

EMPIRICAL MANUSCRIPT

# Prevalence of Anxiety or Depression Diagnosis in Deaf Adults

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## Abstract

The national prevalence of depression and anxiety disorders among deaf adults who use American Sign Language (ASL) remains largely understudied. Data for self-reported depression and anxiety disorder diagnosis ( $n = 1,704$  deaf adults;  $n = 3,287$  hearing adults) as told by their healthcare providers were drawn from HINTS-ASL and HINTS datasets. Chi-square and Poisson regression analysis compared characteristics and predictors for depression or anxiety disorder diagnosis among deaf adults. Rate of diagnosed depression or anxiety disorder was significantly higher (25%) and occurred at earlier age (45 years;  $SD = 15$ ) for deaf adults compared to hearing adults (22%; mean age = 56;  $SD = 14$ ). After adjusting for covariates, deaf individuals who were White, younger, female, educated, or single were significantly more likely to self-report a diagnosis of depression/anxiety disorder as told by their healthcare providers. Deaf adults have higher reported rate of diagnosis of depression or anxiety disorder at an earlier onset compared to the general population. Communication access with healthcare providers is essential for accurate diagnosis, treatment, and follow up care.

In the United States, 20.6% of adults experienced at least one major depressive episode (Hasin et al., 2018) and 31.2% had an anxiety disorder of any type in their lifetime. Higher rates of major depressive episodes were reported among women, those between the age of 18 and 25, and those who reported two or more races. Women were found to have higher rates compared to men, with prevalence rates of 24.3–14.3% respectively (Substance Abuse and Mental Health Services Administration, 2017). According to the 2007 National Comorbidity Survey, approximately 31.1% of adults in the U.S. experienced an anxiety disorder within their lifetime (Harvard Medical School, 2007). The national prevalence of depression and anxiety disorders among deaf adults who use American Sign Language (ASL) remains largely understudied, though the field of public health has amassed evidence to indicate that people with disabilities experience health disparities (Krahn, Walker, & Correa-De-Araujo, 2015). Of the 13 U.S.-based studies published to date, a majority focused on depression in this medically underserved population (see Table 1).

The U.S.-based studies on the prevalence of mood and anxiety disorders in the deaf population have been contradictory, with two studies reporting significant differences in the rates of mood and anxiety disorders among deaf inpatients compared to hearing inpatients (Black & Glickman, 2006; Diaz, Landsberger, Povlinski, Sheward, & Sculley, 2013) and other archival studies reporting no significant differences in the rates of mood and/or anxiety disorders between deaf and hearing inpatients and outpatients (Landsberger & Diaz, 2010; Pollard, 1994). A 2006 study reported a higher rate of depression and anxiety disorders in a sample of 64 deaf inpatients who used ASL or some form of visual-gestural communication compared to hearing counterparts (Black & Glickman, 2006), whereas an archival, community mental health-based dataset from 2002 to 2010 reported a lower rate of diagnosed anxiety disorder among 241 deaf outpatients compared to 345 hearing outpatients (Diaz et al., 2013). In another study that used 1998–2008 archival data to compare differences in mood and anxiety diagnoses between 30 deaf inpatients with 60 hearing inpatients in a Midwestern

**Table 1** Studies on depression and anxiety in deaf adults

Year	Authors	Depression criteria	Measure	Language	N	Location	Data collection
2017	Kushalnagar, Bruce, Sutton, & Leigh	Symptomatology	BDI	ASL <sup>a</sup> & English	143	USA	2013–2014
2014	Li, Zhang, & Hoffman	Symptomatology	PHQ-9	English	3,975	USA	2005–2010
2008	Friedman	Symptomatology	BDI	English	126	USA	n/a
2007	Kvam, Loeb, & Tambs	Symptomatology	3 items: SCL-5	NSL <sup>b</sup> & English	431	Norway	2001
1998	Mulcahy	Symptomatology	BDI-R	ASL & English	50	USA	n/a
1991	Marcus	Symptomatology	BDI; MMPI	ASL & English	129	USA	1985
1989	Leigh, Robins, Welkowitz, & Bond	Symptomatology	BDI	English	102	USA	n/a
2013	Diaz, Landsberger, Povlinski, Sheward, Schulley	Diagnostic	DSM	ASL	241	USA	2002–2010
2010	Landsberger & Diaz	Diagnostic	DSM	ASL	30	USA	1998–2008
2006	Black & Glickman	Diagnostic	DSM	ASL	64	USA	1994–2004
1994	Pollard	Diagnostic	DSM	Unreported	544	USA	1986–1991
Year	Authors	Anxiety criteria		Language	N	Location	Data Collection
2007	Durham	Symptomatology	BAI	English	50	USA	n/a
2005	Fellinger, Holzinger, Dobner, Gerich, Lehner	Symptomatology	GHQ-12, BSI-5 scales	German	236	Austria	2002–2003

