HHS Public Access

Author manuscript

Obstet Gynecol. Author manuscript; available in PMC 2022 September 01.

Published in final edited form as:

Obstet Gynecol. 2021 September 01; 138(3): 398–408. doi:10.1097/AOG.0000000000004505.

Contraceptive Provision and Quality Care Measures for Insured Individuals in Massachusetts Who Are Deaf or Hard of Hearing

Justine Wu, MD, MPH[1,2,3], **Jianying Zhang, MD, MPH**[4], **Michael McKee, MD, MPH**[1,2,3], **Ilhom Akobirshoev, PhD**[4], **Kimberly S. McKee, PhD, MPH**[1,3], **Monika Mitra, PhD**[4]

[1]Department of Family Medicine, University of Michigan, Ann Arbor, Michigan

[2]MDisability Program, University of Michigan, Ann Arbor, Michigan

[3]Institute for Health Policy and Innovation, University of Michigan, Ann Arbor, Michigan

[4]Lurie Institute for Disability Policy, Brandeis University, Waltham, Massachusetts

Abstract

Objective: To evaluate contraceptive provision and contraceptive care quality measures for individuals who are deaf or hard of hearing and compare these outcomes to those individuals who are not.

Methods: We conducted a claims analysis with data from the 2014 Massachusetts All-Payer Claims Database. Among premenopausal enrollees aged 15-44, we determined provision of any contraception (yes/no) and provision by contraception type: prescription contraception (pills, patch, ring, injectables, or diaphragm), long-acting reversible contraceptive (LARC) devices, and permanent contraception (tubal sterilization). We compared these outcomes by deaf or hard-of-hearing status (yes/no). The odds of contraceptive provision were calculated with regression models adjusted for age, Medicaid receipt, a preventive health visit, and deaf or hard-of-hearing status. We calculated contraceptive care quality measures, per the U.S. Office of Population Health, as the percentage of enrollees who used: 1) LARC methods; or 2) most effective or moderately effective methods (tubal sterilization, pills, patch, ring, injectables, or diaphragm).

Results: We identified 1,171,838 enrollees at risk for pregnancy; 13,400 (1.1%) were deaf and hard of hearing. Among individuals who were deaf or hard of hearing, 31.4% were provided contraception (23.5% prescription contraception, 5.4% LARC, 0.7% tubal sterilization). Individuals who were deaf or hard of hearing were less likely to receive prescription contraception (aOR 0.92, 95% CI 0.88-0.96) than individuals who were not. The percentage of individuals who were deaf or hard of hearing who received most effective or moderately effective methods was less than that for individuals who were not (24.2% vs. 26.3%, $p<0.001$). There were no differences in provision of LARC or permanent contraception by deaf and hard-of-hearing status.

Corresponding Author Justine Wu, MD, MPH, 1018 Fuller St, Ann Arbor, MI 48104, p. 734-998-7120, justinep@med.umich.edu.

Financial Disclosure

The authors did not report any potential conflicts of interest.

Each author has confirmed compliance with the journal's requirements for authorship.

Conclusion: Individuals who were deaf or hard of hearing were less likely to receive prescription contraception than individuals who were not; factors underlying this pattern need to be examined. Provision of LARC or permanent contraception did not differ by deaf or hard-of-hearing status. These findings should be monitored and compared with data from states with different requirements for contraceptive coverage.

Précis:

Individuals who are deaf or hard of hearing are less likely to be provided prescription contraceptives (pill, patch, ring, shot, diaphragm).

BACKGROUND

Nearly 5% of reproductive-aged females in the United States report being deaf or hard of hearing.[1] Individuals who are deaf or hard of hearing face barriers to equitable health care, including lack of universal access to inclusive health education, language and communication accommodations,[2] and health teams trained in culturally competent care.[3-6] These barriers contribute to health disparities for individuals who are deaf or hard of hearing, including greater rates of pregnancy-related complications, compared to individuals who are not.[7] Contraceptive provision is also critical to high-quality reproductive health care[8] and improved maternal and infant outcomes.[9] Population-based analyses have revealed lower rates of contraceptive provision and contraceptive use (with the exception of tubal sterilization) among women with physical, sensory, or intellectual–cognitive disabilities; however, few studies have examined individuals who are deaf or hard of hearing alone.[10-13]

Hearing loss alone is not a medical contraindication to using any specific contraceptive method.[14] Individuals who are deaf or hard of hearing who do not desire pregnancy should be able to access contraceptive services, prescriptions, and devices in a manner equitable to their non-DHH counterparts. One approach to monitoring the quality of contraceptive provision is to determine clinical performance measures for a population of interest. In 2014, the U.S. Department of Health and Human Services Office of Population Affairs (DHHS OPA) developed contraceptive care quality measures that were endorsed in 2016 by the National Quality Forum (NQF).[15] The NQF is a non-profit organization that evaluates and endorses gold standard health performance measures used by payers, government institutions, and private entities.[15] The purpose of the contraceptive care measures is to inform and monitor quality improvement efforts to ensure access to contraceptive methods approved by the U.S. Food and Drug Administration.[16] To date, there has been no formal evaluation of these measures for individuals who are deaf or hard of hearing based upon our literature search on Pubmed, Scopus, Cochrane Library, and Ovid Medline on June 4, 2021 (search terms (persons with hearing impairments OR deaf OR hearing loss OR hard of hearing) AND (contraception OR family planning OR family planning services OR contraceptive devices OR contraceptive OR contraceptive agents).

To address these gaps, the study objectives were to describe contraceptive provision and contraceptive care quality measures for individuals who are deaf or hard of hearing and compare these outcomes with those for individuals who are not. We refer to “women” or “female” when citing original text from prior publications. Otherwise, we use “person”,

"people", "individuals" or "enrollees" to include those who identify as transgender or non-binary. We refer to the lowercase "d" deaf to refer to the audiological condition of not hearing. We also acknowledge that some may identify as being part of the uppercase "D" Deaf community and culture.

