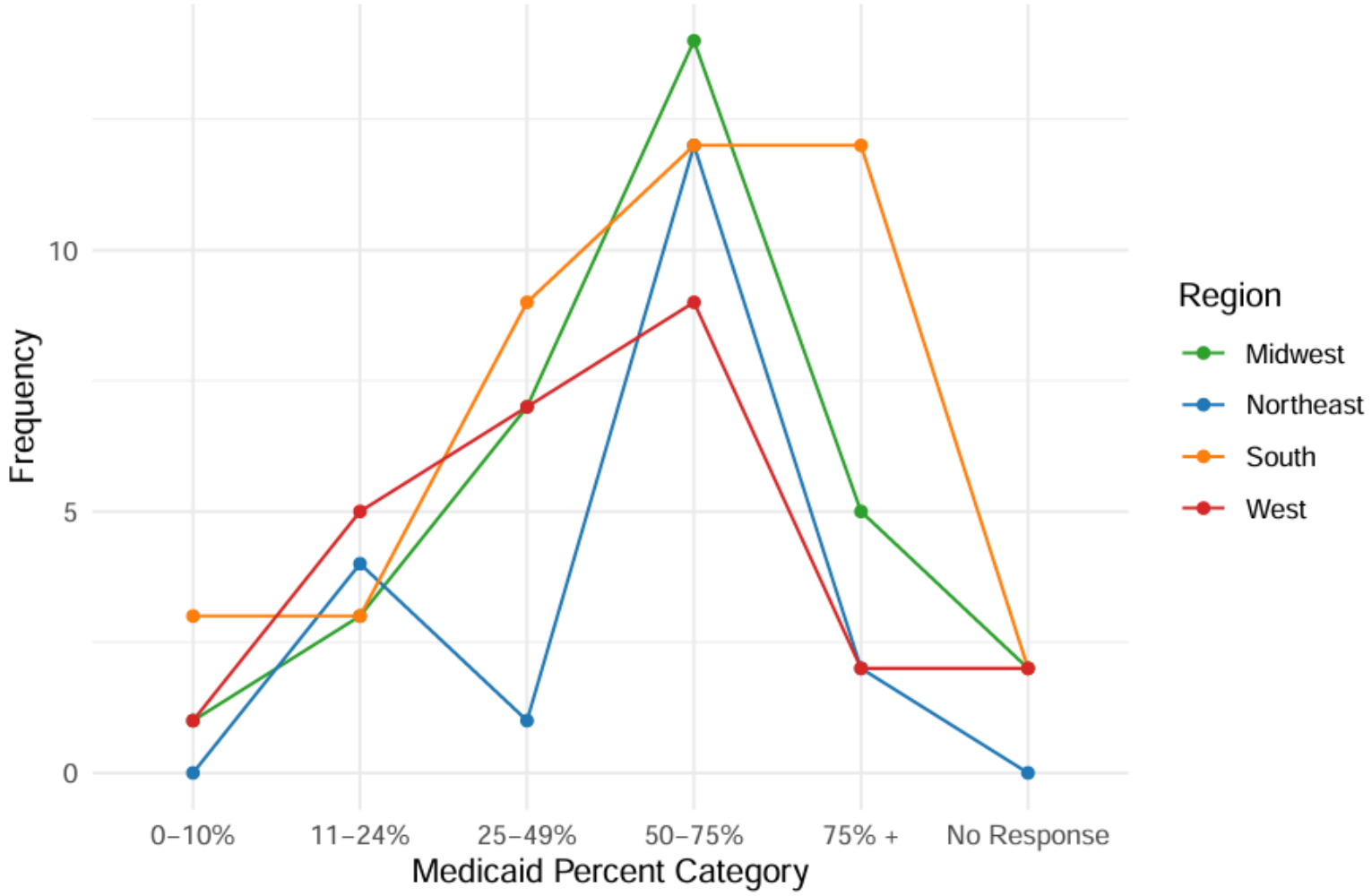
We adapted two validated scales from a 2015 study, “Barriers to Medicaid Participation among Florida Dentists.”

