Social Media Use for Health Purposes by Chronic Disease Patients in the United States

Noara Alhusseini, Jim E. Banta, Jisoo Oh, Susanne B. Montgomery¹

School of Public Health, Loma Linda University, ¹School of Behavioral Health, Loma Linda University, Loma Linda, California, United States

Abstract Background: Social media can be a cost-effective instant tool for exchanging health information among those with chronic diseases. However, few studies have analyzed the nexus between chronic disease and patients' use of the internet for health-related purposes.

Objective: The objective of this study is to determine if chronic disease patients in the United States use social media platforms to share health information and/or join groups of similar condition.

Materials and Methods: This cross-sectional study conducted a secondary analysis of the Health Information Trends Survey dataset 5 (cycle 1 of 2017 and cycle 2 of 2018) (N = 6650), which is nationally representative of American adults. A series of chi-square tests was carried to examine the association between using social media by chronic disease patients and (a) sharing health information and (b) participating in relevant health groups. Logistic regression analysis was used to determine significant findings.

Results: In terms of sharing health information on social media sites, those who were aged 18–49 years (P < 0.0001) and underweight (P = 0.04) were more likely to share health information on social media, while males were less likely to do so (P < 0.0001). In terms of joining relevant health groups on social media, predictors were being aged 35–49 years (P = 0.008), having a Bachelor's or postbaccalaureate degree (P < 0.02) and having depression or anxiety disorder (P = 0.004); males were less likely to join such groups (P = 0.0004). **Conclusion:** Individuals with chronic conditions, except depression or anxiety disorder, were not likely to participate in social media support groups. Future studies should explore how social media can be used to effectively engage those with chronic diseases, which may assist in disease management.

Keywords: Anxiety, chronic medical conditions, health information, online support groups, social media, underweight

Address for correspondence: Dr. Noara Alhusseini, School of Public Health, Loma Linda University, Loma Linda, California, United States. E-mail: alhusseini.n@gmail.com Submitted: 10-May-2020 Revised: 26-Aug-2020 Accented: 27-Son 2020 Publiched: 26 Doc 2020

Submitted: 10-May-2020 Revised: 26-Aug-2020 Accepted: 27-Sep-2020 Published: 26-Dec-2020

INTRODUCTION

In the Unites States, 6 of 10 adults in 2018 had a chronic disease, with 4 of 10 adults having two or more. Chronic diseases are major contributors and drivers of the annual health-care cost in the country.^[1] The Internet is commonly used nowadays, and its use can have both detrimental

Access this article online		
Quick Response Code:		
	www.sjmms.net	
	DOI: 10.4103/sjmms.sjmms_262_20	

and beneficial effects on general health. This, in turn, can influence the onset or status of chronic medical conditions.^[2,3] In 2018, 7 in 10 Americans used social media, which refers to online applications that permit users to create and exchange content. The use of social media has seen rapid adoption: from 5% in 2005, 50% in 2011 and 69% in 2018 among adults.^[4,5] In health care, there are many

This is an open access journal, and articles are distributed under the terms of the Creative Commons Attribution-NonCommercial-ShareAlike 4.0 License, which allows others to remix, tweak, and build upon the work non-commercially, as long as appropriate credit is given and the new creations are licensed under the identical terms.

For reprints contact: WKHLRPMedknow_reprints@wolterskluwer.com

How to cite this article: Alhusseini N, Banta JE, Oh J, Montgomery SB. Social media use for health purposes by chronic disease patients in the United States. Saudi J Med Med Sci 2021;9:51-8.

benefits of using social media, as it can be a cost-effective, instant tool for exchanging health information.^[6]

Welch *et al.*^[7] suggest that social media removes geographic and physical access barriers, and thus promotes health equity among disadvantaged populations. Free access to the vast online health information sources creates opportunities for empowerment, information exchange and engagement in health-promoting behaviors.^[8] In addition, social media also provides interactivity between health-care providers and online health seekers, allowing open discussions, raising questions and allowing for spiritual and emotional support, and such interactions are of potential use in the management of the diseases.^[9-12] In fact, in a systematic review that evaluated the clinical outcomes related to social media use among patients with chronic diseases, it was concluded that providing social and emotional support using social media helps improve care of patients with chronic diseases.^[13]

Factors such as privacy have been shown to limit the use of social media for health-related purposes.^[14] However, currently, there is a lack of evidence regarding the use of social media platforms by chronic disease patients to share health information and/or join support groups. Therefore, the current study was conducted with the aim of identifying this and assessing possible factors that may influence these decisions.

MATERIALS AND METHODS

Study design, setting and participants

This cross-sectional study carried out a secondary analysis of the Health Information Trends Survey (HINTS) dataset 5: Cycle 1 of 2017 and Cycle 2 of 2018. HINTS is a nationally representative survey administered by the National Cancer Institute. The data had been collected using a self-administered mail questionnaire. The database is free to researchers and is available for use without the need for permission, as it comprises de-identified information of the participants to ensure anonymity and confidentiality. This study was approved by the Institutional Review Board of Loma Linda University.

The inclusion criteria were civilian noninstitutionalized adults in the United States, and the exclusion criteria were children, homeless and institutionalized populations. Merging the two datasets resulted in a total of 6650 participants,^[15] after deleting 186 surveys of participants with missing or invalid responses for the outcome measures.

Outcomes and classification of variables

Two outcomes were chosen for this study. The first outcome was sharing health information on social networking sites and the survey question was: "In the last 12 months, have you used the internet for any of the following reasons:" (with one of the possible responses being) "To share health information on social networking sites, such as Facebook or Twitter?" The answer choices were "yes" or "no." The second outcome was participation in an online forum for people with similar health issues and the corresponding survey question for this was: "In the last 12 months, have you used the Internet for any of the following reasons: To participate in an online forum or support group for people with a similar health or medical issue?" (with the answer choices being "yes" or "no").

The independent variables were body mass index (BMI) and chronic medical conditions included diabetes or high blood sugar, high blood pressure or hypertension, heart condition, chronic lung disease, arthritis and depression or anxiety. For BMI calculation, the self-reported weight and height of the study participants were used. The BMI categories included: Underweight (<18.5), normal (18.5–24.9), overweight (25–29.9), obesity 1 (30–34.5), obesity 2 (35–39.9) and obesity 3 (>40). For chronic medical conditions, the survey questions asked if the respondents had such conditions with a yes/no answer choice. Demographic measures included age, gender, race/ethnicity, education, household income and employment, with most measures being recoded to create fewer categories.

Statistical methods

A series of survey-adjusted Wald chi-square tests were conducted to examine the associations of demographics and health status with using social media to share health information and with participating in online support groups. Then, survey-adjusted logistic regression analysis was used to determine the demographic and health status measures that were significantly associated with using social media and participating in online support groups (i.e., "yes" in both cases). To improve model performance and reduce the likelihood of spurious findings, only measures with a P < 0.2 were included in the cross-tabulation to force into the associated regression. For each independent variable, the most frequent category was used as the reference. Records with missing values in any of the independent variables were removed from both regression models. Model strength was indicated by the C-statistic or area under the curve. SAS 9.4 software (SAS Institute, Cary, NC) was used for all analyses. P < 0.05 was considered statistically significant.

RESULTS

The included 6650 respondents represent an estimated annual population of 245.8 million adults in the United States, of which 20% used social media for health purposes. Of those who share health information on social media sites, 53.3% were aged 18–49 years (P < 0.0001), 71.4% were female (P < 0.0001), 53.6% were non-Hispanic White (P = 0.15), 81.5% had at least some college education (P = 0.0008), 61.6% were employed (P < 0.0001) and 52.3% had an annual household income of \$50,000 or more (P = 0.33) [Table 1]. Of those who did not share health information on social media sites, 68.6% were at least 50 years or older. Only a minority of respondents, 34.3% and 31.6%, respectively, reported hypertension and depression or anxiety disorder, respectively, while 66.3% of those sharing health information on social media were overweight/obese.

As shown in Table 2, bi-variable analyses revealed that participants in online support groups with similar health issues were most commonly aged ≤ 49 years (54.5%; P< 0.0001), female (72.4%; P < 0.0001), non-Hispanic Whites (68.6%; P = 0.0002), had at least some college education (85.8%; P < 0.0001), had annual household income of \$50,000 and above (57.6%; P = 0.06) and were employed (61.9%; P < 0.0001). Of those who do not use online support groups, 26% had an education level less than a college degree. There was a statistically significant difference between the users of online support groups and nonusers on all demographic variables (P < 0.05), except household income. Among all chronic health conditions and for BMI, only persons experiencing mental health conditions (depression or anxiety disorder) were more likely to participate in online support groups (P = 0.0002).

