

Handwashing and disinfection precautions taken by U.S. adults to prevent coronavirus disease 2019, Spring 2020

Laura Brown (✉ lrg0@cdc.gov)

Centers for Disease Control and Prevention

E. Rickamer Hoover

Centers for Disease Control and Prevention

Catherine Barrett

Centers for Disease Control and Prevention

Kayla L. Vanden Esschert

Centers for Disease Control and Prevention

Sarah Collier

Centers for Disease Control and Prevention

Amanda Garcia-Williams

Centers for Disease Control and Prevention

Research note

Keywords: COVID-19, coronavirus, handwashing, surface disinfection, demographic differences

Posted Date: October 30th, 2020

DOI: <https://doi.org/10.21203/rs.3.rs-62989/v3>

License: © ⓘ This work is licensed under a Creative Commons Attribution 4.0 International License.

[Read Full License](#)

Version of Record: A version of this preprint was published on December 4th, 2020. See the published version at <https://doi.org/10.1186/s13104-020-05398-3>.

Abstract

Objectives. The objectives of this study were to assess self-reported hygiene precautions taken by U.S. adults during spring 2020 to prevent coronavirus disease 2019 (COVID-19) and to identify demographic characteristics associated with these hygiene precautions.

Results. We obtained data from Porter Novelli Public Services's national survey, *Spring ConsumerStyles*, conducted March 19 – April 9, 2020 among a nationally representative random sample of 6,463 U.S. adults aged 18 years or older. We present data from the survey question: "What, if any, precautions are you taking to prevent coronavirus?". Respondents replied yes or no to the following precautions: washing hands often with soap and water and disinfecting surfaces at home and work often. Most respondents reported taking hygiene-related precautions to prevent COVID-19; more respondents reported handwashing (93%) than disinfecting surfaces (74%). Men, younger respondents, those with lower income and education levels, and respondents in self-rated poor health had lower reported rates of both handwashing and disinfecting surfaces. Communications about hygiene precautions for COVID-19 prevention may need to target sub-populations with the greatest gaps in hygiene-related practices. Research identifying barriers to these practices and developing effective messaging could inform and improve these communications.

Introduction

From January through July 2020, 4,225,687 cases of coronavirus disease 2019 (COVID-19), caused by the virus SARS-CoV-2, were reported in the U.S.; these included 146,546 deaths [1]. Although SARS-CoV-2 is thought to [spread mainly from person to person](#), it is possible that people can become infected by touching something with the virus on it and then touching their own mouth, nose, or possibly eyes [2]. CDC has provided guidance to the public to help prevent the spread of COVID-19, including handwashing and cleaning and disinfection guidance [3]. These recommendations include handwashing with soap and water for at least 20 seconds, using hand sanitizer with at least 60% alcohol, and cleaning and disinfecting frequently touched surfaces daily, with products approved by the Environmental Protection Agency. To assess the U.S. public's adherence to these recommendations, we analyzed national survey data on respondents' self-reported hygiene-related precautions (handwashing and surface disinfection) taken to prevent COVID-19. We also examined associations between respondents' demographic characteristics and their self-reported hygiene-related precautions.

Methods

Porter Novelli Public Services administers a national survey, called *Spring ConsumerStyles*, conducted using Ipsos' KnowledgePanel, which is representative of the non-institutionalized U.S. population [4]. Respondents are randomly recruited by mail through probability-based, stratified sampling to participate in the survey panel. They receive the surveys through email and complete them online; they are provided internet access and a computer, if needed. Respondents receive reward points they can redeem online for

gift cards or prizes. The 2020 *Spring ConsumerStyles* survey was conducted from March 19 – April 9, 2020 and was sent via email to 11,097 participants. The final sample included 6,463 adults who completed the survey, yielding a response rate of 58.2%, which was similar to the 2019 *Spring ConsumerStyles* survey [4]. The analyses were weighted to match the U.S. Census 2019 U.S. Current Population Survey proportions by gender, age, annual household income, race/ethnicity, household size, education, census region, metropolitan status, and parental status. See the Porter Novelli website for more information on *ConsumerStyles* methodology [4].

Coronavirus was defined for respondents as ‘the 2019 novel coronavirus’ as part of the survey. To assess hygiene-related precautions taken in response to COVID-19, respondents were asked, “What, if any, precautions are you taking to prevent coronavirus?”. They then responded yes or no to a series of actions, listed randomly. We present data on the following precautions: washing hands often with soap and water and disinfecting surfaces at home/work often (hereafter, referred to as handwashing and disinfecting surfaces).