- **Perceived Barrier Scale (1-5 scale):** This scale assessed the importance audiologists place on various barriers, from "Not Important" to "Very Important". Example barriers include "low Medicaid reimbursement rates" and "complicated paperwork".
- **Social Responsibility Scale (1-7 scale):** This scale measured agreement with statements reflecting professional ethics, from "Strongly Disagree" to "Strongly Agree". An example statement is "Providing audiology care to the needy is my ethical and professional obligation".

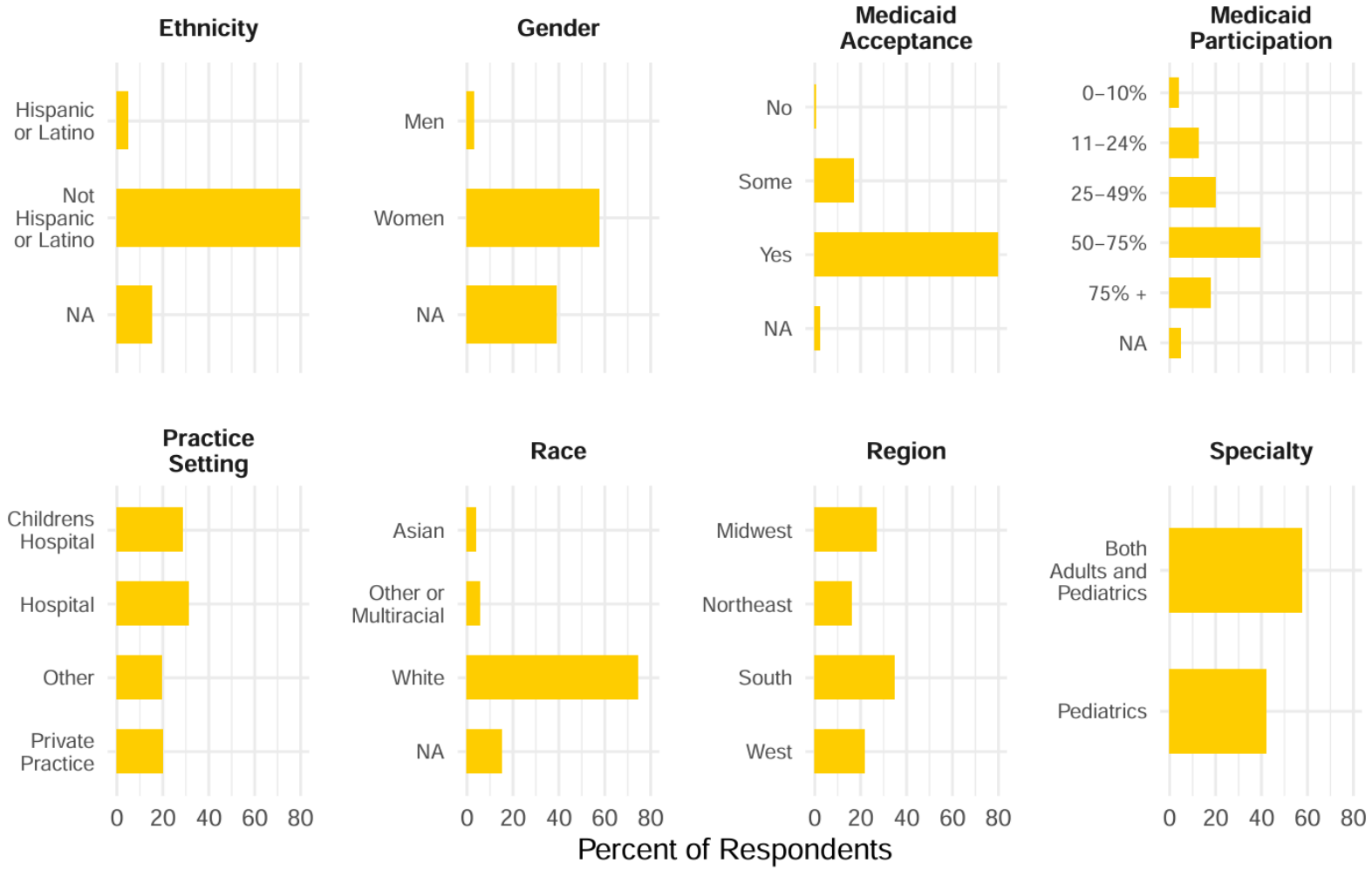
Geographic Distribution



Medicaid Participation by Region



Data

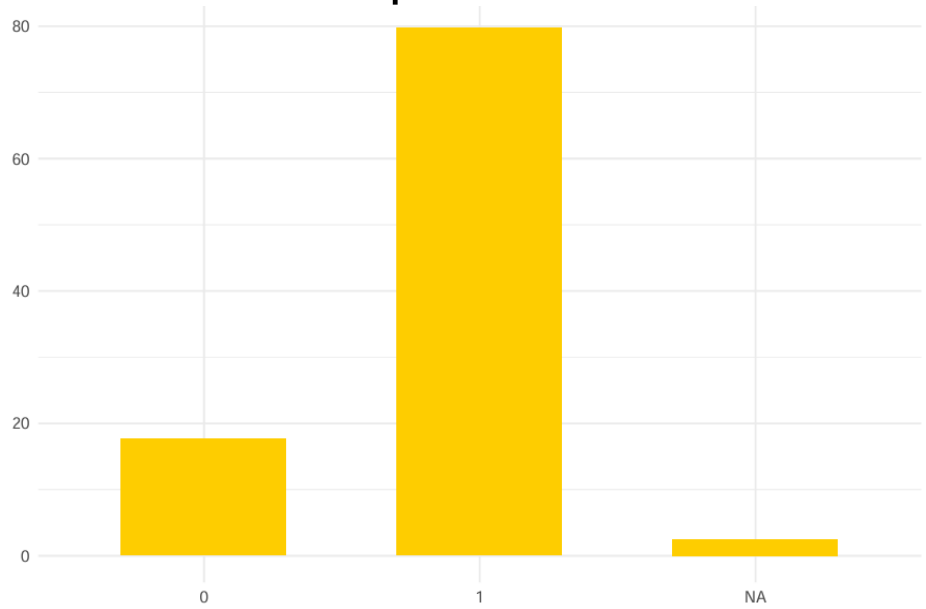

Ethnicity
Hispanic or Latino
Not Hispanic or Latino
NA
Gender
Men
Women
NA
Medicaid Acceptance
No
Some
Yes
NA
Medicaid Participation
0–10%
11–24%
25–49%
50–75%
75% +
NA
Practice Setting
Childrens Hospital
Hospital
Other
Private Practice
Race
Asian
