THE IMPACT OF CO-OCCURRING CHRONIC PAIN AND DEPRESSION/ANXIETY IN THE UNITED STATES FROM 2019 TO 2021

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CONTENTS

ABSTRACT.....3

METHOLODGY.....4

Data source.....4

Measures.....4

RESULT.....6

Limitation.....9

ABSTRACT

Background: The co-occurrence of chronic pain and Anxiety/Depression (A/D) is a significant public health concern. This study examines the prevalence and impact of co-occurring chronic pain and A/D among US adults using data from the National Health Interview Survey (NHIS) from 2019-2021.

Methods: We analyzed NHIS data from 93,047 US adults over the period 2019-2021. Chronic pain was defined based on self-reported pain frequency over the past three months. Anxiety and depression were identified through self-reported diagnoses by a healthcare professional. Participants were categorized into four groups: "no pain or A/D," "Pain only," "A/D only," and "Co-occurring pain and A/D." The prevalence of these groups was calculated using survey weights to represent the US adult population. Differences in demographic characteristics and health outcomes, including functional limitations, poor health, and overnight hospital visits, were analyzed using t-tests and logistic regression models.

Results: The prevalence of co-occurring chronic pain and A/D in the US adult population was 8.3%. Individuals with co-occurring pain and A/D were significantly more likely to report difficulty participating social activity (39.8%), difficulty doing errands alone (30.2%), work limited due to health problem (58.1%), poor health (46.7%), and overnight hospital visits (19.4%) compared to those in the other groups. Logistic regression analysis revealed that co-occurring pain and A/D was a significant predictor of all three adverse health outcomes (Odds Ratios: 3 social activity limitation, 2.5 errands alone limitation, 2.4 work limited, 2.5 for poor health, 1.3 for overnight hospital visits).

Conclusion: The co-occurrence of chronic pain and A/D is associated with a significantly higher burden of functional limitations, poor health, and healthcare utilization. These findings underscore the need for integrated approaches to manage chronic pain and mental health conditions in the US adult population.

METHOLODGY

Data source

Data for the study was obtained from the National Health Interview Survey (NHIS). Since 1957, the NHIS survey has been administered annually in the U.S. by the National Center for Health Statistics (NCHS) in conjunction with the Centers for Disease Control and Prevention (CDC). The NHIS is a cross-sectional household survey that provides nationally representative data on the U.S. civilian, noninstitutionalized population. The survey collects information on a broad range of health topics, including chronic conditions, mental health, and healthcare utilization.

The NHIS employs a complex, multistage probability sampling design to ensure that the data collected are representative of the entire U.S. adult population. Sampling weights are provided with the dataset to account for the survey design, including oversampling of certain demographic groups, nonresponse adjustments, and post-stratification to align with U.S. population estimates.

The study period included significant disruptions due to the COVID-19 pandemic. Beginning on March 19, 2020, NHIS shifted from in-person interviews to telephone-only interviews to maintain data collection while adhering to public health guidelines. In-person interviews resumed in select areas by July 2020 and nationwide by September 2020, though the telephone-first approach remained prevalent through April 2021. From May 2021, in-person interviews were conducted based on local conditions and health risks, though telephone interviews continued as the primary method.

The study sample was derived from the 2019-2021 adult interview NHIS datasets. Initially 93,047 respondents were included in the analysis. However, respondents with missing values or answered “refused”, “Don’t know”, “not ascertained” in chronic pain status, anxiety/depression, were excluded to ensure the accuracy and completeness of the analysis. After excluding cases with missing data, the final analytic sample comprised 91,058 respondents.

Measures

Self-reported chronic pain and Depression/Anxiety were the co-primary exposure for this study. Both variables were operationalized as a binary variable and used to stratify the population into four groups: neither pain nor A/D, pain only, A/D only, co-occurring pain and A/D.

Chronic pain was defined as an individual self-report current pain in any area of the body that has persisted for the past 3 month, based on the survey question "*In the past three months, how often did you have pain? Would you say never, some days, most days, or every day?*", respondents who answered "most day" or "every day" were coded as having chronic pain.