We calculated percentages for both precautions, overall and by demographic characteristics (Table 1). The data on demographic characteristics of gender, age, income, education, race/ethnicity, metropolitan status (metropolitan vs. non-metropolitan), and geographic region (based on U.S. Census regions) were collected when respondents agreed to participate in the panel; data on self-rated health were collected in the survey itself. We calculated prevalence ratios for comparisons across demographic categories by calculating the ratio of the prevalence of behavior in one category compared to another (e.g., handwashing prevalence for females vs. males). Because we were interested in all the comparisons across categories within characteristics (e.g., ages 18-29 vs. 30-44 vs. 45-59), we used multiple reference levels per characteristic. Prevalence ratios, 95% confidence intervals, and p-values were obtained using Zou’s modified Poisson approach [5] (Table 2). We discuss below comparisons significant at $p < .05$. Multiple comparison adjustments were not made. We weighted the data to adjust for selection and nonresponse.

Results

Handwashing (Tables 1 and 2). Almost all (93.4%) respondents said they were washing their hands often with soap and water to prevent COVID-19. Women more often reported frequent handwashing than men. Respondents 60 years of age or older more often reported frequent handwashing than respondents in younger age categories (45-59 year-olds, 30-44 year-olds, and 18-29 year-olds); 45-59 year-olds more often reported frequent handwashing than 30-44 and 18-29 year-olds. Respondents in the highest annual income category (\$100k or more) reported the highest rate of handwashing (95.9%); in general, respondents with higher, compared to lower, incomes more often reported frequent handwashing. Respondents with a Bachelor’s degree or higher reported the highest rate of handwashing (96.0%) compared to other educational levels. Overall, respondents with higher, compared to lower, educational levels more often reported frequent handwashing. Those who rated their health as excellent, compared to those with a lower health self-rating, more often reported frequent handwashing (95.4%). Respondents

with self-rated health of fair, good, very good, or excellent more often reported frequent handwashing than those with self-rated poor health. Respondents with good or very good self-rated health more often reported frequent handwashing than those with fair self-rated health, and those with excellent self-rated health more often reported frequent handwashing than those with very good self-rated health. Respondents living in the northeast region of the U.S. reported the highest rate of handwashing (95.4%) and more often reported frequent handwashing than those living in the south and west. No differences by race/ethnicity or metropolitan status were significant.

Disinfecting (Tables 1 and 2). Nearly three-fourths (74.0%) of respondents said they were disinfecting surfaces at home and work often to prevent COVID-19. Women more often than men (78.7% vs. 69.1%) reported frequent surface disinfection. Respondents aged 45–59 years old reported the highest rate of disinfecting surfaces (77.2%) and more often reported frequent surface disinfection than those aged 30–44 and 18–29 years old. Respondents 60 years of age and older more often reported frequent surface disinfection than those aged 18–29 years old. Respondents in the highest annual income category (\$100k or more), compared to lower categories, reported the highest rate of disinfecting surfaces (75.8%). Respondents in the highest income categories (\$100k or more, 50k–\$99k, \$25k–\$49k) more often reported frequent surface disinfection than those in the lowest category (<\$25k). Non-Hispanic Blacks reported the highest rate of disinfecting surfaces (79.6%); non-Hispanic Blacks and Hispanics, compared to non-Hispanic Whites, more often reported frequent surface disinfection. Respondents who rated their health as excellent, compared to those with a lower health self-rating, more often reported frequent surface disinfection (75.8%). Respondents with self-rated health of good, very good, and excellent more often reported frequent surface disinfection than respondents with poor self-rated health. Those with good, compared to fair, self-rated health more often reported frequent surface disinfection. Respondents living in metropolitan, compared to non-metropolitan, areas more often reported frequent surface disinfection. Those living in the northeast more often reported disinfecting surfaces than those living in the west. No differences by education were significant.

