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An Overview of Hearing Healthcare Disparities

Matthew L. Bush, M.D., Ph.D., MBA, FACS

UK College of Medicine Endowed Chair in Rural Health Policy
Professor and Vice Chair for Research

Disclosures

- Research supported by NIH/NIDCD (R01DC017770, R01DC016957, R21DC019602, U01OD033247)

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Learner Outcomes

- After this course, participants will be able to define inequities in hearing health/healthcare.
- After this course, participants will be able to explain how to conduct equitable research.
- After this course, participants will be able to list 5 social determinants of health

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Bridging “New” Gaps (New River)

https://www.reddit.com/r/WestVirginia/comments/6jyhh7/new_river_gorge_bridge/

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Q – What are Disparities Relevant to Hearing Healthcare?

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Q – How do we define Health and Healthcare Disparities?

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A - Health and health care disparities refer to differences in health and health care between population groups. Disparities occur across many dimensions, including race/ethnicity, socioeconomic status, age, location, gender, disability status, and sexual orientation.

Henry J Kaiser Family Foundation
https://www.kff.org/disparities-policy/issue-brief/disparities-in-health-and-health-care-five-key-questions-and-answers/

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Healthy People 2020

<u>Disparity:</u> Health difference that is closely linked with *social or economic disadvantage*

May occur across many dimensions (race/ethnicity, socioeconomic status, age, location, gender, disability status, and sexual orientation).

Henry J Kaiser Family Foundation
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The Tale of Two 4 Year Olds

- 4-year-old female presents for a yearly follow-up visit.
- Family live in a suburban area (<30 minute drive to their PCP, ENT, audiologist, and SLP)
- Born full term. No complications. Failed NBHS AU
- 3 weeks of age: Sleep deprived ABR at academic center – Dx with bilat. profound SNHL. Confirmatory ABR 2 weeks later.
- 1 month of age: HA fitting and establishes with SLP
- 6 months of age: sedated ABR (profound SNHL) & MRI
- 12 months of age: Bilateral cochlear implants
- Weekly SLP (with telehealth through COVID)
- Enrolling in K-5 small private school next year

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The Tale of Two 4 Year Olds

- 4-year-old male from a very rural community: referred for "hearing evaluation" (No providers in their county)
- Born full term. No complications. Failed NBHS AU
- 3 months of age: Sleep deprived ABR (2-hour drive). Did not sleep and test was rescheduled.
- 3 months – 4 years: Did not return for scheduled follow-ups
- 4 years: Sedated ABR revealed bilateral severe SNHL

HOW AND WHY DOES THIS HAPPEN?

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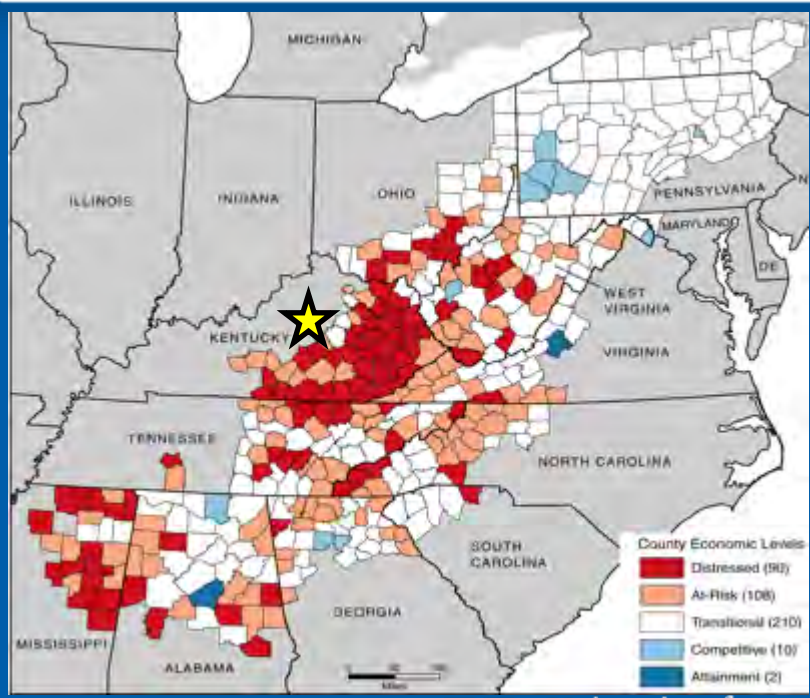
Rural Populations & Poor Health

- Ground zero of the Opioid Epidemic (1380 deaths 2019)
- Persistent Poverty: 40% below the poverty Line for 40 consecutive years
    - High poverty rate
    - Low education
    - Low life expectancy:
- Pervasive high burden of chronic diseases (Heart disease, DM, Cancer)



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Q - What causes Health/Healthcare Disparities?

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A - Complex and interrelated set of individual, provider, health system, societal, and environmental factors contribute to disparities in health and health care…AKA Social Determinants of Health

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Causes of Inequity: Social Determinants of Health

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Torain 2016, *J Am Coll Surg*

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Q – Why do Health/Healthcare Disparities Matter?

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A -

1. Affect the groups facing disparities
2. Limit overall improvements in quality of care and health for the broader population
3. Result in unnecessary costs

$93 billion in excess medical care costs per year

$42 billion in lost productivity per year

Economic losses due to premature deaths

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https://www.kff.org/disparities-policy/issue-brief/disparities-in-health-and-health-care-five-key-questions-and-answers/

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What are some representative hearing healthcare disparities?

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Incidence of Pediatric Hearing Loss

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Infant Hearing Loss: Race and SES (Lantos 2018)

- **Non-white race**: 2.45 higher odds of hearing loss
- **Urban low-income neighborhoods:** Higher prevalence of hearing loss