Anxiety or Depression disorder was defined as self-reported diagnoses by a healthcare professional. Participants were classified as having anxiety disorder if they responded "yes" to the question: "*Have you ever been told by a doctor or other health professional that you had any type of anxiety disorder?*" Similarly, participants were classified as having depression disorder if they responded "yes" to the question: "*Have you ever been told by a doctor or other health professional that you had any type of depression disorder?* "

Functional limitations and health outcomes were assessed across several dimensions. Difficulty doing errands alone was evaluated using the question: "*Because of a physical, mental, or emotional condition, do you have difficulty doing errands alone such as visiting a doctor's office or shopping?*" Participants who answered, "*some difficulty," "a lot of difficulty,"* or *"cannot do it at all"* were categorized as having difficulty with errands. Difficulty participating in social activities was measured by asking: *"Because of a physical, mental, or emotional condition, do you have difficulty participating in social activities such as visiting friends, attending clubs and meetings, or going to parties?"* Those who responded with *"some difficulty," "a lot of difficulty,"* or *"cannot do it at all"* were considered to have difficulty engaging in social activities. Work limitation due to health problems was assessed with the question: *"Are you limited in the kind OR amount of work you can do because of a physical, mental or emotional problem?"* Participants who answered *"yes"* were classified as having a work limitation. For general health status, participants were asked*: "Would you say your health in general is excellent, very good, good, fair, or poor?"* Those who rated their health as *"fair"* or *"poor"* were classified as having poor health, while those who rated their health as *"excellent," "very good,"* or *"good"* were categorized as having good health. Lastly, overnight hospital visits were determined by asking: *"During the past 12 months, have you been hospitalized overnight?"* Participants who responded "yes" were identified as having had an overnight hospital visit.

Descriptive statistics were calculated to determine the prevalence of chronic pain, anxiety/depression, and their co-occurrence. The prevalence was presented as the number of respondents, weighted population estimates (in millions), and as a proportion of the U.S. adult population. Differences in demographic characteristics and health outcomes among the four groups were assessed using t-tests for statistical significance.

Logistic regression models were used to examine the associations between the four groups and the outcomes of interest (functional limitations, poor health, and overnight hospital visits). Adjusted odds ratios (ORs) were reported.

RESULT

The analysis revealed that a significant portion of the US adult population experiences chronic pain and/or A/D. As shown in **Table 1**, the majority of respondents (65.7%) reported neither chronic pain nor A/D. However, 12.8% of adults reported chronic pain only, while 13.2% reported A/D only. Notably, 8.3% of the population reported co-occurring chronic pain and A/D.

Table 1. **Prevalence of chronic pain, anxiety/depression, and co-occurrence in the US adult general population.**

	Unweighted no.*	**Weighted no. (million)†**	**95 CI**	**POP. %‡**	**95 CI**
Neither	57594	161.7	156.1,167.3	65.7%	65.1, 66.3
Pain§ only	12829	31.4	30.2,32.7	12.8%	12.4,13.1
A\D** only	12243	32.7	31.4,34.1	13.2%	13.0,13.6
Co-occurring symptoms	8392	20.4	19.4,21.4	8.3%	8.0,8.6

Figure 1 illustrates the consistency of these prevalence rates over the three-year period from 2019 to 2021. The proportion of individuals in each group remained relatively stable, indicating a persistent burden of these conditions in the US adult population.

* Data Source: National Center for Health Statistics, National Health Interview Survey, 2019-2021.
Unweighted no. number of responses in survey sample.