Other or Multiracial
White
NA
Region
Midwest
Northeast
South
West
Specialty
Both Adults and Pediatrics
Pediatrics
0 20 40 60 80
Percent of Respondents

College of Public Health

Methodology

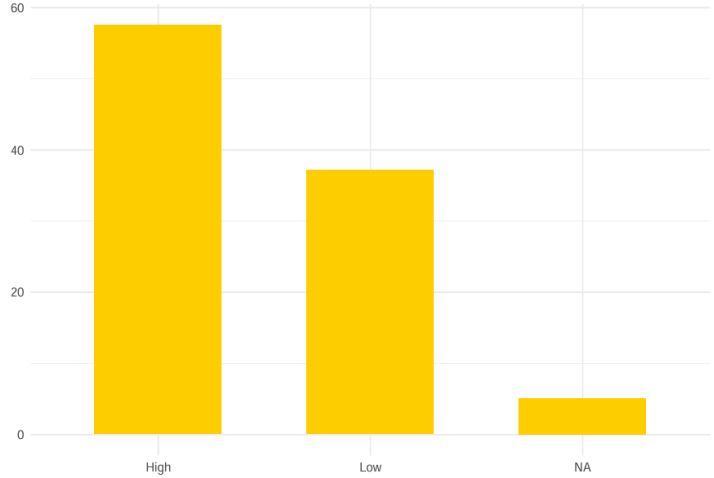
Defining our Outcome Variables

- **Acceptance (Binary Outcome):** This variable measures whether a clinic accepts Medicaid at all.
  - **"Yes" (Coded as 1):** The clinic accepts all types of Medicaid.
  - **"Some/No" (Coded as 0):** The clinic accepts only some types of Medicaid or does not accept it at all.



Defining our Outcome Variables

- **Participation (Binary Outcome):** This variable measures the proportion of a clinic's caseload that consists of Medicaid patients.
  - **"High Participation" (Coded as "High"):** 50% or more of the clinic's patients are covered by Medicaid.
  - **"Low Participation" (Coded as "Low"):** Fewer than 50% of the clinic's patients are covered by Medicaid.