MATERIALS AND METHODS

We conducted an analysis of individual-level medical and pharmacy claims data from the Massachusetts APCD. The APCD is the most comprehensive source of claims data from commercial insurers, self-insurance, and public payers for Massachusetts residents and employees.[17] The Center for Health Information and Analysis (CHIA) maintains the APCD and has broad authority to collect data from the vast majority of private and public payers under Massachusetts law.[17] CHIA performs continuous data validation to verify diagnosis, procedure, billing code, and demographics and meet national standards for reporting.[17] For this analysis, we used all claims available in the APCD dataset, including Medicaid claims. Because of the lack of common identifiers that link Medicare claims to APCD claims, Medicare data could not be included. However, all enrollees who had Medicare also had a commercial plan, and any contraceptive-related claims from these commercial plans were available for analysis.

Our analysis followed analytic procedures to assess contraceptive care quality measures as recommended by the U.S. DHHS OPA.[18] First, we isolated a cohort of individuals at risk for pregnancy by identifying enrollees aged 15-44 years who were continuously enrolled in an insurance plan for at least 320 days and had at least one insurance claim in 2014. We then excluded enrollees who were not at risk for pregnancy for surgical reasons (e.g., hysterectomy, oophorectomy), medical reasons (e.g., natural or induced menopause), were less than 2 months postpartum, or were still pregnant at the end of the calendar year. The remaining enrollees were assumed to be fertile and comprised the study final analytical sample (Figure 1).

We ascertained contraceptive provision with a list of codes that included International Classification of Diseases, 9th Revision, Clinical Modification (ICD-9-CM) codes, Current Procedural Terminology (CPT) codes, and National Drug Codes.[19] We also accounted for insertion, removal, or re-insertion of long-acting reversible contraception (LARC) within the same calendar year and switching to other contraceptive methods after LARC discontinuation.[18] We grouped contraceptive categories as: 1) permanent contraception (tubal sterilization); 2) prescription contraception (oral pills, ring, patch, injectables, diaphragm); or 3) LARC, which included intrauterine devices (IUDs) and the implant.

To identify individuals with DHH diagnoses, we used codes and methods previously described.[19,20] Based upon 36 diagnostic sub-codes, each individual was assigned to one of the following five main ICD-9 categories: conductive hearing loss (389.0x), sensorineural hearing loss (389.1x), mixed hearing loss (389.2x), other hearing loss (388.xx, 389.7, 389.8 and 389.9), and congenital anomalies (744.0x).

We reported age (15-20, 20-24, 25-34, 35-44), which is strongly associated with contraceptive selection, particularly tubal sterilization.[21] Education, race/ethnicity data, and parity could not be reported because these data were not available for 70% of the sample. We reported Medicaid receipt because it is strongly correlated with income and access to federal and state Title X funds for family planning services.[22] Finally, we explored associations between preventive health services and contraceptive provision using ICD-9 Codes for routine gynecologic exam, cervical cancer screening, screening or treatment for sexually transmitted infections, and routine general medical exams (V72.3, V72.31, V72.32, V76.2, V70.0, V70.3, V70.5, V70.6, V70.8, V70.9V72.3, V72.31, V72.32.)

Using SAS 9.4,[23] we calculated descriptive statistics, including frequencies and percentages. Bivariate relationships between contraceptive categories (permanent, prescription, or LARC) and deaf or hard-of-hearing status (yes/no) were calculated with chi-square tests. Using logistic regression models, we calculated estimates for each contraceptive category with odds ratios (OR) and 95% confidence intervals that were adjusted for deaf or hard-of-hearing status (yes/no), age (15-20, 20-24, 25-34, 35-44), Medicaid (yes/no), and a preventive health visit (yes/no). To corroborate findings from the logistic regression analysis, we also conducted propensity score matching (1:1 match for age, Medicaid, preventive health visit).

For the contraceptive care measures, we calculated the percentage of all enrollees who were provided: 1) most effective or moderately effective methods (tubal sterilization, pill, patch, ring, injectables, or diaphragm); or 2) LARC methods. Per NQF recommendations for vulnerable subgroups, we also reported these measures for adolescent (15-20 years) versus adults (21-44 years) and Medicaid receipt (yes/no).[18] The study protocol was approved by the institutional review boards of the Massachusetts Department of Public Health, the Massachusetts Center for Health Information and Analysis, and Brandeis University. We set alpha at <0.01.

Results

Among the 1,171,838 enrollees in the final analytic sample, 13,400 enrollees (1.1%) had a DHH diagnosis and 1,158,438 enrollees did not (98.9%). Table 1 summarizes enrollee characteristics. Among DHH enrollees, the most common diagnostic categories were sensorineural hearing loss (39.3%), other hearing loss (35.2%), and conductive hearing loss (21.9%). DHH enrollees more likely to be older; 40.8% of DHH enrollees were aged 35-44 compared to 32.9% of non-DHH enrollees. DHH enrollees were also more likely to receive Medicaid (36.2%) and a preventive health visit (68.2%) than their non-DHH counterparts (29.7% for Medicaid; 61.2%, for a preventive health visit).

Figure 2 shows how contraceptive categories were determined for the entire cohort. By the end of the analysis year, 25.6% enrollees were provided prescription methods, 5.1% received a LARC device, and 0.6% obtained tubal sterilization. Table 2 summarizes contraceptive provision by DHH diagnosis. DHH enrollees were less likely to be provided prescription methods (23.5% vs. 25.6%, $p<0.001$) and more likely to be provided no contraception (70.5% vs. 68.6%, $p<0.01$) than non-DHH enrollees. There were no differences noted in

LARC or permanent contraception by deaf or hard-of-hearing status. Among all enrollees given prescription methods, oral pills were the most frequently prescribed (85.3%), followed by injectables (7.8%), the ring (5.0%); the patch (1.7%), and the diaphragm (<1%) (results not shown).