Original Research—Pediatric Otolaryngology

AMERICAN ACADEMY OF OTOLARYNGOLOGY-HEAD AND NECK SURGERY FOUNDATION

Otolaryngology–Head and Neck Surgery 2018, Vol. 159(6) 1051–1057
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DOI: 10.1177/0194599818803305
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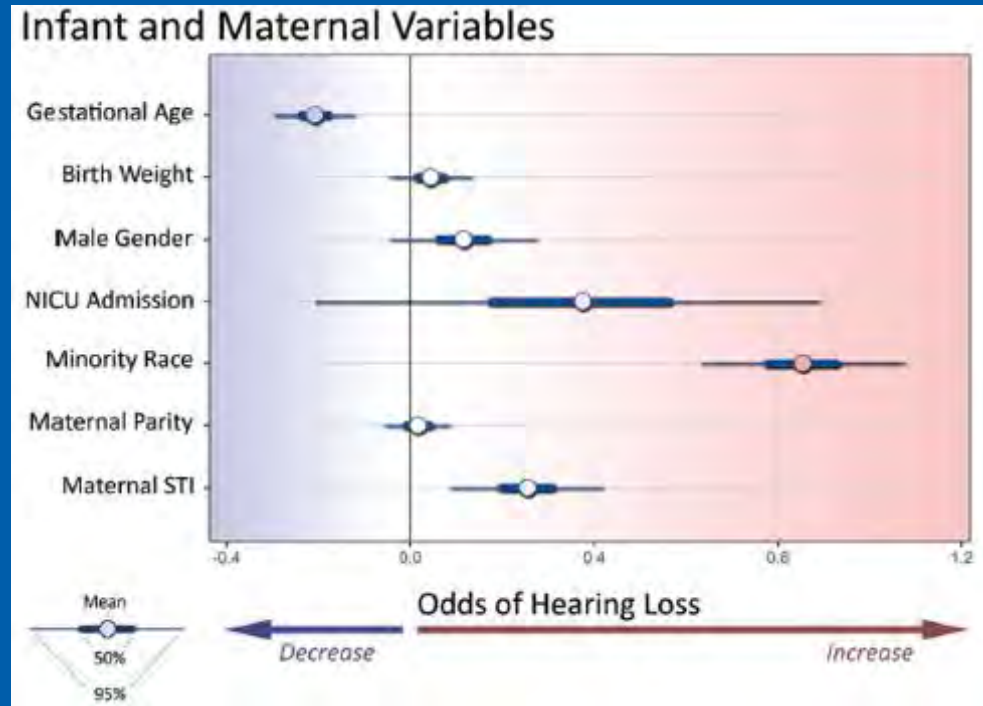
Geographic and Racial Disparities in Infant Hearing Loss

Paul M. Lantos, MD, MSGIS[1,2,3], Gabriela Maradiaga-Panayotti, MD[1], Xavier Barber, PhD[4], Eileen Raynor, MD[5], Debara Tucci, MD, MBA[5], Kate Hoffman, PhD[6], Sallie R. Permar, MD, PhD[1,7], Pearce Jackson[6], Brenna L. Hughes, MD[8], Amy Kind, MD, PhD[9,10], and Geeta K. Swamy, MD[8]



Infant Hearing Loss: Vulnerable populations (Creel 2020)

- **Black children** more likely to fail screen (OR 1.48)
- **Native American** children more likely to fail screen (OR 1.83)
- **Medicaid Insurance** and HL (OR 1.45)
- **Neonatal abstinence Syndrome Children**:
  - Lower likelihood of documented screening
  - Higher likelihood of hearing loss (OR 2.17)

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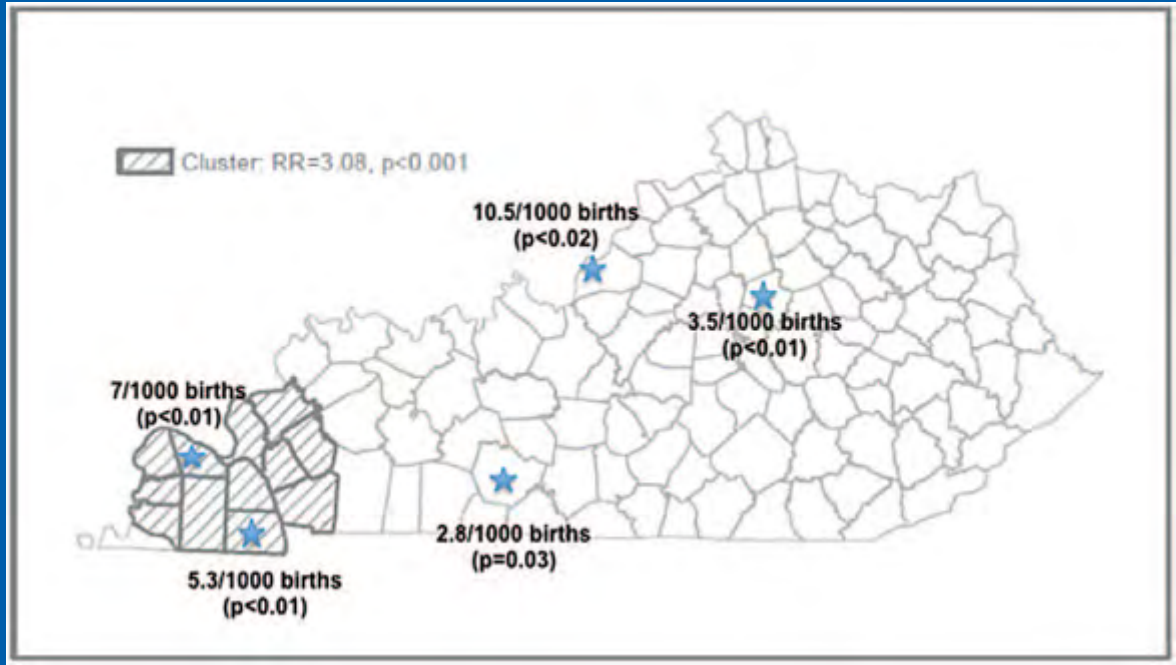
Infant Hearing Loss: Rural Regions (Bush 2015)

- **Rural Regions**: 3.08 times the risk of hearing loss (7/1000 live births)

Targeting Regional Pediatric Congenital Hearing Loss Using a Spatial Scan Statistic

Matthew L. Bush,[1] Warren Jay Christian,[2] Kristin Bianchi,[3] Cathy Lester,[4] and Nancy Schoenberg[5]



Pediatric Hearing Healthcare Utilization/Timing

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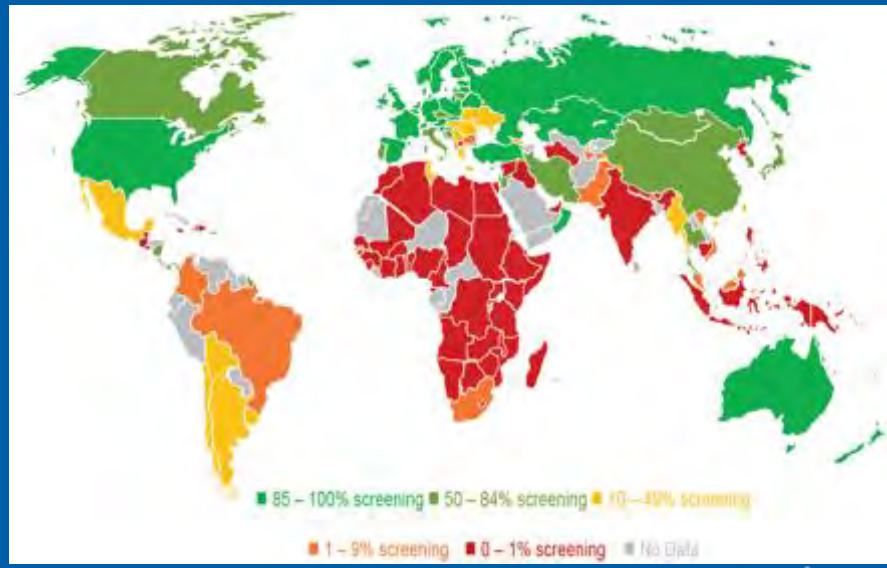
EHDI Programs Promote Efficient Diagnosis
(*Neumann et al, JEHDI, 2017*)