Describing Our Independent Variables

- Our analysis evaluated the relationship between our two outcomes (Acceptance and Participation) and a wide range of predictor variables.
- **Practice Demographics:**
  - **Setting:** Where does the audiologist work? (Children's Hospital, Hospital, Private Practice, or Other)
  - **Region:** Which U.S. region is the practice in? (Midwest, Northeast, South, West)
  - **Specialty:** Does the practice focus on Pediatrics, or both Adults and Pediatrics?
  - **Years in Practice:** How experienced is the audiologist? (Analyzed in quartiles)
- **Barrier & Attitude Questions:**
  - We analyzed responses to 28 questions from the Perceived Barrier and Social Responsibility scales.
  - **Examples:** "How important is *Denial of Payment* as a barrier?" or "To what extent do you agree that *Providing Audiology Care to the Needy is My Ethical and Professional Obligation*?"

Comparisons of Interest

- **Chi-Square or Fisher's Exact Tests**
- **How they work:** These tests evaluate the extent to which the distribution of responses between two categorical variables is due to chance or a real association.
- **Choosing the Right Test:**
  - **Chi-Square Test**
  - **Fisher's Exact Test:** The standard guideline is to use this test if more than 20% of the cells in a contingency table have an expected count of less than 5.
- **Significance Level:** $\propto = 0.01$
  - We used a strict p-value of less than 0.01 to ensure we only included the most impactful variables in our logistic regression model.

Logistic Regression

- **Modeling a Binary Outcome**
- **What is it?** Logistic regression is a statistical model used to predict a binary outcome (a "yes/no" or "1/0" event) based on one or more predictor variables.
- **The Mathematical Model:** The model calculates the probability (p) of the outcome being '1' (e.g., high participation). The core equation models the log-odds of this probability:

$$\ln\left(\frac{p}{1-p}\right) = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \cdots + \beta_k X_k$$

- **Interpreting the Results (The Odds Ratio):** We don't look at the coefficients (β) directly. Instead, we exponentiate them (e^{β}) to get an Odds Ratio (OR).
  - **OR > 1:** For each one-unit increase in the predictor (X), the odds of the outcome occurring increase.
  - **OR < 1:** The odds of the outcome occurring decrease.
  - **OR = 1:** The predictor has no effect on the odds of the outcome.

Building the Predictive Models

- We constructed two separate logistic regression models using the significant variables identified in our initial comparisons of interest.
- **The "Acceptance" Model:**
  - **Outcome:** Whether a clinic accepts Medicaid (1) or not (0).
  - **Goal:** To identify the strongest predictors that influence an audiologist's decision to become a full Medicaid provider in the first place.
- **The "Participation" Model:**
  - **Outcome:** Whether a clinic has high participation (1) or low participation (0).
  - **Goal:** To identify the strongest predictors that influence the proportion of Medicaid patients a clinic serves.

College of Public Health

Results

Table 1: Questions Where >25% of Respondents Answered 'Very Important', 'Strongly Agree', 'Not Important', or 'Strongly Disagree'

Question	Total
Very Important to Denial of Payment Being a Barrier	34.7
Very Important to Low Medicaid Hearing Aid Reimbursement Rates Compared to Commercial Rates Being a Barrier	33.9
Strongly Agree to Providing Audiology Care to the Needy is My Ethical and Professional Obligation	54.2
Strongly Agree to I Would Never Turn any Patient Away Regardless of their Background or Socioeconomic Status	61.0
Strongly Agree to Access to General Health Care is a Right of all People	61.0
Strongly Agree to Access to Audiology Care is a Right of all People	59.3
Not Important to Patient Characteristics Being a Barrier	43.2
Strongly Disagree to My Self Pay Patients Would not Like Being in a Waiting Room with Medicaid Patients	50.0
Strongly Disagree to Other Audiologists will Think less of Me if They Know I See Medicaid Patients	75.4
Strongly Disagree to We Live in a Free Market Economy so I Am not Obliged to Provide Audiology Care to the Poor	57.6
Strongly Disagree to Many Parents with Children on Medicaid Make the Wrong Choices About the Hearing Health Needs of their Children	25.4
Strongly Disagree to I Lack the Cultural Sensitivity to Treat Minority Patients	57.6
Strongly Disagree to I Cannot Financially Afford to Treat Medicaid Patients	36.4
Strongly Disagree to The Audiology Needs of Medicaid Patients are more Difficult to Treat than Other Patients in My Office	31.4