<sup>a</sup>ASL = American Sign Language.<sup>b</sup>NSL = Norwegian Sign Language.

hospital, the authors found no group differences for mood and anxiety disorders (Landsberger & Diaz, 2010). According to this study, ASL interpreters were provided on the specialty deaf inpatient unit; however, none of the psychiatrists who assigned diagnoses knew ASL or specialized in mental health treatment for deaf individuals. An older study used public mental health records in a city known for having a large per capita of deaf residents and identified 343 deaf individuals who had received mental health services (Pollard, 1994). This study found no significant differences in the prevalence of depression or anxiety disorders between these 343 deaf individuals and 68,329 hearing individuals who received mental health services.

Despite the discrepancy in the prevalence rates of depression or anxiety disorders between inpatient and outpatient settings, there is an agreement that the accuracy of diagnosis was heavily influenced by unique factors that influence diagnosis and whether these diagnoses are accurate. For one, accessible communication is an important contributor to the accuracy of mental health diagnoses (Black & Glickman, 2006; Diaz et al., 2013). If the exchange of information between the Deaf patient and the clinician is not effective or understood, diagnoses are likely to be either missed or inaccurate. Even if communication is fully accessible through a qualified interpreter, the diagnostic process can be compromised if the healthcare provider is not familiar with issues commonly experienced by Deaf adults who did not have access to communication while growing up (Black & Glickman, 2006; Diaz et al., 2013). If the Deaf individual self-identifies as LGBTQ, then this individual is less likely to disclose health information if the clinician fails to demonstrate appropriate patient-centered communication behaviors even if an interpreter is present (Miller, Biskupiak, & Kushalnagar, 2018). All of these issues further complicate the diagnostic process for the Deaf population.

Further, these contradictory findings can be understood within the context of legislation for each era that impacted population-based access to medical and mental health care. For instance, the Americans with Disabilities Act (ADA) was signed

into law in 1990 and amended in 2008, with the intent to increase disabled citizen participation in all parts of society, including access to health and mental health care, employment, and other realms known to improve overall health. Later in the same decade, and roughly between 1997 and 2005, universal newborn hearing screening legislation greatly expanded access of the newborn hearing screening and resulted in earlier identification for deaf babies born in and after late 1990s. This specific legislation may have not directly improved health-related outcomes; however, the increased access to health-related services may have impacted how deaf individuals communicated with their doctors and received medical care, including mental health diagnoses.

The goal of the present study was to examine the prevalence of self-reported depression and anxiety disorder diagnosis in a U.S. sample of deaf adults who took the Health Information National Trends Survey in ASL (Kushalnagar, Harris, Paludneviciene, & Hoglind, 2017). Findings were compared with the general population's self-reported data on depression and anxiety diagnosis that was drawn from the English-version of the Health Information National Trends Survey. Within-group analyses were conducted to describe the characteristics of deaf individuals who were told by their healthcare providers that they had depression or an anxiety disorder. This study fills a gap in the literature by its use of a large U.S. sample, the use of the same depression/anxiety diagnosis question for both hearing and deaf adults, and the inclusion of a diverse sample of adults that ranged in age and those who have come of age following legislative changes noted above.