Table 3 shows OR of contraceptive method provision, both unadjusted and adjusted for age group (15-19, 20-24, 25-34, 35-44), receipt of Medicaid (yes/no) and receipt of a preventive health visit (yes/no). Among the covariates examined, a preventive health visit was most strongly associated with LARC (aOR 3.49, 95% 3.41-3.58, p<0.001). The OR for prescription methods was lower for DHH enrollees than for non-DHH enrollees (aOR 0.92, 95% CI 0.88-0.96, p<0.001); this finding remained essentially the same (aOR 0.91, 95% CI 0.87-0.96, p<0.001) in a stratified analysis of only enrollees who had a preventive health visit (n=717,695) (results not shown). There were no differences in odds for permanent contraception or LARC by deaf or hard-of-hearing status. The adjusted OR obtained from propensity score matching and logistic regression were not significantly different (findings not shown).

Table 4 shows the contraceptive care measures across adolescent versus adult age groups, deaf or hard-of-hearing status, and Medicaid receipt. The percentage of those who received LARC, for all ages combined, ranged from 5.1-7.2% with no significant differences noted by deaf or hard-of-hearing status. However, the percentage of DHH enrollees who received most effectively or moderately effective methods was less than that for non-DHH enrollees (24.2% vs 26.3%, p<0.001); this finding remained the same in a sub-analysis of Medicaid enrollees only.

DISCUSSION

This analysis contributes important knowledge regarding contraceptive provision and contraceptive care quality measures for DHH people. We found modest evidence that DHH enrollees were less likely to receive prescription contraception and more likely to not receive any contraception compared to their non-DHH peers. These results are particularly concerning given a recent study that found higher rates of unintended pregnancy among U.S. people with disabilities, including those with hearing disability only, than their peers without disabilities.[24] There are several possibilities for these findings. First, contraceptive knowledge may differ between individuals who are deaf or hard of hearing and individuals who are not. People who are deaf or hard of hearing have been systemically excluded from formal and informal access to health knowledge (e.g. school-based curricula, social media, public message) and have lower health literacy compared to hearing individuals.[25] Contraceptive knowledge is associated with greater contraceptive acceptability and use.[26] In a systematic review, Horner-Johnson and colleagues summarized that on average, DHH women had lower contraceptive knowledge despite reporting higher numbers of sexual partners than their non-DHH peers.[27,28] Most of these data were derived from cross-sectional studies conducted over 20 years ago,[29-32] underscoring the need to assess current knowledge regarding the full range of contraceptive methods among DHH people.

Second, the lack of inclusive care in health care settings may negatively affect the quality of contraceptive counseling. For example, many clinics do not provide accommodations required for optimal communication by some DHH patients, such as assistive listening devices and sign language interpreters.[2,3,5,6] Health teams are not routinely trained to provide culturally competent care for people with hearing loss.[4] DHH patients have also reported discriminatory treatment by staff and health care professionals,[27,33,34] which leads to patient-provider miscommunication and distrust.[32] The extent to which these disparities affect the quality of contraceptive care has yet to be explored from the perspectives of DHH patients.

The majority of prescription methods provided to enrollees were combined hormonal contraceptives (CHC) that contain estrogen. This fact raises the possibility that differences in provision of prescription methods could be partially attributed to differences in medical contraindications to estrogen by deaf or hard-of-hearing status. Mitra and colleagues recently reported that pregnant individuals who are deaf or hard of hearing were more likely to have pregestational diabetes and chronic hypertension than their non-DHH peers,[7] which suggests that this disparity may also affect non-pregnant individuals who are deaf or hard of hearing. If so, then it is possible that health care professionals prescribed CHCs less frequently to DHH patients because of medical conditions that may increase the risk of thrombotic events in the presence of estrogen. Future studies should examine differences in prescribing practices by DHH diagnoses and co-existing medical conditions. Another possibility for differences in prescription method provision is that DHH enrollees could be relying more on non-prescription methods, such as condoms, than non-DHH enrollees, which cannot be accounted for with claims data. The small number of DHH enrollees in this sample precluded a meaningful sub-analysis based upon such medical conditions (e.g., diabetes with end-organ damage, stroke, ischemic heart disease).

The finding that DHH enrollees were less likely to receive prescription contraception is consistent with results from prior studies. A population-based survey revealed that female respondents with physical or sensory disabilities were less likely to report prescription contraceptive method use than those without any disability (adjusted OR 0.64, 95% CI 0.42-0.98).[12] The magnitude of difference in prescription contraceptive rates noted in this study were less than those described in previous studies. Future studies, including qualitative and mixed methods investigations, should probe for patient-, provider-, and system-level factors that contribute to disability-specific (physical, hearing, vision, cognitive) differences in contraceptive care and decision making.

We did not detect differences in LARC use between individuals who are deaf or hard of hearing and individuals who are not. In addition to unmeasured factors related to LARC knowledge and acceptability among DHH enrollees, this finding should also be considered in the local context of Massachusetts health policy. At the forefront of health care reform in the 2000's,[35] Massachusetts has achieved near universal insurance coverage for its residents that includes LARC devices without cost sharing.[36] The high rate of preventive health visits among DHH enrollees and the strong association between these visits and LARC receipt suggests that insurance coverage of preventive health services is critical to actual contraceptive provision for individuals who are deaf or hard of hearing.

Population-based surveys have documented higher rates of tubal sterilization among people with any disability,[37] physical or sensory[10] or cognitive disability[11,13] compared to people without any disability. These findings have raised concerns that long-standing discrimination of people with disabilities, including eugenic compulsory sterilization of thousands throughout the 20th century,[38] continue to influence rates of tubal sterilization today. In this analysis, we did not observe any difference in tubal sterilization based upon deaf or hard-of-hearing status. While this is reassuring, any conclusions regarding equitable counseling and access to tubal sterilization for individuals who are deaf or hard of hearing should be made with caution. Given that only 0.6% of all enrollees had tubal sterilization during the analysis period, we were likely underpowered to detect any differences. Our ability to determine and compare the cumulative prevalence of tubal sterilization between groups was limited by the fact that tubal sterilization is a one-time surgery that does not trigger recurring procedural, drug, or diagnostic codes.