Table 1: P-Values for Chi-Square and Fisher Tests

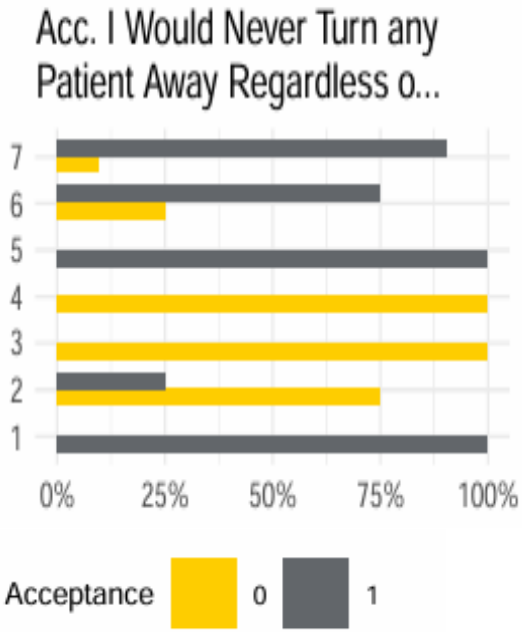
Question	Acceptance	Participation
Hassles in Enrollment Paperwork	0.1741	0.4687
The Need for Prior Approval	0.6063	0.0238
Complicated Paperwork	0.8480	0.1463*
Frequent Changes in Regulations	0.1405	0.0028
Denial of Payment	0.3613	0.0150
Slow Reimbursement	0.8943	0.1572
On and Off Eligibility of Patients	0.4794	0.0462
Patient Characteristics	0.5612	0.4190
Fingerprinting Requirement if Applicable	0.1729	0.7331
Difficulty in Finding Specialists Who Accept Medicaid	0.2736	0.2383
Low Medicaid Hearing Aid Reimbursement Rates Compared to Commercial Rates	0.9868	0.1479
Medicaid Fee Schedule Codes Do not Align with Private Pay Billing Codes	0.0214	0.3849
My Self Pay Patients Would not Like Being in a Waiting Room with Medicaid Patients	0.7703	0.2633
Providing Audiology Care to the Needy is My Ethical and Professional Obligation	0.4162	0.0457
Other Audiologists will Think less of Me if They Know I See Medicaid Patients	0.4185	0.7971
I Would Never Turn any Patient Away Regardless of their Background or Socioeconomic Status	0.0003	0.0018
The Traditional Model of Audiology Practices Adequately Addresses the Hearing Health Needs of Underserved Patients	0.2513	0.0659
If I Am a Medicaid Provider I can Help Prevent Severe Cases of Loss to Follow Up among Children with Hearing Loss	0.2165	0.0005
Medicaid Enrolled Children are more Likely to be Noncompliant than Other Patients in My Practice	0.4603	0.3203
Medicaid Patients Frequently Cancel Appointments	0.7688	0.2682
We Live in a Free Market Economy so I Am not Obliged to Provide Audiology Care to the Poor	0.1896	0.0127
Many Parents with Children on Medicaid Make the Wrong Choices About the Hearing Health Needs of their Children	0.0994	0.2246
Access to General Health Care is a Right of all People	0.0861	0.0610
Access to Audiology Care is a Right of all People	0.0864	0.0536
I Lack the Cultural Sensitivity to Treat Minority Patients	0.6625	0.3944
I Cannot Financially Afford to Treat Medicaid Patients	0.3969	0.0001
I Needed Better Education in Audiology School to Prepare Me to Address Health Disparities in Poor and Minority Patients	0.4428	0.1298
The Audiology Needs of Medicaid Patients are more Difficult to Treat than Other Patients in My Office	0.3462	0.1340
Region	0.3122	0.2999*
Setting	0.0019	0.0001*
Specialty	0.0078*	0.0000*
Years in Practice	1.0000	0.7087*