- 38% of the world's population have no EHDI services
- Screening country:
  - Dx at 4.6 months
- Non-screening country:
  - Dx at 34.9 months



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Failure to Receive Hearing Healthcare (Su-Velez 2022)

- Non-white race
- No Insurance

Original Research—Access

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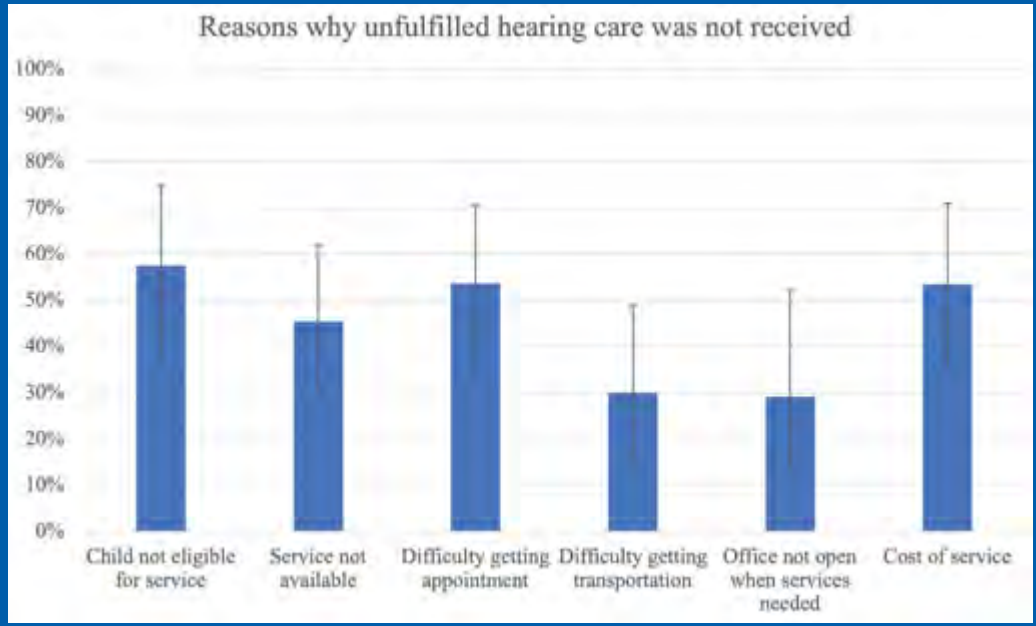
Barriers to Receiving Necessary Hearing Care Among US Children

Brooke M. Su-Velez, MD, MPH[1], Habib Khoury, MD[2], Shaghauyegh S. Azar[2], Nina L. Shapiro, MD[1], and Neil Bhattacharyya, MD[3]



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Rural Inequities in EHDI Utilization

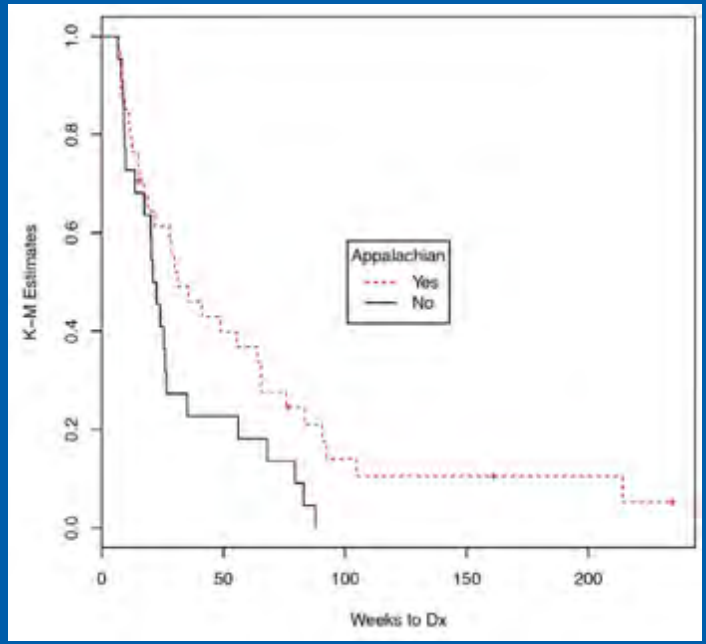
(Bush et al, Journal of Pediatrics, 2014)

THE JOURNAL OF PEDIATRICS • www.jpeds.com ORIGINAL ARTICLES

Delays in Diagnosis of Congenital Hearing Loss in Rural Children

Matthew L. Bush, MD[1], Kristin Bianchi, BA[2], Cathy Lester, MSSW[3], Jennifer B. Shinn, PhD[1], Thomas J. Gal, MD, MPH[1], David W. Fardo, PhD[4], and Nancy Schoenberg, PhD[5]

- **Poor Follow-up After Screening:**
  - **Rural Infants: 27% no-show after screen**
  - Urban Infants: 15% no-show after screen
- **Delayed Diagnosis:**
  - **Rural infants : 7 months**
  - Urban infants: 5 months



Rural EHDI Services (Bush 2014, Elpers 2015)

Otology & Neurotology
36:93–98 © 2014, Otology & Neurotology, Inc.

Rural Barriers to Early Diagnosis and Treatment of Infant Hearing Loss in Appalachia

*Matthew L. Bush, †Bryan Hardin, *Christopher Rayle, ‡Cathy Lester, §Christina R. Studts, and *Jennifer B. Shinn

J Community Health
DOI 10.1007/s10900-015-0086-1

CrossMark

ORIGINAL PAPER

Rural Family Perspectives and Experiences with Early Infant Hearing Detection and Intervention: A Qualitative Study

Julia Elpers[1] · Cathy Lester[2] · Jennifer B. Shinn[3] · Matthew L. Bush[3]

- Quantitative/Qualitative
- Barriers:
  - Parental Education
  - Insurance Coverage/SES
  - Distance
- Poor Communication
  - 14% of rural parents never told screening results