In the logistic regression, the total number of observations used in the models was 4862 owing to the list-wise deletion of those with missing data. Table 3 presents the data regarding those more likely to share health information on social media. In terms of age, respondents aged <49 years were at least twice more likely to share health information on social media platforms compared with those aged 50-64 years (P < 0.0001), while those aged ≥ 65 years were 43% less likely to share the same than those aged 50–64 years (P = 0.0001). Males were 54% less likely to share health information on social media sites than females (P < 0.0001). Underweight respondents were 2.5 times more likely to share health information on social media sites compared to normal weight respondents (P = 0.04). Among those who were underweight, 54.6% were aged 18-34 years, 65% were females, 3.9% had diabetes, 21% had high blood pressure, 8% had a heart condition, 13.1% had a lung disease, 17.1% had arthritis and 13.3% had depression or anxiety disorder. An additional regression was run to examine the linear effect of ordinal variables, as measured by the Wald chi-square statistic. The observed trend for age groups was P < 0.0001, education P = 0.1733 and for BMI P = 0.5639.

In terms of participating in online support groups for similar health issues, it was found that those aged 35–49 were 1.8 times more likely to join than those aged 50–64 years (P = 0.008), males were 50% less likely to participate than females (P = 0.0004) and those with a Bachelor's or postbaccalaureate degree holders were 2.1 times more likely to participate than high school graduates (P < 0.02). Respondents with depression or anxiety disorder were 1.7 times more likely to participate in such online support groups (P = 0.004) [Table 4].

Characteristic	Yes (<i>n</i> =892), <i>n</i> (%)	No (<i>n</i> =5758), <i>n</i> (%)	Р
Age (years)			
18-34	181 (20.3)	584 (10.1)	< 0.0001
35-49	294 (33)	1010 (17.5)	
50-64	282 (31.6)	1867 (32.4)	
65-74	89 (10)	1286 (22.3)	
≥75	24 (2.7)	819 (14.2)	
Missing	22 (2.4)	192 (3.33)	
Gender			
Male	243 (27.2)	2405 (41.8)	< 0.0001
Female	637 (71.4)	3252 (56.4)	
Missing	12 (1.3)	101 (1.8)	
Race/ethnicity			
Non-Hispanic white	478 (53.6)	3331 (57.85)	0.15
Non-Hispanic black	128 (14.35)	706 (12.26)	
Hispanic	148 (16.6)	719 (12.49)	
Non-Hispanic other	81 (9.1)	423 (7.35)	
Missing	57 (6.4)	579 (10)	

Table 1: Survey-weighted characteristics of Health Information Trends Survey respondents, 2017-2018, (*n*=6650), stratified by respondents who use social media to share health information

Alhusseini, <i>et al</i> .: 3	Social media	use for health	purposes
-------------------------------	--------------	----------------	----------

Table 1: Contd..

Characteristic	Yes (<i>n</i> =892), <i>n</i> (%)	No (<i>n</i> =5758), <i>n</i> (%)	Р
Education			
Less than high school	35 (3.9)	433 (7.52)	0.0008
High school graduate	114 (12.8)	1096 (19)	
Some college	287 (32.2)	1658 (28.8)	
Bachelor's degree	274 (30.7)	1447 (25.1)	
Postbaccalaureate	166 (18.6)	995 (17.3)	
Missing	16 (1.8)	129 (2 2)	
Household income (\$)	10 (1.0)	(2.2)	
0-19 999	141 (15.81)	962 (16 71)	0.33
20 000-40 000	235 (26.3)	1375 (24)	0.00
50,000-49,999	233 (20.3)	1560 (27)	
100,000-99,999	241 (27)	1202 (21)	
Missing	220 (23.3)	1202 (21) 650 (11 2)	
IVIISSIIIg	49 (5.5)	050 (11.5)	
Employment		0700 (4 (02)	<0.0001
Employed	545 (61.1)	2709 (46.83)	<0.0001
Retired	128 (14.35)	1898 (32.8)	
Other	194 (21.7)	914 (15.8)	
Missing	25 (2.8)	237 (4.1)	
Diabetes/high blood sugar			
Yes	175 (19.6)	1172 (16.5)	0.66
No	698 (78.3)	4465 (81.9)	
Missing	19 (2.1)	121 (1.6)	
Hypertension/high blood pressure			
Yes	306 (34.3)	2658 (46)	0.003
No	573 (64.2)	2977 (51.46)	
Missing	13 (1.4)	123 (2.12)	
Heart condition			
Yes	74 (8.3)	579 (10)	0.71
No	805 (90.2)	5084 (87.88)	
Missing	13 (1.45)	95 (1.64)	
Chronic lung disease	()		
Yes	136 (15.24)	753 (13)	0.15
No	744 (83.4)	4908 (84.9)	
Missing	12 (1.34)	97 (1.7)	
Arthritis	.= ()	<i>,,,</i> ()	
Yes	215 (24 1)	1803 31 16)	0.11
No	664 (74 43)	3850 (66 86)	0.11
Missing	$13(1\Lambda)$	105 (1.8)	
Depression or anxiety disorder	10 (1.4)	103 (1.0)	
	282 (31.6)	1232 (21 20)	0.000
No	509 (67 04)	1202 (21.27)	0.007
NU Minoing	12 (1.2)	4400 (70.10)	
Wissing	12 (1.3)	120 (2.1)	
BIVII	1((1.0)	(0 (1 0)	0.04
Underweight	16 (1.8)	69 (1.2)	0.04
Normal	266 (29.8)	1/00 (29.4)	
Overweight	275 (30.8)	1955 (33.79)	
Obesity 1	165 (18.5)	1057 (18.27)	
Obesity 2	89 (10)	458 (7.91)	
Obesity 3	62 (7)	325 (5.61)	
Missing	19 (2.1)	194 (3.35)	

BMI categories: Underweight (<18.5), normal (18.5-24.9), overweight (25-29.9), obesity (30-34.5), obesity 2 (35-39.9), obesity 3 (>40). *P* values based on survey-adjusted Wald Chi-square test. BMI – Body mass index

Table 2: Survey-weighted characteristics of respon	dents from Health Information	n Trends Survey 2017-2018	stratified by respondents
who use online support groups (<i>n</i> =6650)			

Characteristic	Yes (<i>n</i> =399), <i>n</i> (%)	No (<i>n</i> =6251), <i>n</i> (%)	Р
Age (years)			
18-34	82 (20.55)	683 (10.9)	< 0.0001
35-49	136 (34)	1168 (18.7)	
50-64	124 (31)	2025 (32.39)	
65-74	35 (8.77)	1340 (21.43)	
75+	12 (3)	831 (13.29)	
Missing	10 (2.5)	204 (3.26)	

Contd...