## Methods

### Data Source

Data were collected through the Health Information National Trends Survey (hints.cancer.gov), which is a nationwide survey focused on collecting information about the American public's

use of health-related information and communication. The HINTS survey was culturally adapted for deaf individuals, translated into ASL, and included in an online survey in which the study procedures were approved by an Institutional Review Board and administered to a national sample of deaf ASL users (see Kushalnagar, Harris, Paludneviene, & Hoglind, 2017, for further details on the translation and study administration procedures).

Data related to deaf ASL users' mental health diagnosis came from the HINTS-ASL (Kushalnagar et al., 2017) surveys that were administered between October 2015 and July 2016 and October 2016 to April 2018. Data on hearing adults' mental health diagnosis were drawn from HINTS 5 (Cycle 1) survey that was mailed to the respondents from January 2017 through May 2017. Only English-speaking respondents who could hear and answered the depression/anxiety diagnosis question were included in the present analyses as the hearing comparison group.

### Selected Items from HINTS and HINTS-ASL Surveys for Current Study

All respondents, deaf and hearing, were asked the same question: "Has a doctor or other health professional ever told you that you had any of the following medical conditions: depression or anxiety disorder?" For this question, a doctor or health professional could include mental health professionals. Additional information was also gathered on comorbidity, including cancer, diabetes, hypertension, cardiovascular diseases, arthritis, and kidney/liver diseases.

Aside from medical condition diagnosis, all deaf and hearing participants were asked if they had a healthcare provider that they saw regularly. Only deaf respondents were asked to select a communication modality that they used the most frequently with a healthcare professional that they saw the most. Response options included (1) ASL directly or through interpreter and (2) speaking/speechreading/writing.

### Statistical analyses

Using age-weighted data, descriptive statistics and group comparisons were used to summarize the sample characteristics by hearing status (deaf vs hearing). Further analyses were done separately for the deaf sample. Within this deaf sample, Poisson regression analysis was used to examine the relationship among sociodemographic variables, patient-related variables, and self-reported depression and anxiety diagnosis. The statistical program SPSS version 24.0 was used for all analyses.

## Results

### Deaf and Hearing Group Comparisons

Table 2 provides an overall comparison of sample characteristics between deaf and hearing adults. Of the 1,704 deaf respondents who answered the question about having been diagnosed with depression or anxiety disorder by a doctor or any healthcare professional, 24.9% self-reported a diagnosis of depression or anxiety disorder. Of the 3,287 English-speaking respondents in the hearing sample, 21.7% self-reported a diagnosis of depression or anxiety disorder. The group difference in the rate of depression or anxiety disorder is significant ( $X^2 = 6.50$ ;  $p < .01$ ). Other group differences emerged for all other sociodemographic and health indicators except for age (see Table 2).

Table 3 presents sociodemographic characteristics of the deaf and hearing groups diagnosed with depression or anxiety disorder. The diagnosed hearing sample (mean age = 56, SD = 14) was significantly older than the diagnosed deaf sample (mean age = 45, SD = 15;  $X^2 = -12.81$ ;  $p < .001$ ); the hearing sample also had more individuals with comorbidity and worse overall health status compared to the deaf sample ( $X^2 = 18.18$ ;  $p < .001$ ;  $X^2 = 33.97$ ;  $p < .001$ ).

Regarding sex, deaf and hearing women had similar rates of self-reported depression or anxiety disorder diagnosis. There were racial/ethnicity differences for depression/anxiety diagnosis across hearing status ( $X^2 = 14.61$ ;  $p = .006$ ), with relatively higher percentage of self-reported diagnosis among deaf Hispanics (12.8%) compared to hearing Hispanics (9.2%).

The hearing group had more individuals who had a regular healthcare provider compared to the deaf group ( $X^2 = 9.03$ ;  $p = 0.003$ ). Importantly, about 68% of hearing adults aged 18–34 with a reported mental health diagnosis had a regular provider that they saw most often compared to only 56% of deaf adults aged 18–34 who were diagnosed with depression or anxiety disorder.