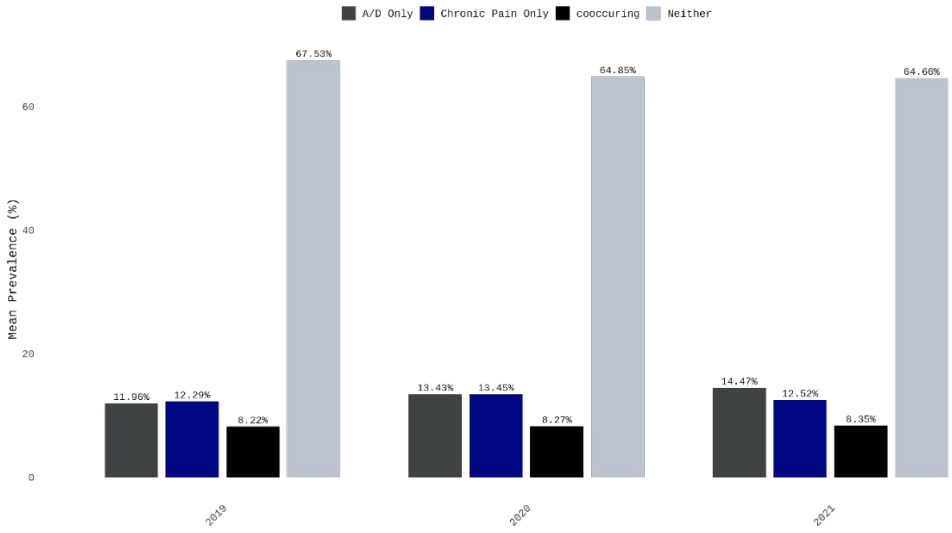
† **Weighted no.** national prevalence, reported in millions of US adults.

‡ **Pop. %** national prevalence as a proportion of the US adult general population.

§ **Chronic pain only** Pain reported on most days or every day during the previous 3 months.

** **A\D** are defined as adult who's ever had anxiety disorder or ever had depression disorder.

Figure 1 Prevalence of chronic pain and A\D among adults - United States, 2019-2021[††]



When comparing demographic characteristics across the groups **Table 2**, significant differences were observed. Individuals with co-occurring chronic pain and A/D were more likely to be middle-aged (45-64 years old) and female. These differences underline the importance of considering demographic factors in the management of chronic pain and mental health conditions.

Table 2 Prevalence of co-occurring chronic pain and depression among adult, by demographic characteristics – US 2019-2021

	Unweighted no.	**Weighted no. (million) [‡‡]**	**Prevalence %**
Overall (2019-2021)	**8392**	**20.4(19.4,21.4)**	**8.3 % (8.0,8.6)**
Survey year			
2019	2880	20.1(18.8,21.3)	8.2 % (7.8,8.7)
2020	2852	20.5(19.2,21.2)	8.3 % (7.9,8.7)[§§]
2021	2660	20.6(19.4,21.8)	8.4 % (8.0,8.8)
Age group			
18-44(Ref)	1906	5.9(5.5,6.3)	5.4 % (5.1,5.8)
45-64	3513	8.9(8.4,9.4)	11.1 % (10.6,11.7)***
≥ 65	2968	5.5(5.2,5.9)	9.7 % (9.3,10.2) ***
Sex			
Female (Ref)	5584	13.3(12.6,14.0)	10.4 % (10.0,10.9)
Male	2805	7.1(6.7,7.6)	6.0 % (5.7,6.3) ***
Race and ethnicity[†††]			
AI/AN, Non-Hispanic	87	0.2(0.1,0.3)	12.2 % (8.1,18.0)

[††] Sample sizes were used to address chronic pain & A/D were as follows: 2019(n= 31,260), 2020 (n=31,081), 2021 (n= 28,717). Missing response and responded who answer “refused”, “Don’t know”, “not ascertained” were excluded from the analysis.

[‡‡] Weighted estimates are rounded. Response coded as “refused”, “don’t know”, “not ascertained” or similar missing value were excluded from the corresponding analysis.

[§§] Despite evaluating difference in co-occurring chronic pain and depression over the year, the result was not statically significant ($p > 0.05$).

*** T-test was used to determine statically significant difference in co-occurring condition for subgroup defined by selected characteristic, difference with p-value ≤ 0.05 were consider statically significant.