Alhusseini, et al.: Social media use for health purposes

Characteristic Yes (n=99), n (%) No (n=221), n (%) P Maie 104 (24.1) 2544 (40.69) <0.0001 Maie 104 (24.1) 2540 (72.4) 3000 (75.79) <0.0001 Missing 6 (1.5) 107 (1.71) Resc/sthnicity 0.0002 Non-Hispanic Black 6 33 (15.8) 77 (12.3) 0.0002 Masing 2 1 (5.26) 6 15 (9.8) <0.0001 Missing 2 1 (5.26) 6 15 (9.8) <0.0001 Missing 2 1 (5.26) 117 (2 (2 1)) <0.0001 Missing 12 (2 (31) 118 (1 (2 1)) <0.0001 Stance college 12 (3 (2 1) 1593 (25.48) <0.0001 Deschool graduate 9 1 (22.8) 1070 (17.1) <0.0001 Missing 8 (2 (2 1) 1593 (25.48) <0.0001 <0.0001 Deschool graduate 9 1 (22.8) 1070 (17.1) <0.0001 Missing 8 (2 (1 2) 1309 (20.41) <0.0001 <0.0001 Deschool graduate 5 (1 (27.8) 10	Table 2: Contd			
Gender	Characteristic	Yes (<i>n</i> =399), <i>n</i> (%)	No (<i>n</i> =6251), <i>n</i> (%)	Р
Male 104 (26.1) 2544 (40.69) <0.0001 Fernale 289 (72.4) 3600 (57.59)	Gender			
Female 289 (72.4) 3600 (57.59) Missing 6 (1.5) 177 (12.3) Race, Athnicity 771 (12.3) 0.0002 Non-Hispanic White 63 (15.8) 771 (12.3) 0.0002 Non-Hispanic Black 63 (15.8) 771 (12.3) 0.0002 Non-Hispanic Cher 32 (8) 472 (7.6) 0.0001 Missing 21 (5.26) 61 (9.8) 0.0001 Education 1.0001 117 (4.26) 451 (7.2) <0.0001	Male	104 (26.1)	2544 (40.69)	< 0.0001
Missing Resc/ethnic/su 107 (17.1) Non-Hispanic White 234 (88.64) 3575 (57.19) 0.0002 Non-Hispanic Black 63 (15.8) 77 (17.3) 0.0002 Missing 21 (5.20) 818 (13.1) 0.0002 Missing 21 (5.20) 615 (9.2) 0.0001 Missing 21 (5.20) 615 (9.2) 0.0001 Less than high school 7 (4.26) 451 (7.2) <0.0001	Female	289 (72.4)	3600 (57.59)	
Race, ethnicity Rate, ethnicit	Missing	6 (1.5)	107 (1.71)	
Non-Hispanic White 234 (68.64) 357 (57.19) 0.0002 Non-Hispanic Black 63 (15.8) 77 (12.3) 1 Hispanic other 32 (8) 472 (7.6) 1 Missing 21 (5.26) 451 (7.2) <0.0001	Race/ethnicity			
Non-Hispanic Black 63 (15.8) 77 (12.3) Hispanic 49 (12.28) B1 (13.1) Non-Hispanic other 32 (8) 472 (7.6) Basing 21 (5.26) 615 (9.8) Education	Non-Hispanic White	234 (68.64)	3575 (57.19)	0.0002
Hispanic 49 (12.28) 47 (2.76) Missing 21 (5.26) 615 (4.8) Education	Non-Hispanic Black	63 (15.8)	771 (12.3)	
Non-Hispanic other 32 (8) 472 (7.6) Hissing 21 (5.26) 615 (9.8) Education	Hispanic	49 (12.28)	818 (13.1)	
Missing 21 (5.26) 6 15 (9.8) Education	Non-Hispanic other	32 (8)	4/2 (/.6)	
Letucation Less than high school graduate 31 (7.76) 451 (7.2) <0.0001 High school graduate 31 (7.76) 1179 (18.86) Some college 124 (31) 1821 (29.1) Bachelor's degree 128 (32) 1503 (25.48) Postbaccalaureate 91 (22.8) 1070 (17.1) Missing 8 (2) 137 (2.19) Household income (\$) 0-19,999 55 (13.78) 1048 (16.76) 0.06 20,000-49,999 68 (21.55) 1524 (24.38) 50,000-99,999 111 (27.81) 1699 (27.17) 100,000 or more 119 (29.82) 1309 (20.94) Missing 26 (7) 671 (10.73) Employment 26 (7) 671 (10.73) Employment 97 (18) 1021 (16.33) Other 67 (18) 1021 (16.33) Missing 14 (3.5) 248 (3.96) Diabetes / high blood sugar Yes 71 (17.79) 1276 (20.41) 0.77 No 319 (79.94) 4844 (77.49) 0.77 Missing 9 (2.25) 131 (2.1) Missing 8 (2) 128 (2) 0.43 Missing 8 (2) 128 (2) 0.43 Missing 8 (2) 128 (2) 0.43 Missing 71 (17.79) 1276 (20.41) 0.77 No 326 (65.16) 3220 (52.3) 0.43 Missing 8 (2) 128 (2) 0.43 Missing 7 (1.75) 101 (1.61) Cronclung disease 7 (1.75) 101 (1.61) Cronclung disease 7 (1.75) 101 (1.61) Cronclung disease 7 (1.75) 102 (1.6) Missing 7 (1.75) 102 (1.6) Missing 7 (1.75) 102 (1.6) Missing 7 (1.75) 102 (1.6) Missing 7 (1.75) 101 (1.61) Cronclung disease 8 (17) 822 (13.1) 0.75 No 324 (81.2) 5328 (85.2) Missing 7 (1.75) 102 (1.6) Missing	Missing	21 (5.26)	615 (9.8)	
Lass than ingli school 1 (4.26) 417 (27) 40.000 (High school graduate 31 (7.76) 1179 (18.86) Some college 128 (32) 1593 (25.48) Postbaccalaureate 91 (22.8) 1070 (17.1) Missing 8 (2) 137 (2.19) Household income (\$) 0.19,999 55 (13.78) 1048 (16.76) 0.06 20,000-49,999 86 (21.55) 1524 (24.38) 55,000-99,999 111 (27.81) 1699 (27.17) 100,000 or more 119 (29.82) 1309 (20.94) Missing 28 (7) 671 (10.73) Employeent Employeent Employeent Employeent Employeent Postback (20.94) Missing 14 (3.5) 248 (3.96) Diabetes / high blood sugar Yes 71 (17.79) 1276 (20.41) 0.77 No 319 (79.94) 4844 (77.49) Missing 9 (22.5) 131 (2.1) Yes 36 (9) 617 (9.87) 0.73 No 250 (65.15) 3220 (56.3) Missing 8 (2) 122 (2) Heart condition Yes 36 (9) 617 (9.87) 0.73 No 356 (89.22) 5533 (86.51) 0.73 No 356 (89.22) 5533 (86.51) 0.73 No 356 (89.22) 5533 (86.51) 0.73 No 324 (81.2) 128 (2) Heart condition Yes 6 (817) 821 (13.1) 0.15 No 324 (81.2) 128 (85.1) No 324 (81.2) 128 (85.2) No 324 (81.2) 129 (13.1) 0.15 No 324 (81.2) 129 (13.1) 0.15 No 324 (81.2) 120 (11.61) Yes 0 (81 (7.1) 1276 (20.4) 0.73 No 324 (81.2) 120 (12.6) Missing 7 (1.75) 102 (1.6) Athritis	Education	17 (4.0()		-0.0001
High school graduate 3 1 (7.76) 117 (7.6) 1182 (22.1) Bachelor's degree 128 (32) 1593 (25.48) Postbaccaluareate 9 (22.8) 1377 (2.19) Missing 8 (2) 1377 (2.19) 0.06 0.06 D0.19,999 55 (13.78) 1048 (16.76) 0.06 20,000-49,999 86 (21.55) 1524 (24.38) 0.06 50,000-99,999 111 (27.81) 1699 (27.17) 100,000 or more 119 (29.82) 1300 (20.94) Missing 28 (7) 671 (10.73) Temployment Temployment 71 (17.79) 300 (20.94) 300 (20.94) Retried 51 (12.78) 1021 (16.33) 0.001 0.01 0.01 Retried 51 (17.79) 276 (20.41) 0.77 0.7<	Less than high school	17 (4.26)	451 (7.2)	<0.0001
Some College 124 (31) 122 (31) 1593 (25.48) Postbaccalaureate 91 (22.8) 1070 (17.1) Household income (5)	High school graduate	31 (7.76)	11/9 (18.86)	
bacheor's degree 128 (32) (159 (32)) Missing 8 (2) 137 (2.19) Missing 8 (2) 137 (2.19) 0-19,999 55 (13.78) 1048 (16.76) 0.06 0,000-99,999 86 (21.55) 1524 (24.38) 100000 or more 100,000 or more 119 (29.82) 309 (20.94) 100000 or more Missing 28 (7) 671 (10.73) 100000 or more Employed 24 (7 (1.9) 3007 (48) <0.0001	Some college	124 (31)	1821 (29.1)	