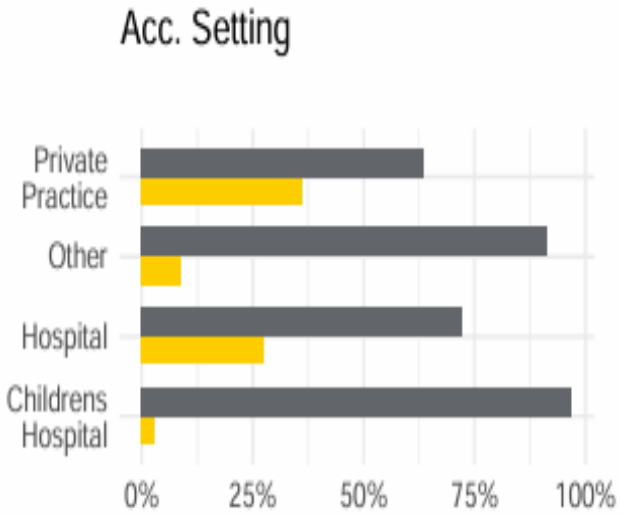
P-value significane is denoted by color where dark blue is < 0.01, medium blue is < 0.05, and light blue is < 0.1.
Asterisks indicate chi-square tests, all others are Fisher's exact tests.

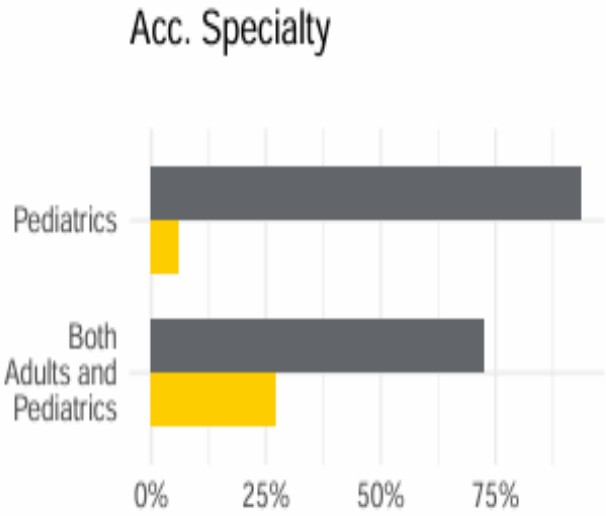
Predictors Included

- **Acceptance:**
  - "I would never turn any patient away regardless of their background or socioeconomic status"
  - Setting
  - Specialty
- **Participation**
  - "I would never turn any patient away regardless of their background or socioeconomic status"
  - "Frequent changes in regulations"
  - "If I am a Medicaid provider, I can help prevent severe cases of loss to follow-up among children with hearing loss"
  - "I cannot financially afford to treat Medicaid patients"
  - Setting
  - Specialty