Our study generated important benchmark measures of contraceptive care quality for individuals who are deaf or hard of hearing. To emphasize the importance of respect for individual preferences and non-coercive contraceptive counseling, the DHHS OPA and the NQF have not set desired thresholds for the contraceptive care quality measures.[39] However, very low percentages, such as 1-2% LARC provision, should raise concerns about barriers to contraceptive access.[39] Our findings that LARC rates did not differ by deaf or hard-of-hearing status and were >5% for nearly every subgroup, including Medicaid recipients, were promising and should continue to be monitored. These quality measures should be compared to data from states with different policies that affect contraceptive services and LARC access.

There were several strengths to this analysis. We followed rigorous procedures per the DHHS OPA technical standards and used a robust set of contraceptive codes and procedures to ascertain method switching. The Massachusetts APCD is a high-quality and comprehensive database that includes claims from Medicaid, which is a critical source contraceptive coverage for low income people and people with disabilities.[17] The fact that Massachusetts has provided near universal health coverage since 2006,[40] participated in Medicaid expansion in 2014,[41] and has required insurers to cover FDA-approved contraceptives since 2002[42] makes it a unique reference point to compare to states with less comprehensive requirements for contraceptive coverage. Finally, our use of claims data captured individuals who are deaf or hard of hearing who would otherwise not be included in household or phone surveys that do not provide communication accommodations.

There are inherent weaknesses to insurance claims analyses. We cannot determine or control for personal characteristics that influence contraceptive decisions, such as, parity, sexual activity, marital status, and pregnancy desires; health care professional -related factors such as quality of contraceptive counseling; or clinic-level factors such as modes of accessible communication (e.g., sign language interpreters). Second, we cannot ascertain method switching to withdrawal or over-the-counter contraceptive methods (condoms, spermicides) that do not have associated claims or codes. Because of small sample sizes and overlapping ICD codes, a sub-analysis by DHH category was not possible. The extent to which socio-demographic factors that affect or magnify disparities in care, such as race and ethnicity,

could not be explored. Our findings are not generalizable to uninsured populations or insured populations from other states.

This is the first report of contraceptive provision by method type and NQF-endorsed contraceptive care measures for insured individuals who are deaf or hard of hearing. Researchers, policy makers, and payers should continue to monitor these metrics with the goal of equitable contraceptive access for all. Future research should also explore factors that may contribute to rates of prescription contraception that differ by deaf or hard-of-hearing status and across different DHH categories.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgements

This publication was made possible by Grant Number R40MC30754 from the Health Resources and Services Administration (HRSA), an operating division of the U.S. Department of Health and Human Services and the Eunice Kennedy Shriver National Institute of Child Health and Human Development of the National Institutes of Health under Award Number R01HD090103. Its contents are solely the responsibility of the authors and do not necessarily represent the official views of the funders.

REFERENCES

1. Zelaya CE, Lucas JW, Hoffman HJ. Self-reported hearing trouble in adults aged 18 and over: United States, 2014. U.S. Department of Health and Human Services, Centers for Disease Control. Accessed January 26, 2021. https://www.cdc.gov/nchs/data/databriefs/db214.pdf
2. National Institute on Deafness and Other Communication Disorders (NIDCD). Assistive Devices for People with Hearing, Voice, Speech, or Language Disorders. NIH Publication No. 11-7672. 122011. Accessed January 25, 2021. https://www.nidcd.nih.gov/health/assistive-devices-people-hearing-voice-speech-or-language-disorders
3. Barnett S, McKee M, Smith SR, Pearson TA. Deaf sign language users, health inequities, and public health: opportunity for social justice. Prev Chronic Dis2011;8(2):A45. [PubMed: 21324259]
4. Kuenburg A, Fellinger P, Fellinger J. Health care access among deaf people. J Deaf Stud Deaf Educ2016;21(1):1–10. DOI: 10.1093/deafed/env042 [PubMed: 26405210]
5. Steinberg AG, Wiggins EA, Barmada CH, Sullivan VJ. Deaf women: experiences and perceptions of healthcare system access. J Womens Health (Larchmt)2002;11(8):729–41. DOI: 10.1089/15409990260363689 [PubMed: 12570039]
6. McKee MM, Moreland C, Atcherson SR, Zazove P. Hearing loss: communicating with the patient who is deaf or hard of hearing. FP Essent2015;434:24–28. [PubMed: 26161525]
7. Mitra M, McKee MM, Akobirshoev I, Valentine A, Ritter G, Zhang J, et al.Pregnancy, birth, and infant outcomes among women who are deaf or hard of hearing. Am J Prev Med2020;58(3):418–26. DOI: 10.1016/j.amepre.2019.10.012 [PubMed: 31952943]
8. Gavin L, Pazol K. Update: providing quality family planning services - recommendations from CDC and the U.S. Office of Population Affairs, 2015. MMWR Morb Mortal Wkly Rep2016;65(9):231–234. [PubMed: 26963363]
9. Ahmed S, Li Q, Liu L, Tsui AO. Maternal deaths averted by contraceptive use: an analysis of 172 countries. Lancet2012;380(9837):111–25. DOI: 10.1016/S0140-6736(12)60478-4 [PubMed: 22784531]
10. Wu JP, McKee MM, McKee KS, Meade MA, Plegue M, Sen A. Female sterilization is more common among women with physical and/or sensory disabilities than women without disabilities in the United States. Disabil Health J2017;10(3):400–5. DOI: 10.1016/j.dhjo.2016.12.020 [PubMed: 28110980]