Productabulation P1 (20) 107 (17.1) Missing B (2) 137 (2.19) Household income (\$) 0 0.06 0.19,999 55 (13.78) 1048 (16.76) 0.06 20,000-49,999 111 (27.81) 1699 (27.17) 100,000 or more 119 (29.82) 13309 (20.94) Missing 28 (7) 671 (10.73) Employment 28 (7) 671 (10.73) Employment 87 (1.8) 1221 (16.33) 007 (48) <0.0001	Bachelor's degree	128 (32)	1070 (17.1)	
Initiality 0 (2) 137 (2.19) O-19,999 55 (13.78) 1048 (16.76) 0.06 O-19,999 86 (21.55) 1524 (24.38) 0.06 50,000-99,999 111 (27.81) 1699 (27.17) 0.000 100,000 ormore 119 (29.82) 1309 (20.94) Missing 28 (7) 671 (10.73) Employment Employment 28 (7) 671 (10.73) 0.0001 Retired 51 (12.78) 1975 (31.59) 0.0001 Other 87 (1.8) 1021 (16.33) 0.001 Bissing 14 (3.5) 248 (3.96) 0.77 No 319 (79.94) 4484 (77.49) 0.77 No 319 (79.94) 4844 (77.49) 0.73 Missing 9 (2.25) 131 (2.1) 0.73 No 260 (55.16) 3290 (52.63) 0.43 No 260 (95.22) 5533 (86.51) 0.73 No 326 (89.22) 5533 (86.51) 0.75 No 324 (81.2) 5328 (85.2) 0.9	Missing	91 (22.8)	1070 (17.1)	
nouseling inclusion 0.06 0-19,999 55 (13.78) 1048 (16.76) 0.06 20,000-49,999 111 (27.81) 1699 (27.17) 100,000 or more 119 (29.82) 1309 (20.94) Missing 28 (7) 671 (10.73) Employment 671 (10.73) 0.0001 Employment 87 (1.8) 1027 (16.73) 0.0001 Retired 51 (12.78) 1027 (15.9) 0.0001 Other 87 (1.8) 1021 (16.33) 0.0001 Missing 14 (3.5) 248 (3.90) 0.77 No 319 (79.94) 4844 (77.49) 0.77 No 319 (79.94) 4844 (77.49) 0.43 Wissing 9 (2.25) 13 (12.1) 0.77 No 350 (65.16) 3290 (52.63) 0.43 No 260 (65.16) 3290 (52.63) 0.43 No 356 (89.22) 553 (88.51) 0.73 No 356 (89.22) 553 (88.51) 0.73 No 324 (81.2) 528 (85.2) 0.43	Missing	8 (2)	137 (2.19)	
bc 1 yr yr 53 (13.7) 0.43 (10.70) 0.00 bc 1 yr yr 53 (13.7) 1043 (10.70) 0.00 50,000 - 99,999 111 (27.81) 1699 (27.17) 100,000 or more 119 (29.82) 1309 (20.44) Missing 28 (7) 671 (10.73) Employment 28 (7) 671 (10.73) Employed 247 (61.9) 3007 (48) <0.001		55 (12 70)	1049 (16 76)	0.04
20,00-97,979 60 (21,33) 104 (24,36) 00,00-97,979 111 (27,81) 1699 (27,17) 100,000 or more 119 (29,82) 1309 (20,94) Missing 28 (7) 671 (10,73) Employed 247 (61,9) 3007 (48) <0.0001	0-19,999	DD (13.78) 96 (21.55)	1048 (10.70)	0.06
b0.000-97,979 111 (2, 81) 1099 (2, 1/) Missing 28 (7) 671 (10.73) Employed 247 (61.9) 3007 (48) <0.001	50,000-49,999	00 (21.55) 111 (27.91)	1524 (24.36)	
TODOUD INTINE T1 (22.62) 621 (10.73) Employed 28 (7) 671 (10.73) Employed 247 (61.9) 3007 (48) <0.001	100,000-99,999	110 (20.92)	1200 (20.04)	
Missing $20 (7)$ $00 + (10.5)$ Employment $277 (61.9)$ $3007 (48)$ <0.001 Employment $57 (12.78)$ $977 (31.59)$ <0.001 Missing $14 (3.5)$ $248 (3.96)$ <0.001 Other $87 (1.8)$ $1021 (16.33)$ <0.001 Missing $14 (3.5)$ $248 (3.96)$ <0.001 Diabetes / high blood sugar <0.001 <0.001 <0.001 Yes $71 (17.79)$ $4244 (77.49)$ <0.001 Hypertension/high blood pressure $9 (2.25)$ $131 (2.1)$ <0.43 No $200 (55.16)$ $3290 (52.63)$ 0.43 No $200 (55.16)$ $3290 (52.63)$ 0.73 No $200 (55.16)$ $3290 (52.63)$ 0.73 No $356 (89.22)$ $5533 (86.51)$ 0.73 No $356 (89.22)$ $5538 (85.2)$ 0.55 No $324 (81.2)$ $5328 (85.2)$ 0.55 No $324 (81.2)$ $5328 (85.2)$ 0.55	Missing	119 (29.02)	671 (10 72)	
Employed 247 (61.9) 3007 (48) <0.0001	Employment	28 (7)	071 (10.73)	
Entropy of the second	Employed	247 (61.0)	3007 (48)	<0.0001
Name Officities Officities Officities Other 87 (1.8) 1021 (16.33) Missing 14 (3.5) 248 (3.96) Diabetes/high blood sugar ************************************	Retired	51 (12 78)	1075 (31 50)	<0.0001
Missing 14 (3.5) 12 (10.5) Diabetes/high blood sugar 7 1(7.79) 1276 (20.41) 0.77 No 319 (79.94) 4844 (77.49) 0.77 No 319 (79.94) 4844 (77.49) 0.77 No 319 (79.94) 4844 (77.49) 0.73 Missing 9 (2.25) 131 (2.1) 0.43 Hypertension/high blood pressure 7 0 220 (52.63) 0.43 No 260 (65.16) 3290 (52.63) 0.43 Missing 8 (2) 128 (2) 128 (2) Heart condition 7 128 (2) 128 (2) Heart condition 7 101 (1.61) Chronic lung disease Chronic lung disease 7 101 (1.61) Chronic lung disease 102 (1.6) Yes 68 (17) 821 (13.1) 0.15 No No 324 (81.2) 5228 (85.2) Missing 7 (1.75) 102 (1.6) Yes 0.80 (27.1) 1910 (30.5) 0.95 No 284 (71.17) 4230 (67	Other	87 (18)	1021 (16.33)	
Interset Interset Yes 71 (17.79) 1276 (20.41) 0.77 No 319 (79.94) 4844 (77.49) 0.77 Missing 9 (2.25) 131 (2.1) 111 Hypertension/high blood pressure Yes 131 (32.83) 2833 (45.32) 0.43 No 260 (65.16) 3290 (52.63) 0.73 Missing 8 (2) 128 (2) Heart condition 7 1.75) 101 (1.61) Yes 36 (9) 617 (9.87) 0.73 No 356 (89.22) 5338 (85.51) 0.73 Missing 7 (1.75) 101 (1.61) 0.15 Chronic lung disease 7 1.75) 102 (1.6) 1.5 No 324 (81.2) 5328 (85.2) 0.15 0.5 No 284 (71.17) 4230 (67.6) 0.95 0.95 0.95 0.002 0.002 0.002 No 248 (62.15) 4756 (76.1) 0.0002 No 248 (62.15) 4756 (76.1) 0.0002 No 248 (62.15)<	Missing	14 (3 5)	248 (3.96)	
Pres 71 (17.79) 1276 (20.41) 0.77 No 319 (79.94) 4844 (77.49) 4844 (77.49) Missing 9 (2.25) 131 (2.1) Hypertension/high blood pressure 9 2.25) 131 (2.1) Hypertension/high blood pressure 9 2.25) 131 (2.1) Hypertension/high blood pressure 0 260 (65.16) 3220 (52.63) Missing 8 (2) 128 (2) 7 Heart condition 7 17.75) 0.73 Yes 36 (9) 617 (9.87) 0.73 No 356 (89.22) 5533 (86.51) 0 Missing 7 (1.75) 101 (1.61) 0 Chronic lung disease 7 11.50 0 15 No 324 (81.2) 5328 (85.2) Missing 7 (1.75) 102 (1.6) Arthritis 7 117 4230 (67.6) 269 269 No 284 (71.17) 4230 (67.6) 269 269 261 (3.1) 275 20.0002 No	Diabetes / high blood sugar	1+ (0.0)	240 (0.70)	
No 319 (79.94) 484 (77.49) 0.1.7 Missing 9 (2.25) 131 (2.1) Hypertension/high blood pressure 7 131 (32.83) 2833 (45.32) 0.43 No 260 (65.16) 3290 (52.63) 0.43 Missing 8 (2) 128 (2) Heart condition 7 128 (2) Yes 36 (9) 617 (9.87) 0.73 No 356 (89.22) 5533 (88.51) 0.15 Missing 7 (1.75) 101 (1.61) 0.15 Chronic lung disease 7 128 (2) 1353 (88.52) Yes 68 (17) 821 (13.1) 0.15 No 324 (81.2) 5328 (85.2) 0.15 No 324 (81.2) 5328 (85.2) 0.15 No 324 (81.2) 5328 (85.2) 0.15 No 284 (71.17) 4230 (67.6) 0.95 No 284 (71.17) 4230 (67.6) 0.95 No 248 (62.15) 4756 (76.1) 0.0002 No	Yes	71 (17,79)	1276 (20.41)	0.77