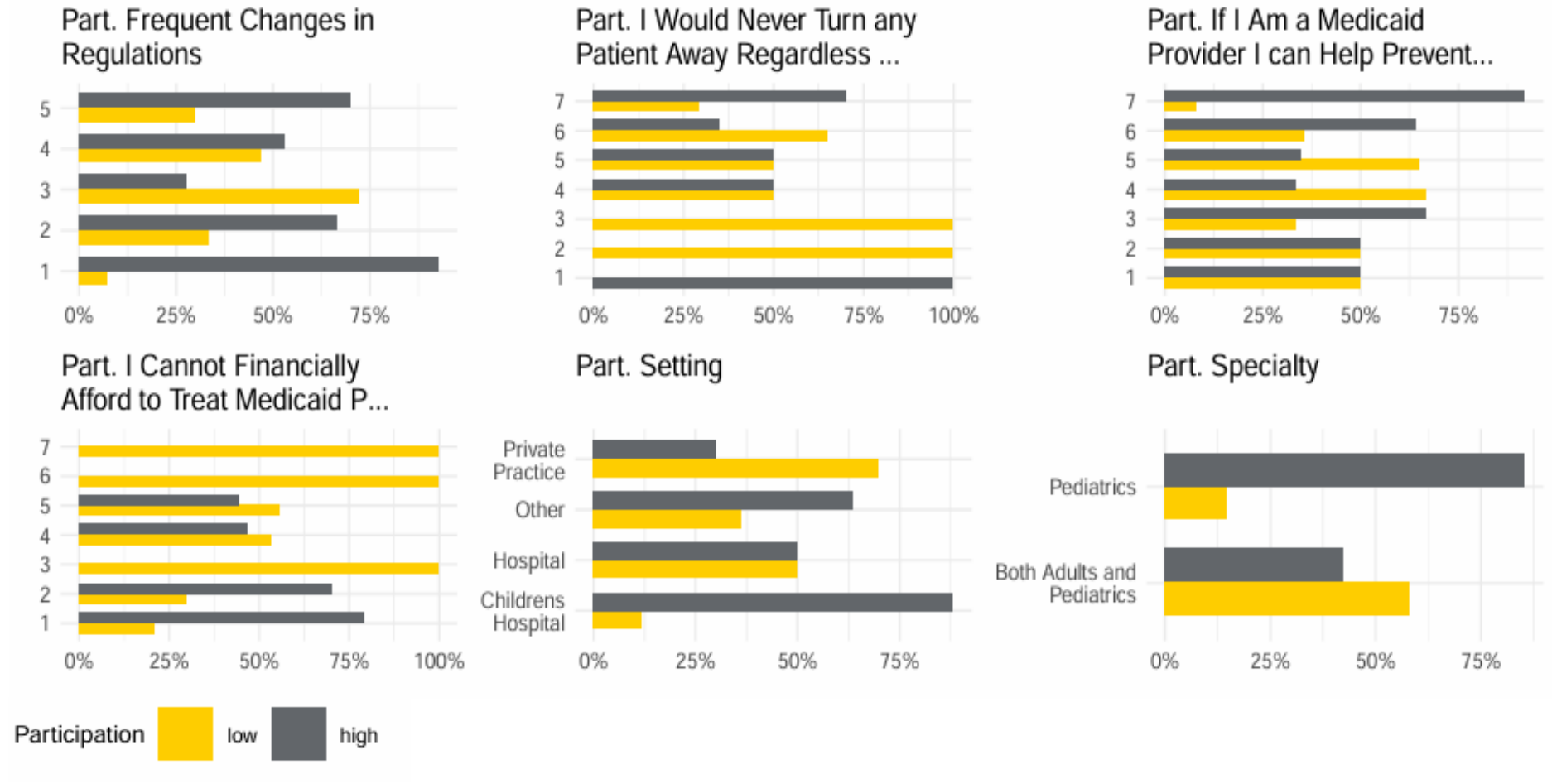
Acceptance Contingency Plots







Participation Contingency Plots



Acceptance Regression Results

Characteristic	OR	95% CI	p-value
I Would Never Turn Any Patient Away...	1.58	1.12, 2.34	0.012
Setting			
Childrens Hospital	—	—	
Hospital	0.17	0.01, 3.31	0.2
Other	0.33	0.01, 7.34	0.5
Private Practice	0.12	0.00, 2.63	0.2
Specialty			
Both Adults and Pediatrics	—	—	
Pediatrics	2.03	0.29, 29.2	0.5

Abbreviations: CI = Confidence Interval, OR = Odds Ratio

Participation Regression Results

Characteristic	OR	95% CI	p-value
Frequent Changes in Regulations	1.15	0.71, 1.92	0.6
I Would Never Turn any Patient Away...	1.05	0.65, 1.73	0.9
If I Am a Medicaid Provider I can Help...	1.45	0.99, 2.21	0.064
I Cannot Financially Afford...	0.64	0.41, 0.95	0.036
Setting			
Childrens Hospital	—	—	
Hospital	3.31	0.20, 114	0.4
Other	2.33	0.19, 69.5	0.5
Private Practice	1.81	0.11, 54.0	0.7
Specialty			
Both Adults and Pediatrics	—	—	
Pediatrics	27.6	2.99, 723	0.012

Abbreviations: CI = Confidence Interval, OR = Odds Ratio

Takeaways

- **Acceptance:** The decision to accept Medicaid seems to be driven by an audiologist's ethical code. The only significant predictor (at α= 0.05) was:
  - "I would never turn any patient away regardless of their background of socioeconomic status," with an odds ratio of 1.58.
- **Participation:** The decision of how much to participate is also driven by practical and professional factors. The significant predictors were
  - "I cannot financially afford to treat Medicaid patients," with an odds ratio of 0.64
  - Pediatric Specialty with an odds ratio of 27.6!
- **The Bottom Line:** Personal ethics may get an audiologist to accept Medicaid, but the financial and professional realities of their practice determine their actual level of engagement.