11. Mosher W, Hughes RB, Bloom T, Horton L, Mojtabai R, Alhusen JL. Contraceptive use by disability status: new national estimates from the National Survey of Family Growth. Contraception2018;97(6):552–8. DOI: 10.1016/j.contraception.2018.03.031 [PubMed: 29596784]
12. Wu JP, McKee KS, McKee MM, Meade MA, Plegue MA, Sen A. Use of reversible contraceptive methods among US women with physical or sensory disabilities. Perspect Sexual Reprod Health2017;49(3):141–7. DOI: 10.1363/psrh.12031
13. Li H, Mitra M, Wu JP, Parish SL, Valentine A, Dembo RS. Female sterilization and cognitive disability in the United States, 2011-2015. Obstet Gynecol2018;132(3):559–64. DOI: 10.1097/AOG.0000000000002778 [PubMed: 30095774]
14. Curtis KM, Tepper NK, Jatlaoui TC, et al.U.S. Medical eligibility criteria for contraceptive use, 2016. MMWR Recomm Rep2016;65(3):1–103.
15. National Quality Forum (NQF). Accessed January 25, 2021. http://www.qualityforum.org/what_we_do.aspx
16. Moniz MH, Gavin LE, Dalton VK. Performance measures for contraceptive care: a new tool to enhance access to contraception. Obstet Gynecol2017;130(5):1121–5. DOI: 10.1097/aog.0000000000002314 [PubMed: 29016515]
17. Center for Health Information Analysis. Overview of the Massachusetts All-Payer Claims Database. 2016. Accessed January 25, 2021. http://www.chiamass.gov/assets/docs/p/apcd/APCD-White-Paper-2016.pdf
18. U.S. Department of Health and Human Services, Office of Population Affairs. Measure CCW: Contraceptive Care-All Women Ages 15-44, 2014. Accessed January 26, 2021. https://opa.hhs.gov/sites/default/files/2020-07/contraceptive-use-specifications-global-2014.pdf
19. Mitra M, Akobirshoev I, McKee MM, Iezzoni LI. Birth outcomes among U.S. women with hearing loss. Am J Prev Med2016;51(6):865–73. DOI: 10.1016/j.amepre.2016.08.001 [PubMed: 27687529]
20. Reed NS, Altan A, Deal JA, Yeh C, Kravetz AD, Wallhagen M, et al.Trends in health care costs and utilization associated with untreated hearing loss over 10 years. JAMA Otolaryngol Head Neck Surg2019;145(1):27–34. DOI: 10.1001/jamaoto.2018.2875 [PubMed: 30419131]
21. Daniels K, Abma JC. Current contraceptive status among women aged 15–49: United States, 2017–2019. NCHS Data Brief, No. 388. Hyattsville, MD: National Center for Health Statistics. Accessed January 25, 2021. https://www.cdc.gov/nchs/data/databriefs/db388-H.pdf
22. Darney BG, Jacob RL, Hoopes M, Rodriguez MI, Hatch B, Marino M, et al.Evaluation of medicaid expansion under the affordable care act and contraceptive care in U.S. community health centers. JAMA Netw Open2020;3(6):e206874. DOI: 10.1001/jamanetworkopen.2020.6874 [PubMed: 32496568]
23. SAS Institute Inc. SAS Version 9.4 [software]. Accessed April 30, 2021. https://www.sas.com/en_us/curiosity.html?utm_source=other&utm_medium=cpm&utm_campaign=non-cbo-us&dclid=&gclid=Cj0KCQjw1a6EBhC0ARIsAOiTkrFSI3pvtMS78J3UjAApirsJwbp7xBbHsa-bw9dAofcLrYLr_HgqIYMaAkw1EALw_wcB
24. Horner-Johnson W, Dissanayake M, Wu JP, Caughey AB, Darney BG. Pregnancy intendedness by maternal disability status and type in the United States. Perspect Sex Reprod Health2020;52(1):31–8. DOI: 10.13.63/psrh.12130 [PubMed: 32096336]
25. McKee MM, Paasche-Orlow MK, Winters PC, Fiscella K, Zazove P, Sen A, et al.Assessing Health Literacy in Deaf American Sign Language Users. J Health Commun2015;20(Suppl 2):92–100. DOI: 10.1080/10810730.2015.1066468 [PubMed: 26513036]
26. Paul R, Huysman BC, Maddipati R, Madden T. Familiarity and acceptability of long-acting reversible contraception and contraceptive choice. Am J Obstet Gynecol2020;222(4S):S884 e881–S884 e889. DOI: 10.1016/j.ajog.2019.11.1266 [PubMed: 31838124]
27. Horner-Johnson W, Moe EL, Stoner RC, et al.Contraceptive knowledge and use among women with intellectual, physical, or sensory disabilities: a systematic review. Disabil Health J2019;12(2):139–54. DOI: 10.1016/j.dhjo.2018.11.006 [PubMed: 30473221]
28. Heiman E, Haynes S, McKee M. Sexual health behaviors of Deaf American Sign Language (ASL) users. Disabil Health J2015;8(4):579–85. DOI: 10.1016/j.dhjo.2015.06.005 [PubMed: 26242551]