Missing 9 (2.25) 131 (2.1) Hypertension/high blood pressure 7 121 (2.5) 131 (2.1) Hypertension/high blood pressure 7 0.43 0.43 No 260 (65.16) 32290 (52.63) 0.43 Missing 8 (2) 128 (2) 128 (2) Heart condition 7 128 (2) 0.73 No 356 (89.22) 5533 (88.51) 0.73 Missing 7 (1.75) 101 (1.61) 0.73 Chronic lung disease 7 (1.75) 102 (1.6) 0.75 Yes 68 (17) 821 (13.1) 0.15 No 324 (81.2) 5328 (85.2) 0.80 Missing 7 (1.75) 102 (1.6) 0.75 Arthritis 7 7 111 (1.7) 0.95 No 284 (71.17) 4230 (67.6) 0.95 No 248 (62.15) 4756 (76.1) 0.0002 No 248 (62.15) 79 (1.26) 0.89 Normal 119 (29.82) 1847 (29.5)	No	319 (79.94)	4844 (77.49)	
Hypertension/high blood pressure 11 (32.83) 2833 (45.32) 0.43 Yes 131 (32.83) 2833 (45.32) 0.43 No 260 (65.16) 3290 (52.63) Heart condition 128 (2) 128 (2) Heart condition 7 128 (2) Yes 36 (9) 617 (9.87) 0.73 No 356 (89.22) 5533 (88.51) 0.73 Missing 7 (1.75) 101 (1.61) 0.73 Chronic lung disease 7 (1.75) 101 (1.61) 0.73 Yes 68 (17) 821 (13.1) 0.15 No 324 (81.2) 5328 (85.2) 0.43 Missing 7 (1.75) 102 (1.6) Arthritis Yes 108 (27.1) 1910 (30.5) 0.95 No 284 (71.17) 4230 (67.6) Missing Yes 108 (22.15) 4756 (76.1) 0.0002 No 248 (62.15) 4756 (76.1) Missing 8 (2) 124 (2) BMI Underweight 6 (1.5) 79 (1	Missing	9 (2.25)	131 (2.1)	
Yes 131 (32.83) 2833 (45.32) 0.43 No 260 (65.16) 3290 (52.63) 1 Missing 8 (2) 128 (2) Heart condition 7 128 (2) Yes 36 (9) 617 (9.87) 0.73 No 356 (89.22) 5533 (88.51) 0.73 Missing 7 (1.75) 101 (1.61) 0.75 Chronic lung disease 68 (17) 821 (13.1) 0.15 Yes 68 (17) 821 (13.1) 0.15 No 324 (81.2) 5328 (85.2) Missing Yes 108 (27.1) 102 (1.6) 102 (1.6) Arthritis 7 102 (1.6) 102 (1.6) Yes 108 (27.1) 1910 (30.5) 0.95 No 284 (71.17) 4230 (67.6) 0.95 No 248 (62.15) 4756 (76.1) 111 (1.7) Depression or anxiety disorder 7 124 (2) 111 (1.7) Ves 143 (35.83) 137 1 (21.9) 0.0002 No	Hypertension/high blood pressure	, ())	
No $260 (65.16)$ $3290 (52.63)$ Missing $8 (2)$ $128 (2)$ Heart condition $7 (2.87)$ 0.73 Yes $36 (9)$ $617 (9.87)$ 0.73 No $356 (89.22)$ $5533 (88.51)$ Missing $7 (1.75)$ $101 (1.61)$ Chronic lung disease $7 (1.75)$ $101 (1.61)$ Ves $68 (17)$ $821 (13.1)$ 0.15 No $324 (81.2)$ $5328 (85.2)$ $7 (1.75)$ Missing $7 (1.75)$ $102 (1.6)$ Arthritis $7 (1.75)$ $102 (1.6)$ Yes $108 (27.1)$ $1910 (30.5)$ 0.95 No $284 (71.17)$ $4230 (67.6)$ Missing $7 (1.7)$ $111 (1.7)$ Depression or anxiety disorder $7 (2.9)$ 0.0002 No $248 (62.15)$ $4756 (76.1)$ Missing $8 (2)$ $124 (2)$ BMIUnderweight $6 (1.5)$ $79 (1.26)$ 0.89 Normal $119 (29.82)$ $1847 (29.5)$ 0.002 Overweight $125 (31.32)$ $2105 (3.7)$ $00esity 1$ Obesity 1 $66 (16.54)$ $1156 (18.49)$ $0besity 1$ $503 (8)$ Obesity 2 $44 (11)$ $503 (8)$ $00esity 2$ $29 (7.26)$ Missing $29 (7.26)$ $358 (5.7)$ $00esity 2$	Yes	131 (32.83)	2833 (45.32)	0.43
Missing $\hat{8}(2)$ $12\hat{8}(2)$ Heart conditionYes $36(9)$ $617(9.87)$ No $356(89.22)$ $5533(88.51)$ Missing $7(1.75)$ $101(1.61)$ Chronic lung diseaseYes $68(17)$ $821(13.1)$ No $324(81.2)$ $5328(85.2)$ Missing $7(1.75)$ $102(1.6)$ ArthritisYes $108(27.1)$ $1910(30.5)$ No $284(71.17)$ $4230(67.6)$ Missing $7(1.7)$ $111(1.7)$ Depression or anxiety disorder $7(1.7)$ $111(1.7)$ Ves $143(35.83)$ $1371(21.9)$ 0.0002 No $248(62.15)$ $4756(76.1)$ $79(1.26)$ Missing $8(2)$ $124(2)$ BMIUUUUnderweight $6(1.5)$ $79(1.26)$ 0.89 Normal $119(29.82)$ $1847(29.5)$ 0002 Overweight $125(31.32)$ $2105(3.7)$ $00esity 2$ Obesity 1 $66(16.54)$ $1156(18.49)$ $00esity 2$ $44(11)$ $503(8)$ $029(7.26)$ $358(5.7)$ Missing $29(7.26)$ $328(5.7)$	No	260 (65.16)	3290 (52.63)	
Heart condition 36 (9) 617 (9.87) 0.73 Yes 36 (89.22) 5533 (88.51) Missing 7 (1.75) 101 (1.61) Chronic lung disease 7 101 (1.61) Yes 68 (17) 821 (13.1) 0.15 No 324 (81.2) 5328 (85.2) 0.73 Missing 7 (1.75) 102 (1.6) 0.75 Arthritis 7 125 (1.7) 102 (1.6) Yes 108 (27.1) 1910 (30.5) 0.95 No 284 (71.17) 4230 (67.6) 0.95 No 284 (71.7) 111 (1.7) 0.0002 Persosion or anxiety disorder 7 111 (1.7) 0.0002 No 248 (62.15) 4756 (76.1) 0.0002 Missing 8 (2) 124 (2) 111 BMI 119 (29.82) 1847 (29.5) 0.89 Normal 119 (29.82) 1847 (29.5) 0.89 Normal 119 (29.82) 1847 (29.5) 0.89 Overweight 125 (31.32) 2105 (3.7) 0.005 (3.7) Obesity 3 29 (7.	Missing	8 (2)	128 (2)	
Yes 36 (9) 617 (9.87) 0.73 No 356 (89.22) 5533 (88.51)	Heart condition			
No 356 (89.22) 5533 (88.51) Missing 7 (1.75) 101 (1.61) Chronic lung disease 7 (1.75) 101 (1.61) Yes 68 (17) 821 (13.1) 0.15 No 324 (81.2) 5328 (85.2) Missing 7 (1.75) 102 (1.6) Arthritis 7 (1.75) 102 (1.6) Arthritis 7 (1.7) 111 (1.7) Yes 108 (27.1) 4230 (67.6) 0.95 No 284 (71.17) 4230 (67.6) 0.95 Missing 7 (1.7) 111 (1.7) Depression or anxiety disorder 9 0.0002 0.0002 Yes 143 (35.83) 1371 (21.9) 0.0002 0.0002 No 248 (62.15) 4756 (76.1) 0.89 0.0002 BMI Underweight 6 (1.5) 79 (1.26) 0.89 0.89 Normal 119 (29.82) 1847 (29.5) 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 0.89 <	Yes	36 (9)	617 (9.87)	0.73
Missing 7 (1.75) 101 (1.61) Chronic lung disease 7 821 (13.1) 0.15 Yes 68 (17) 5328 (85.2) 0.15 No 324 (81.2) 5328 (85.2) 0.15 Missing 7 (1.75) 102 (1.6) 0.15 Arthritis 7 1.75) 102 (1.6) Arthritis 7 (1.7) 1910 (30.5) 0.95 No 284 (71.17) 4230 (67.6) 0.95 No 284 (71.7) 4230 (67.6) 0.0002 Missing 7 (1.7) 111 (1.7) 0.0002 Depression or anxiety disorder 7 1371 (21.9) 0.0002 No 248 (62.15) 4756 (76.1) 0.89 Missing 8 (2) 124 (2) 81 Underweight 6 (1.5) 79 (1.26) 0.89 Normal 119 (29.82) 1847 (29.5) 0.89 Overweight 125 (31.32) 2105 (3.7) 0 Obesity 1 66 (16.54) 1156 (18.49) 0	No	356 (89.22)	5533 (88.51)	
Chronic lung diseaseYes $68 (17)$ $821 (13.1)$ 0.15 No $324 (81.2)$ $5328 (85.2)$ Missing $7 (1.75)$ $102 (1.6)$ Arthritis 7 $1.75)$ $0.02 (1.6)$ Yes $108 (27.1)$ $1910 (30.5)$ 0.95 No $284 (71.17)$ $4230 (67.6)$ 0.95 Missing $7 (1.7)$ $111 (1.7)$ Depression or anxiety disorder 7 0.0002 No $248 (62.15)$ $4756 (76.1)$ Missing $8 (2)$ $124 (2)$ BMI $110 (29.82)$ $1847 (29.5)$ Overweight $125 (31.32)$ $2105 (3.7)$ Obesity 1 $66 (16.54)$ $1156 (18.49)$ Obesity 2 $44 (11)$ $503 (8)$ Obesity 3 $29 (7.26)$ $358 (5.7)$ Missing $10 (25)$ $203 (3.2)$	Missing	7 (1.75)	101 (1.61)	