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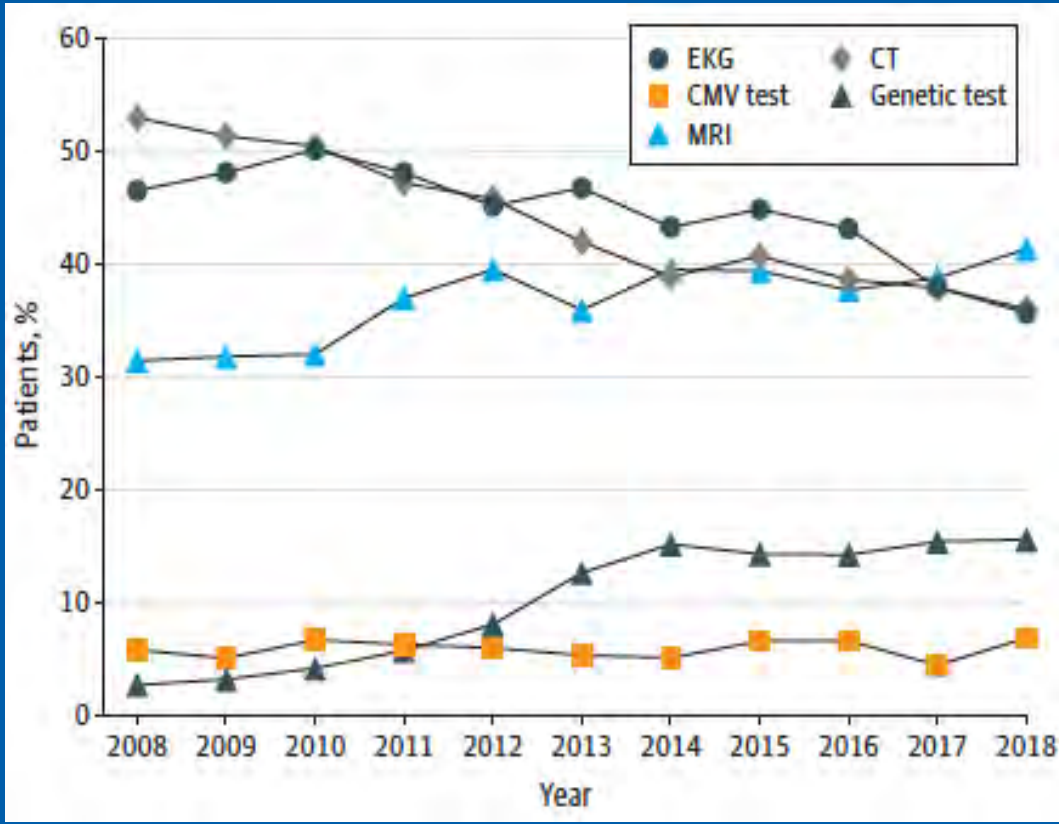
Dx/Tx Services (Qian 2020)

JAMA Otolaryngology-Head & Neck Surgery | Original Investigation

Use of Diagnostic Testing and Intervention for Sensorineural Hearing Loss in US Children From 2008 to 2018

Z. Jason Qian, MD; Kay W. Chang, MD; Iram N. Ahmad, MD; Melissa S. Tribble, AuD; Alan G. Cheng, MD

- Genetic Testing:
  - Black Race (OR 0.5)
  - Higher SES (OR 1.31)
- EKG: Asian (OR 0.76)
- SLP: Asian (OR 0.84), Hispanic (OR 0.76)
- Hearing Aid: Black (OR 0.72, Hispanic (OR 0.80)



Cochlear Implantation: Race and Ethnicity (Liu 2020)


Original Research—Pediatric Otolaryngology

Racial and Insurance Inequalities in Access to Early Pediatric Cochlear Implantation

Xinliang Liu, MBBS, PhD, MS[1], Linda I. Rosa-Lugo, EdD, CCC-SLP[2], Janel L. Cosby, AuD, PhD, CCC-A[2], and Cedric V. Pritchett, MD, MPH[3,4]

- 12-year Review of Pediatric CI in Florida (N=1511)
  - **NO BLACK CHILD IMPLANTED < 12 MONTHS**
- CI under age 2 (Compared to white children):
  - **Black children were 56% less likely**
  - **Hispanic children were 30% less likely**
  - **Medicaid children 36% less likely**
  - **White Medicaid/Self-pay more likely than black children**

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Rural Inequities in Hearing Loss Treatment

(Bush et al, Laryngoscope, 2014)

The Laryngoscope

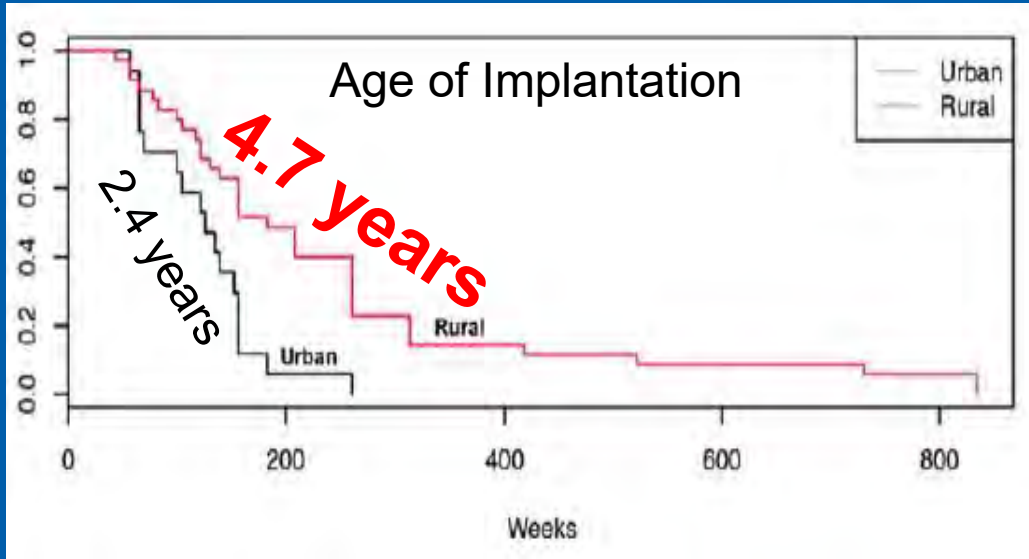
Assessment of Appalachian Region Pediatric Hearing Healthcare Disparities and Delays

Matthew L. Bush, MD; Mariel Osetinsky, BA; Jennifer B. Shinn, PhD; Thomas J. Gal, MD, MPH; Xiuhua Ding, MS; David W. Fardo, PhD; Nancy Schoenberg, PhD

Rural children with hearing loss take:

- 2x longer obtain HA's

- 2x longer obtain a CI



(Re)Hab Care and Access (Noblitt 2018)


Otology & Neurotology
39:e307–e313 © 2018, Otology & Neurotology, Inc.