### Within-Deaf Group Comparisons

Table 4 compares deaf people's characteristics across diagnostic status. Within this sample, a higher rate of self-reported diagnosis of depression or anxiety disorder was found among women, those who were younger, and those who were college graduates. About 17% of 668 deaf men reported that they were diagnosed with depression or anxiety disorder compared to 29% of 1,012 deaf women. While mode of communication with a healthcare professional did not associate with self-reported diagnosis of anxiety or depression among deaf adults, seeing a regular healthcare provider regularly was associated with a diagnosis of depression or anxiety disorder ( $X^2 = 10.91$ ;  $p < .001$ ).

When all significant sociodemographic and patient variables were entered in a robust multivariable Poisson model in Table 5, the model was significant for self-reported diagnosis of depression or anxiety disorder ( $X^2(12) = 112.807$ ,  $p < .001$ ). After controlling for correlates, deaf individuals who were NonHispanic White, younger, female, educated, or never married were more likely to self-report a diagnosis of depression or anxiety disorder. Odds of being diagnosed with depression or anxiety disorder were significantly lower in NonHispanic Blacks (adjOR: 0.60, CI: 0.42–0.85) and NonHispanic Asians (adjOR: 0.57, CI: .38–.86) compared to NonHispanic White deaf adults. Seeing a healthcare provider regularly was associated with an increased likelihood of receiving a diagnosis of depression or anxiety disorder (adjOR: 1.35, CI: 1.12–1.61).

## Discussion

Our study using a fully accessible health survey in ASL and English is the first to look at self-reported diagnosis of depression or anxiety disorder from a health professional in a large, U. S. sample of deaf adults. The deaf sample with a self-reported diagnosis of depression or anxiety disorder was significantly younger compared to the hearing sample with the same diagnosis. The deaf sample with the diagnosis also included a higher proportion of employment and college graduates compared to the hearing sample with the diagnosis. Furthermore, the deaf sample reported lower rates of obesity, comorbidity, seeing a regular healthcare provider, and fair/poor health compared to the hearing sample.

**Table 2** Age-weighted sociodemographic characteristics for deaf and hearing adult samples

	Deaf		Hearing		
	n = 1704 <sup>a</sup>		n = 3287 <sup>a</sup>		
	Mean (SD)		Mean (SD)		
Age	48 (17)		58 (15)		t-test (p-value)
Subgroups	n	%	n	%	-21.2 1(<.001) X <sup>2</sup> (p-value)
Sex					NS
Male	705	40.3	1291	40.7	
Female	1046	59.7	1882	59.3	
Race/Ethnicity					34.63 (0.001)
NonHispanic White	1216	68.5	2016	65.4	
NonHispanic Black	167	9.4	439	14.2	
NonHispanic Asian	109	6.1	122	4.0	
Hispanic	214	12.0	392	12.7	
Other	70	3.9	113	3.7	
Marital Status					41.63 (<.001)
Married/in a partnership					
Divorced/separated/widowed					
Never married					
Occupation					339.13 (<.001)
Employed	940	53.6	1633	50.1	
Unemployed	155	8.8	133	4.1	
Homemaker	67	3.8	149	4.6	
Student	157	9.0	29	0.9	
Retired	389	22.2	1089	33.4	
Disabled	46	2.6	208	6.4	
Education					52.75 (<.001)
HS graduate					
College graduate					
Comorbidity					18.83 (<.001)
None	1104	65.8	1920	59.5	
Has one or more medical condition(s)	573	34.2	1308	40.5	
BMI Category					7.75 (.05)
Underweight	26	1.5	34	1.0	
Normal	580	32.7	986	30.2	
Overweight	617	34.8	1131	34.6	
Obese	548	30.9	1115	34.1	
Regular provider					35.00 (.001)
Yes	1116	66.0	2444	74.0	
No	574	34.0	857	26.0	
Health Status					46.86 (<.001)
Excellent/Very Good	961	54.2	1591	48.0	
Good	632	35.7	1162	35.0	
Fair/Poor	179	10.1	564	17.0	
Depression/Anxiety Disorder Diagnosis					6.50 (<.01)
Yes	424	24.9	713	21.7	
No	1280	75.1	2574	78.3	

<sup>a</sup>Frequencies not summing to total reflect missing data.