Yes $68 (17)$ $821 (13.1)$ 0.15 No $324 (81.2)$ $5328 (85.2)$ Missing $7 (1.75)$ $102 (1.6)$ Arthritis $7 (1.75)$ $102 (1.6)$ Yes $108 (27.1)$ $1910 (30.5)$ 0.95 No $284 (71.17)$ $4230 (67.6)$ Missing $7 (1.7)$ $111 (1.7)$ Depression or anxiety disorder $7 (1.7)$ $111 (1.7)$ Yes $143 (35.83)$ $1371 (21.9)$ 0.0002 No $248 (62.15)$ $4756 (76.1)$ Missing $8 (2)$ $124 (2)$ BMI $119 (29.82)$ $1847 (29.5)$ Overweight $125 (31.32)$ $2105 (3.7)$ Obesity 1 $66 (16.54)$ $1156 (18.49)$ Obesity 2 $44 (11)$ $503 (8)$ Obesity 3 $29 (7.26)$ $358 (5.7)$ Missing $10 (25)$ $203 (3.2)$	Chronic lung disease			
No $324 (81.2)$ $5328 (85.2)$ Missing7 (1.75) $102 (1.6)$ Arthritis Yes $108 (27.1)$ $1910 (30.5)$ 0.95 No $284 (71.17)$ $4230 (67.6)$ Missing7 (1.7) $111 (1.7)$ Depression or anxiety disorder Yes $143 (35.83)$ $1371 (21.9)$ 0.0002 No $248 (62.15)$ $4756 (76.1)$ 0.89 Missing $8 (2)$ $124 (2)$ BMI $Underweight$ $6 (1.5)$ $79 (1.26)$ 0.89 Normal $119 (29.82)$ $1847 (29.5)$ 0.89 0002 0002 Normal $125 (31.32)$ $2105 (3.7)$ 0002 Obesity 1 $66 (16.54)$ $1156 (18.49)$ 0002 Obesity 2 $44 (11)$ $503 (8)$ 0002 Obesity 3 $29 (7.26)$ $358 (5.7)$ $003 (3 2)$	Yes	68 (17)	821 (13.1)	0.15
Missing Arthritis7 (1.75) $102 (1.6)$ Arthritis108 (27.1) $1910 (30.5)$ 0.95 No $284 (71.17)$ $4230 (67.6)$ Missing7 (1.7) $111 (1.7)$ Depression or anxiety disorder Yes $143 (35.83)$ $1371 (21.9)$ 0.0002 No $248 (62.15)$ $4756 (76.1)$ Missing8 (2) $124 (2)$ BMI $Underweight$ $6 (1.5)$ $79 (1.26)$ 0.89 Normal119 (29.82) $1847 (29.5)$ 0.89 Overweight125 (31.32) $2105 (3.7)$ $0besity 1$ $66 (16.54)$ $1156 (18.49)$ Obesity 2 $44 (11)$ $503 (8)$ $09 (7.26)$ $358 (5.7)$ Missing $19 (25)$ $29 (7.26)$ $358 (5.7)$	No	324 (81.2)	5328 (85.2)	
ArthritisYes $108 (27.1)$ $1910 (30.5)$ 0.95 No $284 (71.17)$ $4230 (67.6)$ Missing $7 (1.7)$ $111 (1.7)$ Depression or anxiety disorder 7 $1371 (21.9)$ 0.0002 No $248 (62.15)$ $4756 (76.1)$ Missing $8 (2)$ $124 (2)$ BMI $119 (29.82)$ $1847 (29.5)$ Overweight $125 (31.32)$ $2105 (3.7)$ Obesity 1 $66 (16.54)$ $1156 (18.49)$ Obesity 2 $44 (11)$ $503 (8)$ Obesity 3 $29 (7.26)$ $358 (5.7)$ Missing $10 (2.5)$ $203 (3.2)$	Missing	7 (1.75)	102 (1.6)	
Yes108 (27.1)1910 (30.5) 0.95 No284 (71.17)4230 (67.6)Missing7 (1.7)111 (1.7)Depression or anxiety disorder7Yes143 (35.83)1371 (21.9)No248 (62.15)4756 (76.1)Missing8 (2)124 (2)BMI119 (29.82)1847 (29.5)Overweight125 (31.32)2105 (3.7)Obesity 166 (16.54)1156 (18.49)Obesity 244 (11)503 (8)Obesity 329 (7.26)358 (5.7)Missing10 (2.5)203 (3.2)	Arthritis			
No $284 (71.17)$ $4230 (67.6)$ Missing7 (1.7)111 (1.7)Depression or anxiety disorder 7 $1371 (21.9)$ 0.0002 No $248 (62.15)$ $4756 (76.1)$ Missing $8 (2)$ $124 (2)$ BMI $119 (29.82)$ $1847 (29.5)$ Overweight $125 (31.32)$ $2105 (3.7)$ Obesity 1 $66 (16.54)$ $1156 (18.49)$ Obesity 2 $44 (11)$ $503 (8)$ Obesity 3 $29 (7.26)$ $358 (5.7)$	Yes	108 (27.1)	1910 (30.5)	0.95
Missing 7 (1.7) 111 (1.7) Depression or anxiety disorder 143 (35.83) 1371 (21.9) 0.0002 No 248 (62.15) 4756 (76.1) 0.0002 Missing 8 (2) 124 (2) 0.0002 BMI 0.0002 0.0002 0.0002 Vormal 119 (29.82) 1847 (29.5) 0.89 Overweight 125 (31.32) 2105 (3.7) 0.0002 Obesity 1 66 (16.54) 1156 (18.49) 0.0002 Obesity 2 44 (11) 503 (8) 0.0002 Obesity 3 29 (7.26) 358 (5.7) 0.002	No	284 (71.17)	4230 (67.6)	
Depression or anxiety disorder 143 (35.83) 1371 (21.9) 0.0002 No 248 (62.15) 4756 (76.1) 0 Missing 8 (2) 124 (2) BMI 0.0002 0.89 Vormal 119 (29.82) 1847 (29.5) Overweight 125 (31.32) 2105 (3.7) Obesity 1 66 (16.54) 1156 (18.49) Obesity 2 44 (11) 503 (8) Obesity 3 29 (7.26) 358 (5.7) Missing 10 (2.5) 203 (3.2)	Missing	7 (1.7)	111 (1.7)	
Yes 143 (35.83) 1371 (21.9) 0.0002 No 248 (62.15) 4756 (76.1) Missing 8 (2) 124 (2) BMI Underweight 6 (1.5) 79 (1.26) 0.89 Normal 119 (29.82) 1847 (29.5) 0 Overweight 125 (31.32) 2105 (3.7) 0 Obesity 1 66 (16.54) 1156 (18.49) 0 Obesity 2 29 (7.26) 358 (5.7) 0 Missing 10 (2.5) 203 (3.2) 0	Depression or anxiety disorder			
No 248 (62.15) 4/56 (76.1) Missing 8 (2) 124 (2) BMI Underweight 6 (1.5) 79 (1.26) 0.89 Normal 119 (29.82) 1847 (29.5) 0.89 Overweight 125 (31.32) 2105 (3.7) 0besity 1 66 (16.54) 1156 (18.49) Obesity 2 44 (11) 503 (8) 0besity 3 29 (7.26) 358 (5.7) Missing 10 (2.5) 203 (3.2) 203 (3.2) 203 (3.2)	Yes	143 (35.83)	1371 (21.9)	0.0002
Missing 8 (2) 124 (2) BMI	No	248 (62.15)	4/56 (/6.1)	
BMI 79 (1.26) 0.89 Underweight 6 (1.5) 79 (1.26) 0.89 Normal 119 (29.82) 1847 (29.5) 0 Overweight 125 (31.32) 2105 (3.7) 0 Obesity 1 66 (16.54) 1156 (18.49) 0 Obesity 2 44 (11) 503 (8) 0 Obesity 3 29 (7.26) 358 (5.7) 358 (5.7)	Missing	8 (2)	124 (2)	
Onderweight 0 (1.2) 79 (1.26) 0.89 Normal 119 (29.82) 1847 (29.5) 0 Overweight 125 (31.32) 2105 (3.7) 0 Obesity 1 66 (16.54) 1156 (18.49) 0 Obesity 2 44 (11) 503 (8) 0 Obesity 3 29 (7.26) 358 (5.7) 0	BIVII		70 (1 0/)	0.00
Normal 119 (29.82) 1847 (29.5) Overweight 125 (31.32) 2105 (3.7) Obesity 1 66 (16.54) 1156 (18.49) Obesity 2 44 (11) 503 (8) Obesity 3 29 (7.26) 358 (5.7) Missing 10 (2.5) 203 (3.2)	Underweight	0 (1.5)	/ y (1.20) 1947 (20.5)	0.89
Overweight 129 (31.32) 2105 (3.7) Obesity 1 66 (16.54) 1156 (18.49) Obesity 2 44 (11) 503 (8) Obesity 3 29 (7.26) 358 (5.7) Missing 10 (2.5) 203 (3.2)	Normaisht	119 (29.82)	1847 (29.5)	
Obesity 1 00 (10.54) 1150 (18.49) Obesity 2 44 (11) 503 (8) Obesity 3 29 (7.26) 358 (5.7) Missing 10 (2.5) 203 (3.2)	Overweight	123 (31.32)	2 IUO (3.7)	
Obesity 2 44 (11) 503 (8) Obesity 3 29 (7.26) 358 (5.7) Missing 10 (2.5) 203 (3.2)	Obesity 2	00 (10.04)	1130 (18.49) 502 (9)	
Ouesity 5 27 (7.20) 30δ (0.7) Missing 10 (2.5) 203 (3.2)	Obesity 2	44 (11) 20 (7 26)	203 (8) 259 (5 7)	
	Missing	27 (7.20) 10 (2 5)	203 (3.2)	