Barriers to Rehabilitation Care in Pediatric Cochlear Implant Recipients

Bryce Noblitt, Kristan P. Alfonso, Margaret Adkins, and Matthew L. Bush

Department of Otolaryngology–Head and Neck Surgery, University of Kentucky, Lexington, Kentucky

- **Rural Residence**
  - Longer distance to to AuD or SLP
  - Lower likelihood of early access to Speech Therapy
  - Higher likelihood of Device Problems
- **Parental Education**: Lower education linked to poor speech outcomes

Adult Hearing Healthcare Utilization/Timing

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HA Access: Geography (KY)(Chan 2017)

The Laryngoscope
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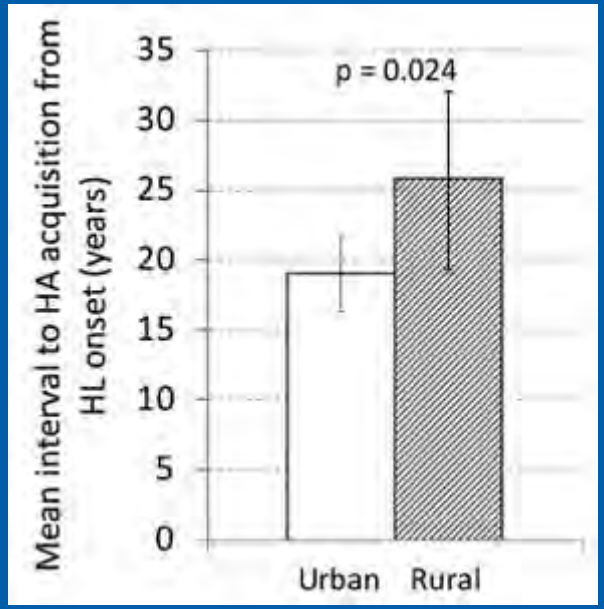
Rurality and Determinants of Hearing Healthcare in Adult Hearing Aid Recipients

Stephen Chan, BS; Brian Hixon, MD; Margaret Adkins, AuD; Jennifer B. Shinn, PhD; Matthew L. Bush, MD

- **26 Year Journey** to HA for Rural adults
- Audiology shortage in rural area (Jung 2012, Winmill 2013)



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The Big Wait…

Barriers to Adult Cochlear Implant Care in the United States: An Analysis of Health Care Delivery

Ashley M. Nassiri, M.D., M.B.A.,[1] John P. Marinelli, M.D.,[2] Donna L. Sorkin, M.A.,[3] and Matthew L. Carlson, M.D.[1,4]

- Adults face on average 10 years of severe-profound SNHL before cochlear implantation (Balkany 2007)
- Most CI candidates have sentence testing scores of 10-15% and PTA of 90 dB on initial CI evaluation (Barnes 2021)
- **LACK OF STANDARD HEARING TESTING IN PRIMARY CARE** (Krist 2021)

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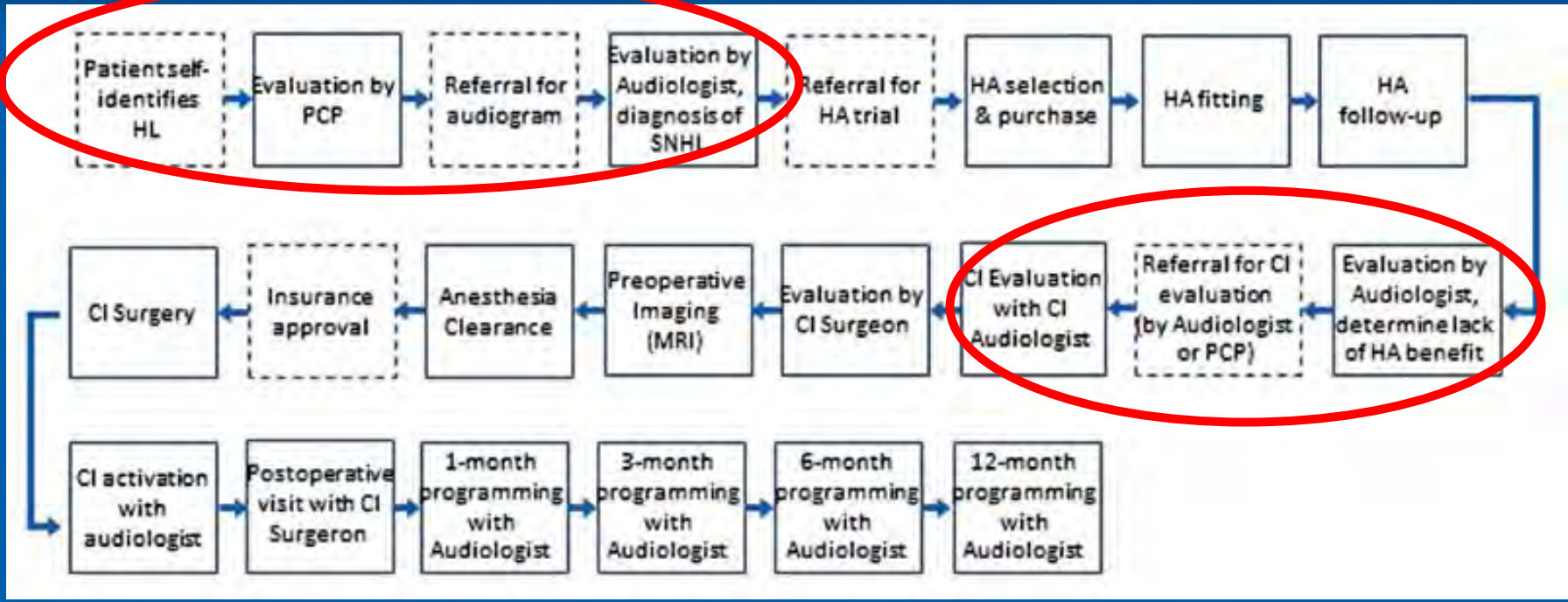
The Long and Winding Road



Would you get seek hearing healthcare?

Nassiri AM, Marinelli JP, Sorkin DL, Carlson ML. Barriers to Adult Cochlear Implant Care in the United States: An Analysis of Health Care Delivery. Semin Hear. 2021 Dec 9;42(4):311-320.

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Access: Sociodemographics (TX, GA, SC) (Tolisano 2020, Mehendran 2021, Dornhoffer 2019)

- **Lower Likelihood of Pursing a CI**
  - **Non-white** → 52% lower odds
  - **Older Age**
  - **Single/Widowed**
- Delayed Implantation: **Non-white race**
- **Medicaid** is a barrier to Adult CI (Sorkin 2019)


Identifying Disadvantaged Groups for Cochlear Implantation: Demographics from a Large Cochlear Implant Program

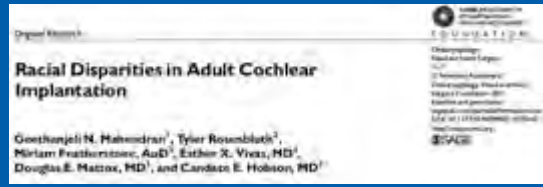
SAGE

Anthony M. Tolisano, MD, Natalie Schauwecker, BBA, BS, Bethany Baumgart, AuD, Johanna Whitson, AuD, Joe Walter Kutz Jr, MD, FACS, Brandon Isaacson, MD, FACS, and Jacob B. Hunter, MD


Factors Influencing Time to Cochlear Implantation

James R. Dornhoffer, Meredith A. Holcomb, Ted A. Meyer, Judy R. Dubno, and Theodore R. McRackan

Department of Otolaryngology—Head and Neck Surgery, Medical University of South Carolina, Charleston, South Carolina


Racial Disparities in Adult Cochlear Implantation

SAGE

Geethanjali N. Mahendran, Tyler Rosenblatt, Miriam Featherstone, AuD, Esther X. Vivas, MD, Douglas E. Mattox, MD, and Candace E. Hobson, MD