Similar to the comparison of depression and anxiety disorders between white and non-white groups in the general population (Hasin et al., 2018; Substance Abuse and Mental Health Services Administration, 2017), the self-reported rate of depression or anxiety diagnosis was lower among deaf adults who self-identified as NonHispanic Black or Asian in our sample than those who self-identified as NonHispanic White or Hispanic. However, patients who identified as NonHispanic and Hispanic ethnicity in the general population were significantly less likely to receive psychotropic medication compared to NonHispanic white patients. It is possible that similar trends

are occurring among racial and ethnic groups within the deaf population, particularly when the providers are not culturally competent in working with deaf patients with intersectional identities.

Communication access with health-care providers is essential for accurate diagnosis, treatment, and follow up care. It is unclear from this study if or how much the prevalence of depression and anxiety diagnosis is underreported due to missed diagnosis by the provider or lack of access to a regular provider. In our sample, deaf adults who reported that they saw a provider regularly in the past year were more likely to report a

**Table 3** Age-weighted sociodemographic characteristics for deaf and hearing adults with self-reported diagnosis of depression or anxiety disorder

	Deaf		Hearing		
	n = 424 <sup>a</sup>		n = 713 <sup>a</sup>		
	Mean (SD)		Mean (SD)		
Age	45 (15)		56 (14)		t-test (p-value)
Subgroups	n	%	n	%	−12.81 (<.001) X <sup>2</sup> (p-value)
Sex					NS
Male	112	27.5	199	29.0	
Female	296	72.5	488	71.0	
Race/Ethnicity					14.61 (.006)
NonHispanic White	299	70.9	480	71.3	
NonHispanic Black	33	7.8	84	12.5	
NonHispanic Asian	17	4.0	11	1.6	
Hispanic	54	12.8	62	9.2	
Other	19	4.5	36	5.3	
Marital Status					41.63 (<.001)
Married/in a partnership	177	42.0	326	46.0	
Divorced/separated/widowed	99	23.5	253	35.7	
Never married	145	34.4	130	18.3	
Occupation					132.98 (<.001)
Employed	236	56.5	307	44.7	
Unemployed	47	11.2	42	6.1	
Homemaker	24	5.7	41	6.0	
Student	47	11.2	8	1.2	
Retired	53	12.7	182	26.5	
Disabled	11	2.6	107	15.6	
Education					52.75 (<.001)
HS graduate	155	37.0	422	59.4	
College graduate	264	63.0	289	40.6	
Comorbidity					18.18 (<.001)
None	141	33.7	155	22.1	
Has one or more medical condition(s)	277	66.3	546	77.9	
BMI Category					12.58 (.006)
Underweight	9	2.1	11	1.6	
Normal	145	34.4	182	25.8	
Overweight	129	30.6	218	30.9	
Obese	139	32.9	295	41.8	
Regular provider					9.03 (.003)
Yes	295	72.8	570	80.6	
No	110	27.2	137	19.4	
Health Status					33.97 (<.001)
Excellent/Very Good	183	43.3	255	35.8	
Good	170	40.2	227	31.9	
Fair/Poor	70	16.5	230	32.3	

<sup>a</sup> Frequencies not summing to total reflect missing data.

diagnosis of depression or anxiety disorder than deaf adults who saw a doctor less regularly. The question about seeing a regular provider within the past year explicitly excluded mental health professionals, so it is possible that the individuals who had a regular provider also had better self-care, health literacy, and sought mental health care.

Consistent with the literature, deaf adults who had a comorbid condition and reported their health to be fair or poor were more likely to also report a diagnosis of depression or anxiety. Since those with physical health conditions are more often under the care of a physician, this increases the opportunity for physicians to identify and diagnose mental health disorders and encourage appropriate follow-up care.

Given the average age of 45 in the diagnosed group compared to the non-diagnosed group (mean age = 50), the rates of diagnosed depression and anxiety in deaf adults was significantly higher and younger compared to hearing adults in this sample. The higher mean age for hearing adults with a diagnosis of depression or anxiety disorder is likely due to the significantly higher number of retirees (27%) compared to only 13% in the deaf sample. This age difference also likely explains why the hearing sample had more individuals with comorbidity and worse overall health status compared to the deaf sample. Yet, despite the relationship between comorbid conditions and poor health with depression or anxiety disorder, the deaf sample still had higher rates of self-reported depression or anxiety disorder.