29. Sawyer RG, Desmond SM, Joseph JM. A comparison of sexual knowledge, behavior, and sources of health information between deaf and hearing university students. Journal of Health Education1996;27(3):144–55. DOI: 10.1080/10556699.1996.10603187
30. Tripp AW, Kahn JV. Comparison of the sexual knowledge of hearing impaired and hearing adults. JADARA1986.
31. Joseph JM, Sawyer R, Desmond S. Sexual knowledge, behavior and sources of information among deaf and hard of hearing college students. Ann Fam Med1995;140(4):338–45. DOI: 10.1353/aad.2012.0379
32. Ralston E, Zazove P, Gorenflo DW. Physicians' attitudes and beliefs about deaf patients. J Am Board Fam Pract1996;9(3):167–73. DOI: 10.3122/JABFM.9.3.167 [PubMed: 8743229]
33. McKee MM, Barnett SL, Block RC, Pearson TA. Impact of communication on preventive services among deaf American Sign Language users. Am J Prev Med2011;41(1):75–9. DOI: 10.1016/j.amepre.2011.03.004 [PubMed: 21665066]
34. Gichane MW, Heap M, Fontes M, London L. "They must understand we are people": pregnancy and maternity service use among signing Deaf women in Cape Town. Disabil Health J2017;10(3):434–9. DOI: 10.1016/j.dhjo.2017.03.016 [PubMed: 28416204]
35. Doonan MT, Tull KR. Health care reform in Massachusetts: implementation of coverage expansions and a health insurance mandate. Milbank Q2010;88(1):54–80. DOI: 10.1111/j.1468-0009.2010.00589.x [PubMed: 20377758]
36. Guttmacher Institute. Insurance Coverage of Contraceptives. Accessed January 26, 2021. https://www.guttmacher.org/state-policy/explore/insurance-coverage-contraceptives
37. Haynes RM, Boulet SL, Fox MH, Carroll DD, Courtney-Long E, Warner L. Contraceptive use at last intercourse among reproductive-aged women with disabilities: an analysis of population-based data from seven states. Contraception2018;97(6):538–45. DOI: 10.1016/j.contraception.2017.12.008 [PubMed: 29253580]
38. Wu J, Braunschweig Y, Harris LH, Horner-Johnson W, Ernst SD, Stevens B. Looking back while moving forward: a justice-based, intersectional approach to research on contraception and disability. Contraception2019;99(5):267–71. DOI: 10.1016/j.contraception.2019.01.006 [PubMed: 30763580]
39. U.S. Department of Health and Human Services Office of Population Affairs. Contraceptive Care Measures: How the Measure Should Be Used. Accessed January 26, 2021. https://opa.hhs.gov/evaluation-research/title-x-services-research/contraceptive-care-measures
40. Kaiser Family Foundation. Focus on Health Reform: Massachusetts Health Care Reform Six Years Later. Accessed January 26, 2021. https://www.kff.org/wp-content/uploads/2013/01/8311.pdf
41. Kaiser Family Foundation. Status of State Medicaid Expansion Decisions: Interactive Map. Accessed January 26, 2021. https://www.kff.org/medicaid/issue-brief/status-of-state-medicaid-expansion-decisions-interactive-map/
42. National Conference of State Legislatures. Insurance Coverage for Contraception Laws. Accessed January 26, 2021. https://www.ncsl.org/research/health/insurance-coverage-for-contraception-state-laws.aspx.

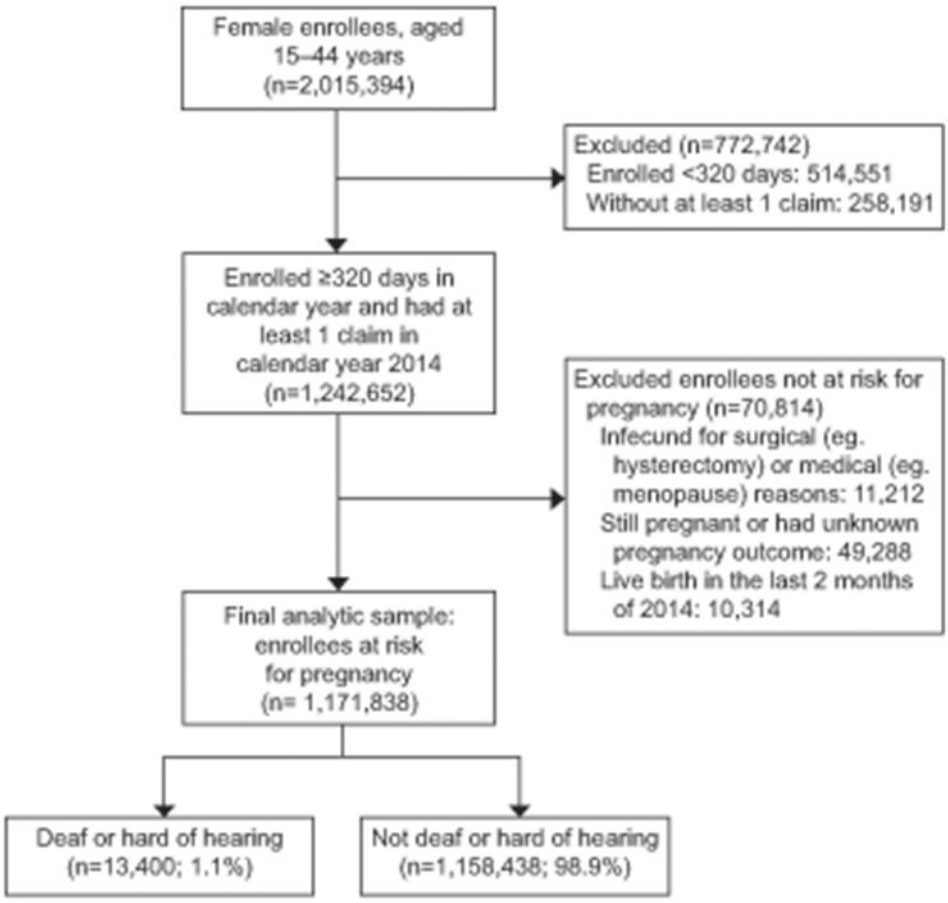

Figure 1.
Identifying eligible enrollees at risk for pregnancy in calendar year 2014.