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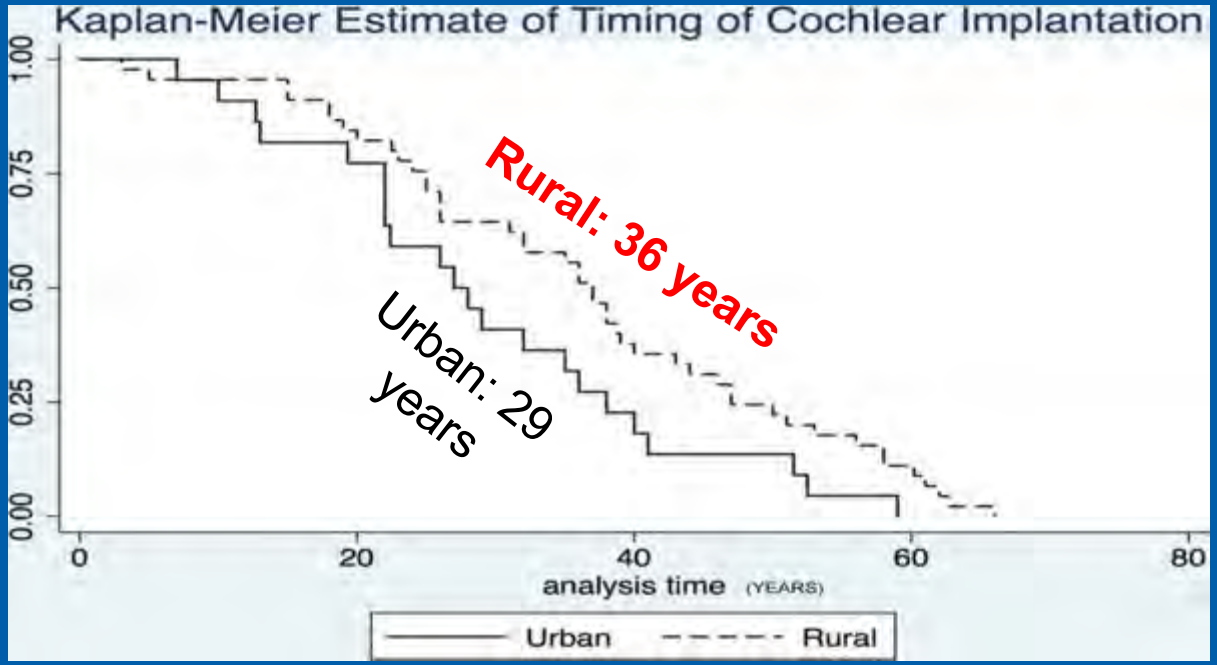
CI Access: Geography (KY)(Hixon 2016)

Timing and Impact of Hearing Healthcare in Adult Cochlear Implant Recipients: A Rural–Urban Comparison

*Brian Hixon, †Stephen Chan, *Margaret Adkins, *Jennifer B. Shinn, and *Matthew L. Bush

*Department of Otolaryngology—Head and Neck Surgery; and †College of Medicine, University of Kentucky, Lexington, Kentucky

- **+36 Year Journey** to CI for Rural adults



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Consider the Complexities that Create Hearing Health/Healthcare Disparities

Defining Disparities in Cochlear Implantation through the Social Determinants of Health

Marissa Schuh, M.P.H.[1] and Matthew L. Bush, M.D., Ph.D., M.B.A.[1]

ABSTRACT

Hearing loss is a global public health problem with high prevalence and profound impacts on health. Cochlear implantation (CI) is a well-established evidence-based treatment for hearing loss; however, there are significant disparities in utilization, access, and clinical outcomes among different populations. While variations in CI outcomes are influenced by innate biological differences, a wide array of social, environmental, and economic factors significantly impact optimal outcomes. These differences in hearing health are rooted in inequities of health-related socioeconomic resources. To define disparities and advance equity in CI, there is a pressing need to understand and target these social factors that influence equitable outcomes, access, and utilization. These factors can be categorized according to the widely accepted framework of social determinants of health, which include the following domains: healthcare access/quality, education access/quality, social and community context, economic stability, and neighborhood and physical environment. This article defines these domains in the context of CI and examines the published research and the gaps in research of each of these domains. Further consideration is given to how these factors can influence equity in CI and how to incorporate this information in the evaluation and management of patients receiving cochlear implants.

(Schuh, *Seminars in Hearing*, 2022)

Evaluating Equity Through the Social Determinants of Hearing Health

Marissa R. Schuh and Matthew L. Bush

(Schuh, *Ear & Hearing*, 2022)

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So how do we address these disparities?

Set An Agenda to Address Disparities

Clinical Review & Education

Special Communication

Setting a National Agenda for Surgical Disparities Research
Recommendations From the National Institutes
of Health and American College of Surgeons Summit

Adil H. Haider, MD, MPH; Irene Dankwa-Mullan, MD, MPH; Allysha C. Maragh-Bass, PhD, MPH; Maya Torain, BS; Cheryl K. Zogg, MSPH, MHS; Elizabeth J. Lilley, MD, MPH; Lisa M. Kodadek, MD; Navin R. Changoor, MD; Peter Najjar, MD, MBA; John A. Rose Jr, MD, MPH; Henri R. Ford, MD, MHA; Ali Salim, MD; Steven C. Stain, MD; Shahid Shafi, MD, MPH; Beth Sutton, MD; David Hoyt, MD; Yvonne T. Maddox, PhD; L. D. Britt, MD, MPH

1. Improve patient-clinician **communication** ("culturally dextrous")
2. Community **Engagement/Outreach** through technology (education, literacy, shared decision making)

Haider 2016, JAMA Surgery

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Clinical Review & Education

Special Communication

Setting a National Agenda for Surgical Disparities Research
Recommendations From the National Institutes
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Adil H. Haider, MD, MPH; Irene Dankwa-Mullan, MD, MPH; Allysha C. Maragh-Bass, PhD, MPH; Maya Torain, BS; Cheryl K. Zogg, MSPH, MHS; Elizabeth J. Lilley, MD, MPH; Lisa M. Kodadek, MD; Navin R. Changoor, MD; Peter Najjar, MD, MBA; John A. Rose Jr, MD, MPH; Henri R. Ford, MD, MHA; Ali Salim, MD; Steven C. Stain, MD; Shahid Shafi, MD, MPH; Beth Sutton, MD; David Hoyt, MD; Yvonne T. Maddox, PhD; L. D. Britt, MD, MPH

3. **Improve care** at centers with higher % of minority patients
4. Evaluate long-term effect of **interventions** on functional outcomes and patient-defined QOL
5. Improve **patient centeredness** by evaluating patient expectations

Haider 2016, JAMA Surgery

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Improve Recruitment and Reporting
(Pittman 2021, Meinhardt 2023)