BMI categories: Underweight (<18.5), normal (18.5-24.9), overweight (25-29.9), obesity (30-34.5), obesity 2 (35-39.9), obesity 3 (>40). *P* values based on survey-adjusted Wald Chi-square test. BMI – Body mass index

Table 3: Regression model for respondents who shared
online health information on social media and chronic
medical conditions (n=4862)

Characteristic	OR	95% CI	Р
Age (years)			
18–34	2.0	1.34-3.03	0.0007
35-49	2.2	1.58-2.94	<0.0001
50-64	Reference		
65-74	0.43	0.28-0.66	0.0001
75+	0.13	0.04-0.39	0.0003
Gender			
Male	0.46	0.35-0.59	<0.0001
Female	Reference		
Race/ethnicity			
Non-Hispanic white	Reference		
Non-Hispanic black	1.26	0.87-1.83	0.22
Hispanic	1.23	0.88-1.71	0.22
Non-Hispanic other	1.09	0.68-1.76	0.71
Education			
Less than high school	0.69	0.32-1.46	0.33
High school graduate	Reference		
Some college	1.46	1.00-2.19	0.07
Bachelor's degree	1.19	0.79-1.79	0.41
Postbaccalaureate	1.16	0.77-1.75	0.47
Employment			
Employed	Reference		
Retired	1.36	0.86-2.16	0.19
Other	0.91	0.65-1.27	0.57
High blood pressure			
Yes	0.93	0.67-1.30	0.68
No	Reference		
Lung disease			
Yes	1.34	0.93-1.93	0.11
No	Reference		
Arthritis			
Yes	1.16	0.84-1.60	0.36
No	Reference		
Depression or anxiety			
Yes	1.34	0.96-1.88	0.08
No	Reference		
BMI			
Underweight	2.52	1.06-6.02	0.04
Normal	Reference		
Overweight	0.87	0.62-1.22	0.43
Obesity 1	0.95	0.62-1.44	0.80
Obesity 2	1.06	0.68-1.67	0.79
Obesity 3	0.68	0.41-1.11	0.12

Area under the curve or C-statistic of regression model=0.704. OR - Odds ratio; CI - Confidence interval

DISCUSSION

This study found that in adults with chronic diseases in the United States, being underweight or having depression/anxiety were most important variables that predict sharing health information and joining relevant health support groups on social media. Low BMI among adults has been found to be associated with decreased levels of physical and emotional well-being,^[16] which may be factors that explain the increased likeliness of underweight adults sharing health information on social media. Nonetheless, this is an interesting finding, especially considering that more research is focused toward obese individuals. Social media use itself can have detrimental effects, especially among females. Studies have shown that the use of social media use by females is associated with body image issues, eating disorders and concerns about weight and body shape resulting in anxiety.^[17,18] Another study found that viewing and commenting on others' social media profiles was significantly correlated with the drive to become slimmer in both genders.^[19] Moreover, maladaptive social media use was found to result in bulimic symptoms among undergraduate females^[20] and was correlated with decreased weight satisfaction and endorsement of the thin appearance.^[21] We speculate that some proportion of the underweight respondents in HINTS may possibly have suffered from the above-stated detrimental effects and their sharing of health benefits could be linked with the time spent on these platforms. However, the present study is limited in its design to extract this information, but is suggestive of further exploration.

Social media use can also have positive influences and may be a meaningful tool in the management of chronic diseases,^[22] despite some arguing that is not inherently empowering.^[23] Studies have shown that using social media with a focus on diet can result in significant weight loss in long-time users as well as can positively impact behavior change and, consequently, could help in mitigating the effects of associated chronic diseases.^[24,25] Similarly, it can also motivate to increase physical activity, which is a major preventive factor for chronic diseases.^[22] Using data of the current study, future studies should not only seek to focus social media health content more specifically toward target audiences that have shown to be open to receiving content through this modality including groups of users with identified needs (such as mental health and being underweight), but also be aware of the potential risk involved and actively seek to mitigate this. Given the potential promise of social media for health promotion, more studies should seek to have health professionals collaborate to produce quality content and then rigorously evaluate such efforts, especially as many are using social media already but do so mostly without content oversight. Offering content to high-need groups is exciting, but its intended positive influence on the individual should be more rigorously monitored.^[26]

Of all chronic diseases studied in this study, only those with depression or anxiety were significantly more likely to join groups on social media that have similar people or provide support. Previous studies have shown that individuals with mental illness often use social media for sharing their experiences, reaching out to receive and provide support to others in similar state and for exploring treatment

	OR	95% CI	Р
Age (years)			
18-34	1.49	0.90-2.46	0.12
35-49	1.79	1.16-2.76	0.008
50-64	Reference		
65-74	0.78	0.47-1.28	0.33
75+	0.50	0.17-1.47	0.21
Gender			
Male	0.50	0.34-0.73	0.0004
Female	Reference		
Race/ethnicity			
Nonhispanic white	Reference		
Nonhispanic black	1.62	0.85-3.11	0.14
Hispanic	0.73	0.39-1.36	0.32
Nonhispanic other	0.75	0.40-1.39	0.36
Education			
Less than high school	0.92	0.30-2.80	0.88
High school graduate	Reference		
Some college	1.74	0.95-3.19	0.07
Bachelor's degree	2.07	1.20-3.59	0.01
Postbaccalaureate	2.43	1.18-4.91	0.02
Employment			
Employed	Reference		
Retired	0.65	0.41-1.04	0.07
Other	1.23	0.84-1.79	0.30
Household income			
0-19,999 USD	Reference		
20,000-49,999 USD	1.41	0.73-2.72	0.31
50,000-99,999 USD	1.45	0.72-2.95	0.30
100,000 or more USD	1.67	0.83-3.36	0.15
Lung disease			
Yes	1.67	1.00-2.78	0.05
No	Reference		
Depression or anxiety			
Yes	1.72	1.19-2.50	0.004
No	Reference		

 Table 4: Regression model of Health Information Trends

 Survey 2017–2018 respondents who joined online support

 groups and chronic medical conditions, n=4862

Area under the curve or C-statistic of regression model=0.708.