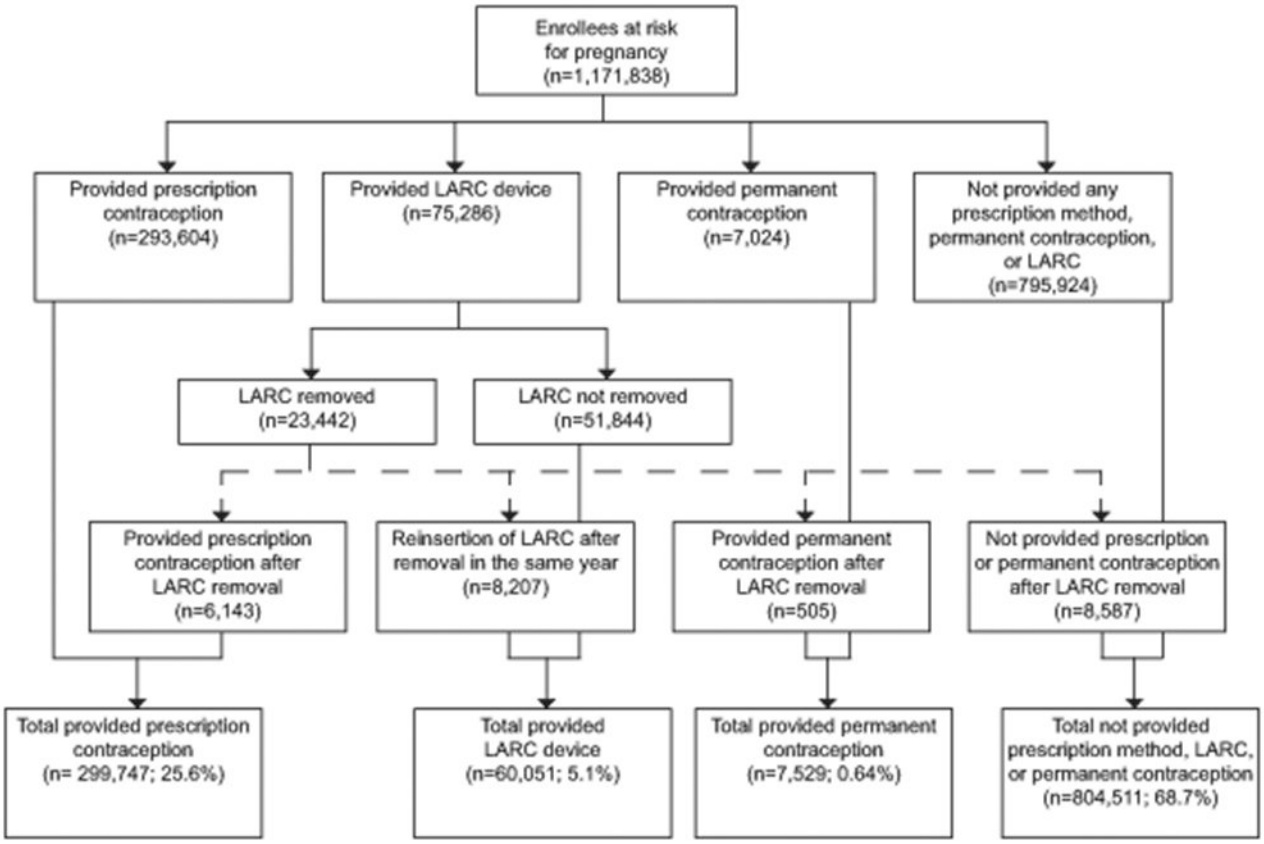

Figure 2.

Contraceptive provision by end of calendar year 2014. Long-acting reversible contraception (LARC) refers to intrauterine devices and the implant; permanent contraception refers to tubal sterilization; prescription contraception refers to pills, patch, ring, injectables, diaphragm.

Table 1.

Enrollee characteristics by deaf or hard-of-hearing status

Characteristics N=1,171,838	Deaf or Hard-of-Hearing Status			
	YES (n=13,400)		NO (n=1,158,438)	
Age group in years	**n**	**%(95%CI)**	**n**	**%(95%CI)**
15-20	2,278	17.0 (16.4-17.6)	189,706	16.4 (16.3-16.4)
20-24	1,788	13.3 (12.8-13.9)	197,227	17.0 (17.0-17.1)
25-34	3,872	28.9 (28.1-29.7)	390,791	33.7 (33.7-33.8)
35-44	5,462	40.8 (39.9-41.6)	380,714	32.9 (32.8-33.0)
Medicaid receipt				
Yes	4,851	36.2 (35.4-37.0)	343,659	29.7 (29.6-29.8)
Preventive health visit				
Yes	9,138	68.2 (67.4-69.0)	708,557	61.2 (61.1-61.3)
DHH ICD-9 Diagnoses				
Sensorineural hearing loss	5,272 (39.3)	39.3 (38.5-40.2)	na	
Other hearing loss	4,719 (35.2)	35.2 (34.4-36.0)	na	
Conductive hearing loss	2,937 (21.9)	21.9 (21.2-22.6)	na	
Mixed hearing loss	378 (2.8)	2.8 (2.5-3.1)	na	
Congenital anomalies	94 (0.7)	0.7 (0.6-0.8)	na	

Notes: ICD-9 codes for DHH diagnoses include: 3890, 3891,3892,3897,3898, 3899,74400,74401,74402, 74403, 74404, 74405, 74409, 3880, 38801,3882, 38812; for preventive health visits, routine gynecologic exams, routine general medical exams include: V72.3, V72.31, V72.32, V76.2, V70.0, V70.3, V70.5, V70.6, V70.8, V70.9; CPT/HCPCS codes for Pap smears, testing for sexually transmitted infections, mammography: Q0091,G0101,G0476,86631,86632, 87110,87270, 87320, 87490, 87491,87810,87590,87591, 87850, 87800, 86592, 86593,86780,87340,87341,G0432,G0433,G0435,G0475, G0202,77063

* DHH: Deaf and Hard of Hearing

* ICD: International Classification of Diseases

* na: not applicable

Table 2.

Contraceptive provision by deaf or hard-of-hearing status

Methods provided at all (yes/no)	Total sample N=1,171,838	Deaf or Hard-of-Hearing Status	
		YES n=13,400	NO n=1,158,438
Any method provision	367,327 (31.4)	*3,961 (29.7)	363,366 (31.4)
No method provision	804,511 (68.7)	*9,439 (70.4)	795,072 (68.6)
Methods by subcategory			
Prescription methods	299,747 (25.6)	**3,145 (23.5)	296,602 (25.6)
LARC	60,051 (5.1)	721 (5.4)	59,330 (5.1)
Permanent contraception	7,529 (0.6)	95 (0.7)	7,434 (0.6)
None of the above	804,511 (68.7)	*9,439 (70.4)	795,072 (68.6)

Notes: "Any method" refers to prescription methods, LARC, and permanent contraception. Prescription methods refer to pills, patch, ring, injectables, or diaphragm. LARC refers to intrauterine devices or the implant. Permanent contraception refers to tubal sterilization including tubal occlusion, tubal ligation, and salpingectomy.

* p<0.01

** p<0.001

* DHH: Deaf and Hard of Hearing

* LARC: long-acting reversible contraceptive

Table 3.