JAMA Otolaryngology-Head & Neck Surgery | Review

Racial/Ethnic and Sex Representation in US-Based Clinical Trials of Hearing Loss Management in Adults
A Systematic Review

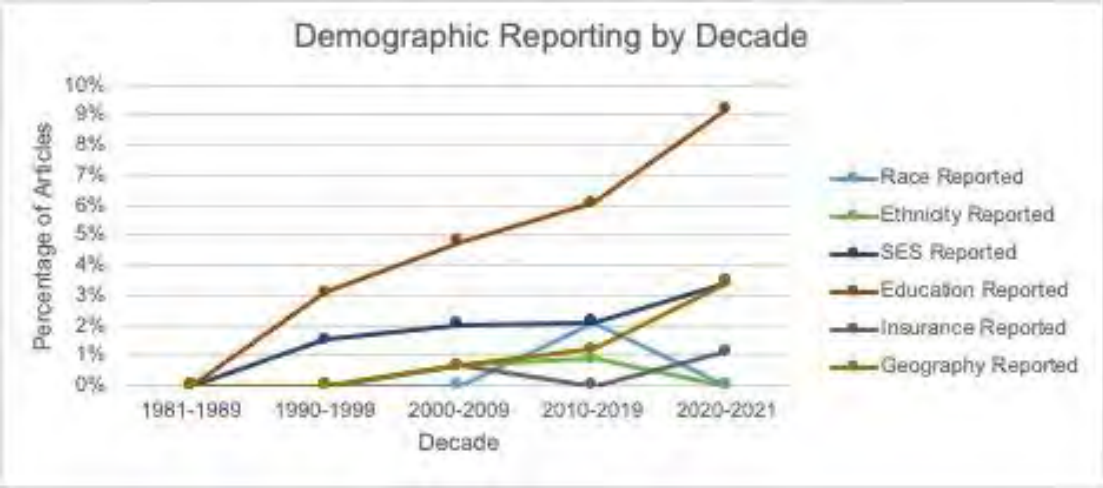
Corinne A. Pittman, BA; Raúl Roura, BS; Carrie Price, MLS; Frank R. Lin, MD, PhD; Nicole Marrone, PhD; Carrie L. Nieman, MD, MPH

Systematic Review and Meta-Analysis

Reporting of Sociodemographic Data in Cochlear Implant Clinical Trials: A Systematic Review

*Gerek Meinhardt, *Christine Sharrer, *Nicole Perez, †Alexandra Downes, †Tess Davidowitz, ‡Marissa Schuh, *Lauren Robinson, †Lawrence R. Lustig, and ‡Matthew Bush

- **Recruitment is inequitable**
  - Inequity in gender recruitment
  - Racial/ethnic group recruitment does not reflect the population
- **<10% of CI trials report key sociodemographic factors**



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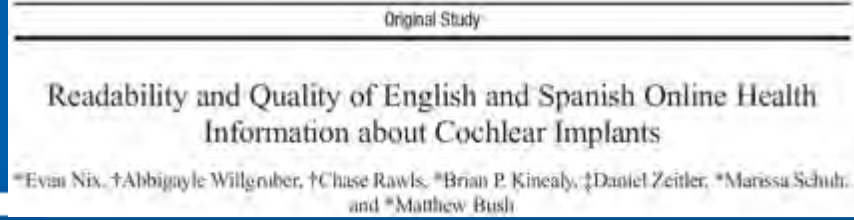
Improve Health Information

- (Nix 2022 – O&N)



Original Study

Readability and Quality of English and Spanish Online Health Information about Cochlear Implants

*Evan Nix, †Abbigayle Willgruber, †Chase Rawls, *Brian P. Kinealy, ‡Daniel Zeitler, *Marissa Schuh, and *Matthew Bush

- CI website <u>readability</u> is poor
  - Independent websites: average reading level of 10th-12th grade (n=80)
  - Industry websites: average reading level of 10th-12th grade (n=11)
- CI website information <u>quality</u> is poor (DISCERN criteria)

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Improve Existing Systems: *EHDI*

CHHIRP: *Communities Helping the Hearing of Infants by Reaching Parents* (R01DC017770)

1. KY EHDI **Effectiveness Trial of a Patient Navigation Program** to improve follow-up after failed newborn hearing screen
2. Evaluation of **Implementation Factors**
3. Assessement of **Cost-Effectiveness**


Open access Protocol

BMJ Open

Communities Helping the Hearing of Infants by Reaching Parents (CHHIRP) through patient navigation: a hybrid implementation effectiveness stepped wedge trial protocol

Matthew Bush, Miranda Hatfield, Marissa Schuh, Beverly Balasuriya, Anthony Mahairas, Julie Jacobs, Christina Studts, Philip Westgate, Nancy Schoenberg, Jennifer Shinn, Liza Creel

(Bush, 2022)

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Incorporate Hearing Health in Primary Care: *Rural Health Clinics*

Hearing Healthcare Assessment in Rural Communities (HHARC)
(R21 DC019602)

R21 (Exploratory Phase)

- Assess experiences, access, and options for adult hearing healthcare in Rural Health Clinics (Mixed methods approach)
  - Evaluate utilization/resources/priorities
  - Provide a hearing screen

R33 (Intervention Phase)

- Develop and test a Patient Navigator program to promote hearing healthcare access in Rural Health Clinic

mimi health

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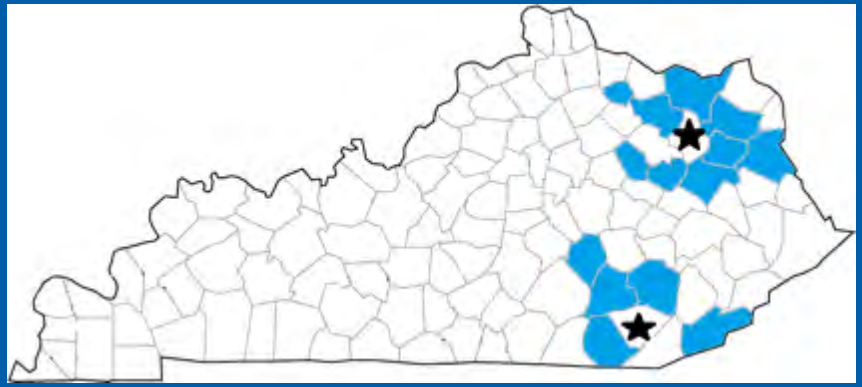
Incorporate Hearing Healthcare into Schools

____alachian Specialty Telemedicine Access for Referrals Trial (AppSTAR)
(NIH (OD) 1U01OD033247 – Bush, Emmett MPI)

1. Adapt school-based telemedicine hearing screening and referral to the rural
2. Evaluate the effectiveness of model to promote hearing health
3. Assess multi-level implementation factors and outcomes



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Practical Methods to Equity-driven Research