			***
Asian, non-Hispanic	104	0.2(0.1,0.3)	1.6 % (1.3,2.1) ***
Black/African America, non-Hispanic	763	1.9(1.7,2.2)	6.8 % (6.1,7.5) ***
Hispanic (Ref)	750	2.2(1.9,2.4)	5.3 % (4.9,5.8)
Other single and multi-race	230	0.6(0.5,0.7)	11.8 % (9.9,14.1)***
White, non-Hispanic	6458	15.3(14.4,16.1)	9.8 % (9.4,10.2)***
Employment status[‡‡‡]			
Employed (Ref)	533	1.5(1.4,1.7)	8.8 % (7.9,9.8)
NE, never worked	135	0.4(0.3,0.5)	6.1 % (5,7.5)***
NE, worked previously	4601	10.2(9.7,10.7)	15.3 % (14.7,15.9)***
Marital status			
Married (Ref)	2087	3.8(3.5,4.0)	15.2 % (14.4,16.1)
Widowed	557	2.0(1.7,2.2)	9.3 % (8.4,10.3)***
Divorced/Separated	3184	9.2(8.7,9.8)	7.3 % (7.0,7.6)***
Never married	1368	3.3(3.1,3.6)	5.9 % (5.5,6.4)***
Living with partner	1100	1.8(1.7,2.0)	12.9 % (12.0,13.9)

[†††] Racial ethic categories from the sample adult codebook were used. Person identifying as “other single and multi-race” or “NH America Indian or Alaska Native and any other group” were combined into “Other, multiple races, NH” .

[‡‡‡] Persons worked during the previous 12 month were consider employed.

The study analyzed the prevalence of poor health, hospitalizations, and functional limitations across the different groups. As shown in **Table 3** and **Figure 2**, the prevalence of self-reported poor health was significantly higher among individuals with co-occurring pain and A/D (46.7%) compared to those with neither condition (6.9%). The odds ratio (OR) for poor health in the co-occurring group was 2.5 indicating more than twice the likelihood of reporting poor health compared to the group that have neither pain nor depression ($p < 0.001$). The data also revealed a higher prevalence of overnight hospital visits in the co-occurring group (19.4%) compared to the neither condition group (6.0%), with an OR of 1.3. This suggests that individuals with both chronic pain and A/D are more likely to be hospitalized overnight than those without these conditions ($p < 0.001$). The study further examined specific functional limitations, including difficulty doing errands alone, participating in social activities, and work limitations due to health problems. As outlined in **Table 3**, individuals in the co-occurring group reported significantly higher levels of functional limitations across all dimensions. For instance, 58.1% of the co-occurring group experienced work limitations due to a health problem, compared to only 10.8% in the neither condition group (OR: 2.4, $p < 0.001$). These results, visualized in **Figure 1**, underscore the disproportionate health burden faced by individuals with co-occurring chronic pain and A/D. The consistently higher prevalence rates and odds ratios across all examined health outcomes highlight the synergistic impact of these conditions on overall health and functionality.

Table 3 Prevalence of Poor Health, Overnight Hospital Visits, and Functional Limitations Among U.S. Adults by Chronic Pain and Anxiety/Depression Status, 2019-2021[§§§]

	Exposure group	Unweighted no.	Weighted no. (million)	Prevalence % (95% CI)	OR	p-Value OR
Reporting poor health	Neither	4041	11.13	6.9(6.7,7.2)	Ref	Ref
	Pain only	3642	8.9	28.3(27.3,29.4)	1.7	< 0.001
	A\D only	1917	5.1	15.5(14.6,16.4)	0.9	< 0.001
	Co-occurring	3920	9.5	46.7(45.2,48.1)	2.5	< 0.001
Overnight stay in hospital (in past 12 months)	Neither	3828	9.7	6.0(5.8,6.3)	Ref	Ref
	Pain only	1895	4.4	13.9(13.2,14.6)	0.9	< 0.001
	A\D only	1262	3.2	9.8(9.2,10.6)	0.5	< 0.001
	Co-occurring	1626	3.9	19.4(18.3,20.4)	1.3	< 0.001
difficulty doing errands	Neither	2048	5.5	3.4(3.2,3.6)	Ref	Ref
	Pain only	1865	4.2	13.5(12.7,14.2)	1.5	< 0.001