OR - Odds ratio; CI - Confidence interval

options;^[27,28] our study findings are in line with these, however, social media use itself can be a factor influencing depression and anxiety. Positive interactions and social support on these platforms are associated with lower levels of depression and anxiety, whereas maladaptive use, negative interaction and social comparisons are associated with higher levels of depression and anxiety.^[29,30]

Our study found that respondents <49 years of age, females and those with Bachelor's degree were more likely to use social media sites for health-related purposes. These findings mirrored those of other studies that suggest females, adults aged <65 years as well as those who have higher levels of education (some college and above) and are well-acquainted with technology are more likely to seek health information on the Internet.^[31,32] The current study did not find any significant difference across race or ethnicity in both its studied outcomes, which is coherent with the general trends of social media use.^[33]

Limitations

The cross-sectional nature of this study limits our ability to establish directionality or infer causal relationships. Secondary analysis restricted us from asking more detailed questions about social media use such as frequency of use, social media sites, type of health information seeking/sharing and chronic diseases (severity and diagnosis date). In addition, the survey was self-administered, which can cause a reporting bias, especially in the BMI and chronic medical conditions categories. It would be beneficial for future research to use longitudinal designs to provide evidence of directionality between chronic diseases and social media use. More research on social media use for health-related purposes is needed to better understand the magnitude of its effectiveness.

CONCLUSION

This study demonstrates that underweight individuals use social media for sharing health information. In addition, having depression or anxiety disorder was significantly associated with joining social media support groups. The willingness by individuals in these sub-categories to use social media for information and/or support suggests that tailored social media groups may provide a more acceptable, private way to seek such support. However, future research also needs to determine how to more broadly recruit persons with other chronic conditions to social media channels for additional support, and to explore the effectiveness of such online platforms in managing, controlling and even preventing chronic diseases.

Ethical considerations

This study was approved by the Institutional Review Board of Loma Linda University (Ref. no.: 5180287) in August 2018. Consent was not required as the study was a secondary analysis of de-identified data.

Peer review

This article was peer-reviewed by three independent and anonymous reviewers.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

REFERENCES

- CDC. About Chronic Diseases National Center for Chronic Disease Prevention and Health Promotion; 2018. Available from: https://www. cdc.gov/chronicdisease/about/index.htm. [Last accessed on 2019 Dec 01.
- 2. Dunlop S, Freeman B, Jones SC. Marketing to youth in the digital

age: The promotion of unhealthy products and health promoting behaviours on social media. Media Commun 2016;4:35-49.

- Holt D. Branding in the age of social media. Harvard Bus Rev 2016;94:40-50.
- Williams G, Hamm MP, Shulhan J, Vandermeer B, Hartling L. Social media interventions for diet and exercise behaviours: A systematic review and meta-analysis of randomised controlled trials. BMJ Open 2014;4:e003926.
- Center PR. Social Media Fact Sheet Pew Research Center 2018. Available from: http://www.pewinternet.org/fact-sheet/social-media/ [Last accessed on 2019 Dec 01].
- McClellan C, Ali MM, Mutter R, Kroutil L, Landwehr J. Using social media to monitor mental health discussions – Evidence from Twitter. J Am Med Inform Assoc 2016;24:496-502.
- Welch V, Petkovic J, Pardo JP, Rader T, Tugwell P. Interactive social media interventions to promote health equity: An overview of reviews. Health Promot Chronic Dis Prev Can 2016;36:63.
- Hirvonen N, Ek S, Niemelä R, Pyky R, Ahola R, Korpelainen R, et al. Everyday health information literacy in relation to health behavior and physical fitness: A population-based study among young men. Libr Inf Sci Res 2016;4:308-18.
- Ahadzadeh AS, Pahlevan Sharif S, Ong FS, Khong KW. Integrating health belief model and technology acceptance model: An investigation of health-related internet use. J Med Internet Res 2015;17:e45.
- Santoro E, Castelnuovo G, Zoppis I, Mauri G, Sicurello F. Social media and mobile applications in chronic disease prevention and management. Front Psychol 2015;6:567.
- Campbell L, Evans Y, Pumper M, Moreno MA. Social media use by physicians: A qualitative study of the new frontier of medicine. BMC Med Inform Decis Mak 2016;16:91.
- Chou WY, Hunt YM, Beckjord EB, Moser RP, Hesse BW. Social media use in the united states: Implications for health communication. J Med Internet Res 2009;11:e48.
- Patel R, Chang T, Greysen SR, Chopra V. Social media use in chronic disease: A Systematic review and novel taxonomy. Am J Med 2015;128:1335-50.
- Antheunis ML, Tates K, Nieboer TE. Patients' and health professionals' use of social media in health care: Motives, barriers and expectations. Patient Educ Couns 2013;92:426-31.
- Westat. Health Information National Treds Survey 5 (HINTS 5). National Cancer Institute National Cancer Institute 2017 July 2017. Report No.
- Renzaho A, Wooden M, Houng B. Associations between body mass index and health-related quality of life among Australian adults. Qual Life Res 2010;19:515-20.
- Fardouly J, Vartanian LR. Negative comparisons about one's appearance mediate the relationship between Facebook usage and body image concerns. Body Image 2015;12:82-8.
- Mabe AG, Forney KJ, Keel PK. Do you "like" my photo? Facebook use maintains eating disorder risk. Int J Eat Disord 2014;47:516-23.

- Kim JW, Chock TM. Body image 2.0: Associations between social grooming on Facebook and body image concerns. Comput Human Behav 2015;48:331-9.
- Smith AR, Hames JL, Joiner TE Jr. Status update: Maladaptive facebook usage predicts increases in body dissatisfaction and bulimic symptoms. J Affect Disord 2013;149:235-40.
- Tiggemann M, Miller J. The Internet and adolescent girls' weight satisfaction and drive for thinness. Sex Roles 2010;63:79-90.
- Valle CG, Tate DF, Mayer DK, Allicock M, Cai J. A randomized trial of a Facebook-based physical activity intervention for young adult cancer survivors. J Cancer Surviv 2013;7:355-68.
- Sosnowy C. Practicing patienthood online: Social media, chronic illness, and lay expertise. Societies 2014;4:316-29.
- 24. Sugano M, Yamazaki C, editors. Behavioral analysis of SNS users with regard to diet. IADIS International Conferences-Web Based Communities and Social Media 2011, Social Media 2011, Internet Applications and Research 2011, Part of the IADIS Multi Conference on Computer Science and Information Systems 2011, MCCSIS; 2011.
- Hales S, Turner-McGrievy GM, Wilcox S, Fahim A, Davis RE, Huhns M, *et al.* Social networks for improving healthy weight loss behaviors for overweight and obese adults: A randomized clinical trial of the social pounds off digitally (Social POD) mobile app. Int J Med Inform 2016;94:81-90.
- Willis EA, Szabo-Reed AN, Ptomey LT, Steger FL, Honas JJ, Washburn RA, *et al.* Do weight management interventions delivered by online social networks effectively improve body weight, body composition, and chronic disease risk factors? A systematic review. J Telemed Telecare 2017;23:263-72.
- 27. Bucci S, Schwannauer M, Berry N. The digital revolution and its impact on mental health care. Psychol Psychother 2019;92:277-97.
- Naslund JA, Aschbrenner KA, Marsch LA, Bartels SJ. The future of mental health care: Peer-to-peer support and social media. Epidemiol Psychiatr Sci 2016;25:113-22.
- Shensa A, Escobar-Viera CG, Sidani JE, Bowman ND, Marshal MP, Primack BA. Problematic social media use and depressive symptoms among US young adults: A nationally-representative study. Soc Sci Med 2017;182:150-7.
- Seabrook EM, Kern ML, Rickard NS. Social networking sites, depression, and anxiety: A Systematic review. JMIR Ment Health 2016;3:e50.
- Caiata-Zufferey M, Abraham A, Sommerhalder K, Schulz PJ. Online health information seeking in the context of the medical consultation in switzerland. Qual Health Res 2010;20:1050-61.
- Tennant B, Stellefson M, Dodd V Chaney B, Chaney D, Paige S, et al. EHealth literacy and web 2.0 health information seeking behaviors among baby boomers and older adults. J Med Internet Res 2015;17:e70.
- Perrin A. Social Media Usage: 2005-2015. Available from: https://www. pewresearch.org/internet/wp-content/uploads/sites/9/2015/10/ PI_2015-10-08_Social-Networking-Usage-2005-2015_FINAL. pdf. [Last accessed on 2019 Dec 01].