1. Mixed Methodology is Critical
2. Collect social determinants of health data
3. Consider different populations and health systems – **where are the marginalized patients?**
4. Community Engagement is a Priority (Patients, Providers, Educators, Stakeholders, Policy Makers) - CAB
5. Clinical Trials! (Medical and Behavioral Interventions)

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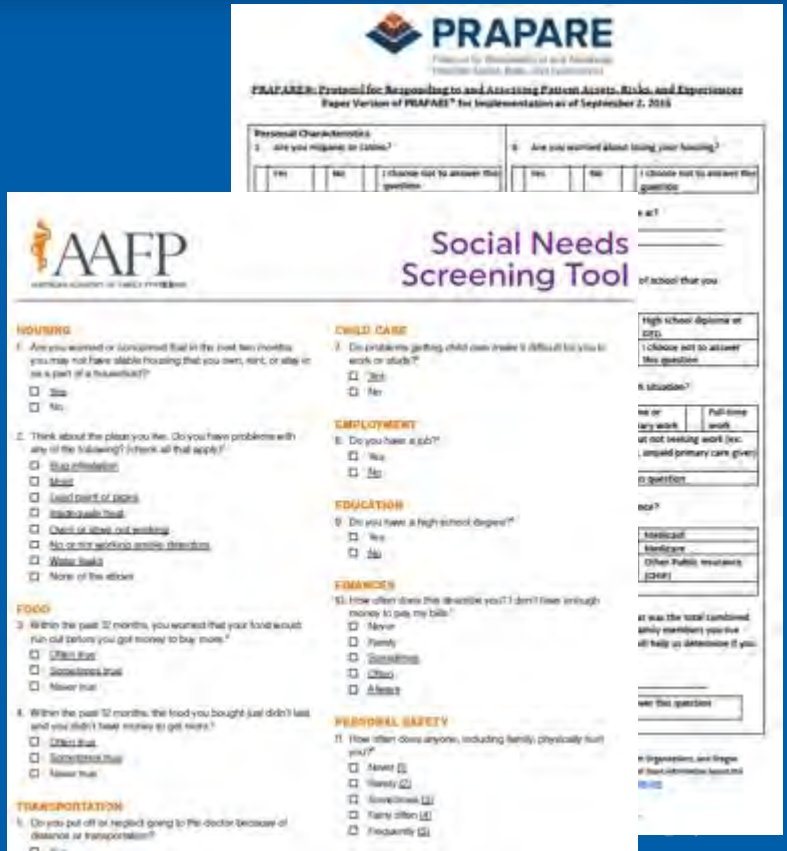
Collect Social Determinants of Health (EVERYTIME)!

1. National Association of Community Health Centers. (2016) Protocol for Responding to and Assessing Patients' Assets, Risks, and Experiences **(PRAPARE)** https://www.nachc.org/research-and-data/prapare/
2. American Academy of Family Physicians. (2017). **The EveryONE Project Toolkit.** https://www.aafp.org/family-physician/patient-care/the-everyone-project/toolkit.html.



Bridging "New" Gaps (New River)

https://www.reddit.com/r/WestVirginia/comments/6jyhh7/new_river_gorge_bridge/

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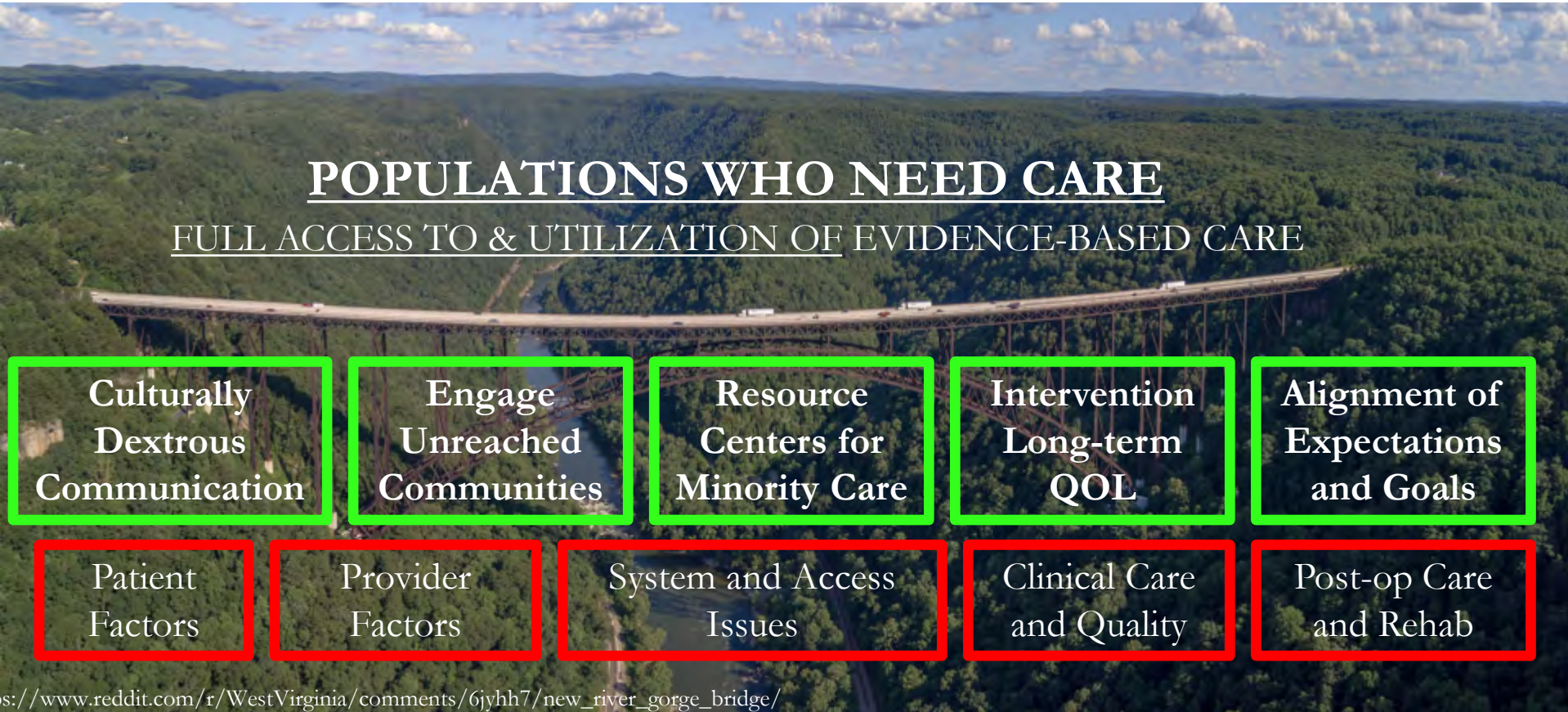
Bridging "New" Gaps (New River)



Summary – A Call to Action for Equity

1. **Define the inequities** – evidenced across sociodemographics and influenced by SDH
2. **Conduct equitable research** - different data/designs
3. **Incorporate novel models/methods** to promote equitable & efficient translation of research to broader practice and populations

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Thank You!