[§§§] Logistic regression was used for the estimation of odds ratios (ORs).

alone	A\D only	1399	3.9	12.0(11.2,12.9)	1.4	< 0.001
	Co-occurring	2534	6.2	30.2(29.0,31.5)	2.5	< 0.001
difficulty participating in social activities	Neither	1845	5.0	3.1(2.9,3.3)	Ref	Ref
	Pain only	1719	4.0	12.8(12.0,13.6)	1.5	< 0.001
	A\D only	2222	6.6	20.1(19.1,21.2)	2.1	< 0.001
	Co-occurring	3258	8.1	39.8(38.5,41.2)	3.0	< 0.001
work limited due to a health problem	Neither	6584	17.4	10.8(10.4,11.2)	Ref	Ref
	Pain only	4936	11.3	36.1(35.0,37.2)	1.5	< 0.001
	A\D only	2741	7.0	21.5(20.6,22.5)	0.8	< 0.001
	Co-occurring	5016	11.8	58.1(56.7,59.5)	2.4	< 0.001

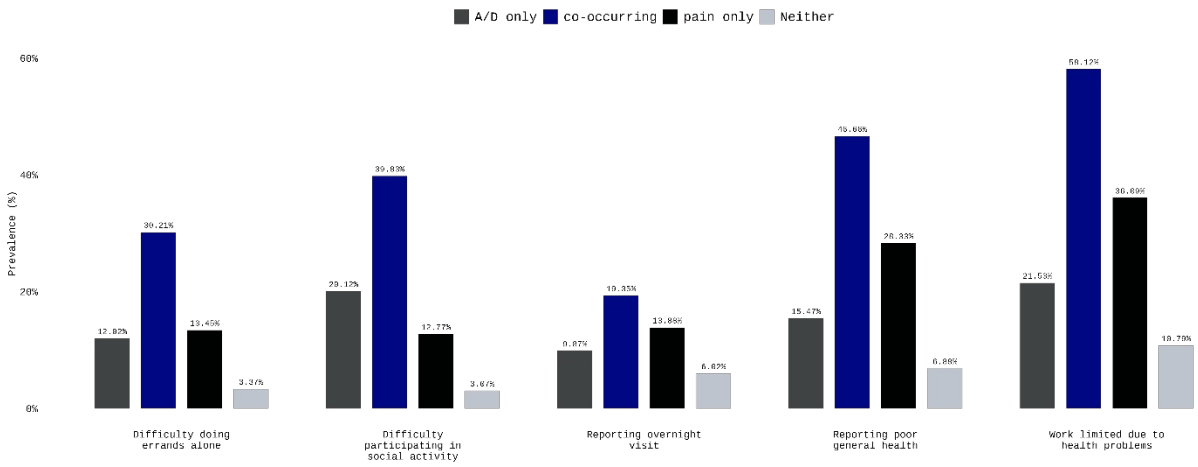


Figure 2 Distribution of Key Health Outcomes by Exposure Group

LIMITATION

A few limitations of this study should be noticed. First, the NHIS data is cross-sectional, which limits the ability to establish causal relationships between chronic pain, anxiety/depression, and the outcomes studied. Second, the study relies on self-reported data, which may be subject to recall bias or social desirability bias. Third, the study period included the COVID-19 pandemic, which caused significant disruptions to data collection methods. Fourth, this study did not differentiate between various subtypes of anxiety and depression, which may have

different implications for individuals with chronic pain. Finally, while the study examined data over the years 2019 to 2021, the interaction between chronic pain and anxiety/depression did not show significant statistical variation across these years.