**Table 4** Sociodemographic characteristics for self-reported depression or anxiety disorder diagnosis among deaf adults

	Deaf sample (N = 1704)				
	Depression/anxiety diagnosis		No diagnosis		
	n = 424 <sup>a</sup>		n = 1280 <sup>a</sup>		
	Mean (SD)		Mean (SD)		
Age	45 (15)		50 (17)		t-test (p-value)
Subgroups	n	%	n	%	X <sup>2</sup> (p-value)
Sex					33.92 (<.001)
Male	112	27.5	555	43.7	
Female	296	72.5	716	56.3	
Race/Ethnicity					NS
NonHispanic White	299	70.9	879	69.0	
NonHispanic Black	33	7.8	124	9.7	
NonHispanic Asian	17	4.0	85	6.7	
Hispanic	54	12.8	142	11.1	
Other	19	4.5	44	3.5	
Marital Status					17.46 (<.001)
Married/in a partnership	177	42.0	655	51.6	
Divorced/separated/widowed	99	23.5	303	23.9	
Never married	145	34.4	311	24.5	
Education					15.61 (<.001)
HS graduate	155	37.0	611	48.1	
College graduate	264	63.0	660	51.9	
BMI Category					NS
Underweight	9	2.1	14	1.1	
Normal	145	34.4	420	33.0	
Overweight	129	30.6	451	35.5	
Obese	139	32.9	386	30.4	
Regular provider					10.91 (.001)
Yes	295	72.8	789	63.9	
No	110	27.2	446	36.1	
Health Status					40.79 (<.001)
Excellent/Very Good	183	43.3	744	58.3	
Good	170	40.2	433	33.9	
Fair/Poor	70	16.5	100	7.8	
Comorbidity					NS
None	265	63.5	836	66.6	
Present	152	36.5	420	33.4	
Language preference					NS
ASL	196	46.3	613	48.6	
English (and ASL)	227	53.7	649	51.4	
Mode of communication with physician					NS
ASL (direct/interpreter)	261	65.1	789	65.7	
English (written/spoken)	140	34.9	412	34.3	
Cultural identity					NS
Culturally deaf	155	44.5	474	46.2	
Deaf	99	28.4	313	30.5	
Hard of hearing	94	27.0	239	23.3	
Deaf parents					NS
Yes	103	25.8	297	24.1	
No	296	74.2	936	75.9	

<sup>a</sup> Frequencies not summing to total reflect missing data.

It is possible that environmental factors such as information deprivation trauma or early life stress might have predisposed the individual to mental health issues. Information deprivation trauma refers to a lack of understanding or access to information that has potential to be a stand-alone traumatic

experience, increase vulnerability to trauma, and/or exacerbate traumatization of a particular event (Schild & Dalenberg, 2015). Early life stress includes child maltreatment and poverty, both of which have been linked to poorer psychological health outcomes later in life (Maniam, Antoniadis, & Morris, 2014).



**Table 5** Age-weighted robust multivariable poisson regression for characteristics of deaf adults with self-reported diagnosis of depression or anxiety disorder

Variable	Poi Reg Adj PR	95% CI for Poi Reg (lower)	95% CI for Poi Reg (upper)
Age	0.980***	0.975	0.986
Female Sex <sup>a</sup>	1.688***	1.393	2.046
Race/Ethnicity <sup>b</sup>			
NonHispanic Black	0.598**	0.423	0.845
Hispanic	0.907	0.703	1.171
NonHispanic Asian	0.574**	0.382	0.862
Others	0.994	0.664	1.489
Education <sup>c</sup>			
High school degree	0.714***	0.600	0.850
Marital status <sup>d</sup>			
Divorced/separated/widowed	1.256 <sup>*</sup>	1.001	1.575
Never married	1.329**	1.091	1.618
Self-reported health status <sup>e</sup>			
Fair/poor	1.826***	1.450	2.298
Good	1.361***	1.127	1.643
Regular provider <sup>f</sup>	1.346***	1.123	1.612
Comorbidity <sup>g</sup>	1.394***	1.149	1.691