Limitations of the Study

- In the logistic regression, any question that has a partial no can't be used for either question.
- Some areas of the country are not well represented.
- Non-response bias.

Importance of the Study

- With recent Medicaid legislation passed, the importance of Medicaid advocacy is more apparent than ever.
- These studies show that there are many barriers that audiologists view for Medicaid, particularly adult audiologists.
- **Next Steps:**
  - Many steps can be taken to address these barriers to Medicaid access.
  - Guaranteed to be covered for children but may affect adults.

College of Public Health

Acknowledgements

Thank you to Dr. Jake Oleson, Ms. Eva Rasche, Dr. Caitlin Sapp, and Dr. Beth Walker for all of the help and guidance on this project.

This project is sponsored by the National Heart Lung and Blood Institute (NHLBI), grant #HL161716-01.

Citations

- Logan, Henrietta L., et al. "Barriers to Medicaid Participation among Florida Dentists." *Journal of Health Care for the Poor and Underserved*, vol. 26, no. 1, Feb. 2015, pp. 154–167. https://doi.org/10.1353/hpu.2015.0000
- Wickham H, François R, Henry L, Müller K, Vaughan D (2023). _dplyr: A Grammar of Data Manipulation_. doi:10.32614/CRAN.package.dplyr <https://doi.org/10.32614/CRAN.package.dplyr>, R package version 1.1.4, <https://CRAN.R-project.org/package=dplyr>.
- Xie Y (2025). _knitr: A General-Purpose Package for Dynamic Report Generation in R_. R package version 1.50, <https://yihui.org/knitr/>.
- Zhu H (2024). _kableExtra: Construct Complex Table with 'kable' and Pipe Syntax_. doi:10.32614/CRAN.package.kableExtra <https://doi.org/10.32614/CRAN.package.kableExtra>, R package version 1.4.0, <https://CRAN.R-project.org/package=kableExtra>.
- Wickham H (2023). _stringr: Simple, Consistent Wrappers for Common String Operations_. doi:10.32614/CRAN.package.stringr <https://doi.org/10.32614/CRAN.package.stringr>, R package version 1.5.1, <https://CRAN.R-project.org/package=stringr>.
- Sjoberg DD, Whiting K, Curry M, Lavery JA, Larmarange J. Reproducible summary tables with the gtsummary package. The R Journal 2021;13:570–80. https://doi.org/10.32614/RJ-2021-053.
- H. Wickham. ggplot2: Elegant Graphics for Data Analysis. Springer-Verlag New York, 2016.
- Becker RA, Wilks AR, Brownrigg R, Minka TP, Deckmyn A (2025). _maps: Draw Geographical Maps_. doi:10.32614/CRAN.package.maps <https://doi.org/10.32614/CRAN.package.maps>, R package version 3.4.3, <https://CRAN.R-project.org/package=maps>.
- Arnold J (2024). _ggthemes: Extra Themes, Scales and Geoms for 'ggplot2'_. doi:10.32614/CRAN.package.ggthemes <https://doi.org/10.32614/CRAN.package.ggthemes>, R package version 5.1.0, <https://CRAN.R-project.org/package=ggthemes>.
- Pebesma, E., & Bivand, R. (2023). Spatial Data Science: With Applications in R. Chapman and Hall/CRC. https://doi.org/10.1201/9780429459016 Pebesma, E., 2018. Simple Features for R: Standardized Support for Spatial Vector Data. The R Journal 10 (1), 439-446, https://doi.org/10.32614/RJ-2018-009
- Wickham H, Vaughan D, Girlich M (2024). _tidyr: Tidy Messy Data_. doi:10.32614/CRAN.package.tidyr <https://doi.org/10.32614/CRAN.package.tidyr>, R package version 1.3.1, <https://CRAN.R-project.org/package=tidyr>.

College of Public Health

Thank you!

Questions?