Unadjusted and adjusted odds ratios for contraceptive provision

Total N=1,158,438		
a. Odds of any contraceptive provision (prescription, permanent, LARC)		
	Unadjusted OR (95% CI)	
DHH status	**0.92(0.89-0.95)**	**p-value**
Yes		<0.001
No	Referent	
	Adjusted OR (95% CI)	**p-value**
DHH status		
Yes	0.92 (0.88-0.95)	<0.001
No	Referent	
Age in years		
15-19	0.37 (0.37-0.38)	<0.001
20-24	Referent	
25-34	0.81 (0.80-0.82)	
35-44	0.31 (0.30-0.31)	
Medicaid		
Yes	1.15(1.14-1.16)	<0.001
No	Referent	
Preventive Health Visit		
Yes	3.08 (3.05-3.11)	<0.001
No	Referent	
b. Odds of prescription methods only (pills, patch, ring, shot, diaphragm)		
	Unadjusted OR (95% CI)	
DHH status		**p-value**
Yes	0.89 (0.86-0.93)	<0.001
No	Referent	
	Adjusted OR (95% CI)	**p-value**
DHH status		
Yes	0.92 (0.88-0.96)	<0.001
No	Referent	
Age in years		
15-19	0.40 (0.40-0.41)	<0.001
20-24	Referent	
25-34	0.73 (0.72-0.74)	
35-44	0.25 (0.24-0.25)	
Medicaid		
Yes	0.95 (0.94-0.96)	<0.001
No	Referent	

Total N=1,158,438		
a. Odds of any contraceptive provision (prescription, permanent, LARC)		
	Unadjusted OR (95% CI)	
DHH status	**0.92(0.89-0.95)**	**p-value**
Preventive Health Visit		
Yes	2.64 (2.6-2.7)	<0.001
No	Referent	
c. Odds of permanent contraception only (tubal sterilization)		
	Unadjusted OR (95% CI)	
DHH status		**p-value**
Yes	1.11 (0.90-1.35)	0.333
No	Referent	
	Adjusted OR (95% CI)	**p-value**
DHH status		
Yes	0.92 (0.75-1.13)	0.445
No	Referent	
Age in years		
15-19	0.11 (0.06-0.19)	<0.0001
20-24	Referent	
25-34	9.53 (8.05-11.29)	
35-44	17.06 (14.43-20.17)	
Medicaid		
Yes	2.47(2.36-2.58)	<0.0001
No	Referent	
Preventive Health Visit		
Yes	1.51 (1.43-1.58)	<0.0001
No	Referent	
d. Odds of LARC only (intrauterine devices and the implant)		
	Unadjusted OR (95% CI)	
DHH status		**p-value**
Yes	1.05 (0.978-1.137)	0.166
No	Referent	
	Adjusted OR (95% CI)	**p-value**
DHH status		
Yes	0.96 (0.88-1.03)	0.293
No	Referent	
Age in years		
15-19	0.36 (0.34-0.38)	<0.0001
20-24	Referent	
25-34	1.31 (1.28-1.34)	<0.0001

Total N=1,158,438		
a. Odds of any contraceptive provision (prescription, permanent, LARC)		
	Unadjusted OR (95% CI)	
DHH status	**0.92(0.89-0.95)**	**p-value**
35-44	0.99 (0.96-1.01)	0.416
Medicaid		
Yes	1.77 (1.74-1.80)	<0.0001
No	Referent	
Preventive Health Visit		
Yes	3.49 (3.41-3.58)	<0.001
No	Referent	

Notes: All variables retained in the adjusted models are shown.

DHH: deaf or hard of hearing

LARC: long-acting reversible contraceptive

Table 4.

National Quality Forum contraceptive care quality measures by age, Medicaid, deaf or hard-of-hearing status

		Deaf or Hard-of-Hearing Status	
Contraceptive care measures	**TOTAL (N=1,171,838)**	**NO (n=1,158,438)**	**YES (n=13,400)**
ALL INSURED (N=1,171,838)			
Provided a most effective or moderately effective method (tubal sterilization, pills, patch, vaginal ring, shot, or diaphragm)			
All age groups (15-44)	307,276 (26.2%)	304,036 (26.3%)	3,240 (24.2) *
• Aged 15-20 only	45,792 (19.8%)	45,300 (19.8%)	492 (18.5%)
• Aged 21-44 only	261,484 (27.8%)	258,736 (27.8%)	2,748 (25.6%) *
Provided a long-acting reversible method (intrauterine devices, implant)			
All age groups (15-44)	60,051 (5.1%)	59,330 (5.1%)	721 (5.4%)
• Aged 15-20 only	3,900 (1.7%)	3,862 (1.7%)	38 (1.4%)
• Aged 21-44 only	56,151 (6.0%)	55,468 (6.0%)	683 (6.4%)
MEDICAID ONLY (n=348,510)			
Provided a most effective or moderately effective method (tubal sterilization, pills, patch, vaginal ring, shot, or diaphragm)			
All age groups (15-44)	91,066 (26.1%)	89,916 (26.2%)	1,150 (23.7%) *
• Aged 15-20 only	14,377(20.6%)	14,186 (20.6%)	191 (18.9%)
• Aged 21-44 only	76,689 (27.5%)	75,730 (27.6%)	959 (25.0%) *
Provided a long-acting reversible method (intrauterine devices, implant)			
All age groups (15-44)	25,024 (7.2%)	24,709 (7.2%)	315 (6.5%)
• Aged 15-20 only	1,967 (2.8%)	1,942 (2.8%)	25 (2.5%)
• Aged 21-44 only	23,057 (8.3%)	22,767 (8.3%)	290 (7.6%)

Notes: The denominator is the total number of fertile individuals at risk of pregnancy per the U.S. Department of Health and Human Services Office of Population Affairs (DHH OPA) Technical Documentation of Contraceptive Provision Measures.

Percentages for Individuals who were not provided a most effective, moderately effective, or LARC method are not shown.

* p value <0.001 between enrollees with and without DHH diagnoses