<sup>a</sup>Male is the reference group.<sup>b</sup>White is the reference group.<sup>c</sup>College degree is the reference group.<sup>d</sup>Married/in a partnership is the reference group.<sup>e</sup>Very good/excellent is the reference group.<sup>f</sup>Does not have a provider is the reference group.<sup>g</sup>No comorbidity is the reference group.<sup>\*</sup> $p \leq .05$ .<sup>\*\*</sup> $p \leq .01$ .<sup>\*\*\*</sup> $p \leq .001$ .

Adverse experiences during childhood alters brain functioning, stress response, and ultimately, the capacity to cope effectively with stressors later in life (Chen & Baram, 2016; Kuhlman, Geiss, Vargas, & Lopez-Duran, 2015). This accumulation of early life stress places the individual at risk for developing mental illness and may explain the higher rates of depression and anxiety among individuals exposed to early life stress (Kuhlman et al., 2015). For deaf individuals specifically, early life stress that is experienced in a more severe and chronic form such as the inability to communicate with or participate in family conversations, being deprived of access to information, and linguistic neglect that began in the early years can potentially contribute to an earlier manifestation of mental health problems and reduced quality of life outcomes (Hall, Levin, & Anderson, 2017; Humphries et al., 2016; Kushalnagar, Bruce, Sutton, & Leigh, 2017).

The overarching issue appears to lie in the access to appropriate health services for information, diagnosis, treatment, and follow up. It is difficult to compare results from this study to other studies done on depression and anxiety in the deaf population because of differing methodologies and cohort effects where the access to care may differ based on changing and hopefully improved access to care over time. Earlier studies on depression and anxiety in deaf adults typically used symptom-based checklists that were administered in English to a small number of participants who lived in the same community or received mental health services at the same hospital (Kvam, Loeb, & Tambs, 2007; Leigh, Robins, Welkowitz, & Bond, 1989), whereas our study used data from a fully accessible HINTS-ASL survey (Kushalnagar et al., 2017) that was given to a nationwide community sample of deaf adults and focused specifically on

the diagnoses that they received from their healthcare providers. This differing methodology represents the progress made in understanding and addressing the ethical issues inherent in conducting public health research with deaf adults (McKee, Schlehofer, & Thew, 2013). Strengths of this study include the breadth of demographic information, diversity of racial and ethnic backgrounds of the sample, and the largest population-based sample of deaf adults in a deaf health study. A limitation of the study is the reliance on self-report of diagnosis received by a healthcare provider, therefore, future research that addresses the accuracy of diagnoses received by a healthcare provider is warranted for this population. Another limitation is how the question about depression and anxiety disorder diagnosis was worded in English and delivered in ASL. No modifications were made to the original text so to allow comparative analyses of depression and anxiety disorder diagnosis between Deaf and hearing adults. No additional examples of depression and anxiety (e.g., bipolar; PTSD) were given in either English or ASL. Therefore, as written, this would not account for fund of information deficits that many Deaf individuals may have about what "depression" or "anxiety" mean and what diagnoses are included in these categories.

Based on present findings, future research is encouraged in learning more about deaf adults' experience with receiving a mental health diagnosis and the available treatment options. Research evidence-based, culturally appropriate treatment options for deaf individuals with depression or anxiety is sorely needed. Current research on telehealth and its potential for providing mental health services to deaf adults is promising (Pertz, Plegue, Diehl, Zazove, & McKee, 2018), and further research is encouraged around its efficacy and any potential risks for use

with deaf population. Deaf and hard of hearing individuals deserve full and equal access to mental health services and information in their preferred language, and existing surveillance indicates a lack of existing policies and resources for providing mental health services to deaf individuals (McDonnall, Crudden, LeJeune, & Steverson, 2017). This will require innovative solutions that increase the number of qualified clinicians and allow them the opportunity to connect with deaf patients in need of treatment.

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## Conflict of interest

No conflicts of interest were reported.

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