Table 1. Percentages of respondents who reported handwashing and disinfecting surfaces often to prevent coronavirus, by demographic characteristics – *Spring ConsumerStyles 2020*

Characteristic	Categories	Washing hands	Disinfecting surfaces
		often	often
		n (weighted %)	n (weighted %)
All respondents	--	6,013 (93.4%)	4,768 (74.0%)
Gender	Female	3,153 (94.5)	2,624 (78.7)
	Male	2,860 (92.1)	2,145 (69.1)
Age	18-29	1,194 (91.4)	909 (69.6)
	30-44	1,546 (90.1)	1,182 (73.4)
	45-59	1,546 (94.7)	1,261 (77.2)
	≥60	1,822 (96.4)	1,417 (74.9)
Income	<\$25k	745 (86.4)	587 (68.1)
	\$25k-\$49k	1,050 (92.9)	850 (75.2)
	\$50k-\$99k	1,977 (93.6)	1,560 (73.9)
	≥\$100k	2,242 (95.9)	1,771 (75.8)
Education	Less than high school	550 (84.7)	463 (71.4)
	High school	1,662 (91.7)	1,324 (73.1)
	Some college	1,713 (95.0)	1,812 (76.6)
	Bachelor's degree or higher	2,088 (96.0)	1,599 (73.5)
Race/Ethnicity	Non-Hispanic White	3,847 (94.0)	2,982 (72.8)
	Non-Hispanic Black	683 (91.2)	596 (79.6)
	Hispanic	964 (92.0)	816 (77.9)
	Multiracial/Other	91 (96.4)	68 (72.7)
Self-rated health ¹	Excellent	2,333 (95.4)	1,874 (76.6)
	Very good	2,237 (94.1)	1,759 (74.0)
	Good	749 (90.0)	566 (68.0)
	Fair	577 (92.4)	470 (75.3)
	Poor	113 (75.2)	96 (63.4)
Region ³	Northeast	1,075 (95.4)	865 (76.8)
	Midwest	1,248 (93.8)	994 (74.7)
	South	2,264 (92.8)	1,815 (74.4)
	West	1,427 (92.5)	1,094 (70.9)
Metropolitan status ²	Metro	5,233 (93.7)	4,169 (74.6)
	Non-metro	780 (91.3)	560 (70.2)

¹Health status assessed by asking "In general, would you say your health is..."

²Metropolitan status was defined as a core-based statistical area.

³ Region categories based on U.S. Census

Table 2. Prevalence ratios, confidence intervals, and p-values for comparisons of respondents' self-reported handwashing and surface disinfecting, by demographic characteristics - *Spring ConsumerStyles 2020**

Characteristic	Comparison ¹	Washing hands often			Disinfecting surfaces often		
		% vs. % ¹	PR ² (95% CI ³)	p	% vs. % ¹	95% CI ³	p
Gender	Female vs. Male	94.5 vs. 92.1	1.03 (1.01, 1.04)	.004	78.7 vs. 69.1	1.14 (1.10, 1.18)	.001
		96.4 vs. 94.7	1.02 (1.00, 1.03)	.037	74.9 vs. 77.2	0.97 (0.933, 1.01)	.125
Age	≥60 vs. 45-59	96.4 vs. 90.1	1.07 (1.05, 1.10)	.001	74.9 vs. 73.4	1.05 (0.99, 1.12)	.121
	≥60 vs. 30-44	96.4 vs. 91.4	1.05 (1.02, 1.09)	.001	74.9 vs. 69.6	1.08 (1.01, 1.15)	.026
	45-59 vs. 30-44	94.7 vs. 90.1	1.05 (1.03, 1.08)	.001	77.2 vs. 73.4	1.05 (1.01, 1.10)	.023
	45-59 vs. 18-29	94.7 vs. 91.4	1.04 (1.01, 1.07)	.022	77.2 vs. 69.6	1.09 (1.00, 1.19)	.048
	30-44 vs. 18-29	90.1 vs. 91.4	0.98 (0.95, 1.01)	.392	73.4 vs. 69.6	1.05 (0.98, 1.13)	.132
	Income	≥\$100k vs. \$50k-\$99k	95.9 vs. 93.6	1.02 (1.01, 1.04)	.010	75.8 vs. 73.9	1.03 (0.98, 1.07)
≥\$100k vs. \$25k-\$49k		95.9 vs. 92.9	1.03 (1.00, 1.06)	.005	75.8 vs. 75.2	1.00 (0.93, 1.07)	.984
	≥\$100k vs. <\$25k	95.9 vs. 86.4	1.11 (1.07, 1.16)	.001	75.8 vs. 68.1	1.11 (1.04, 1.19)	.002
	\$50k-\$99k vs. \$25k-\$49k	93.6 vs. 92.9	1.01 (0.98, 1.03)	.520	73.9 vs. 75.2	0.98 (0.93, 1.04)	.508
	\$50k-\$99k vs. <\$25k	93.6 vs. 86.4	1.08 (1.04, 1.13)	.001	73.9 vs. 68.1	1.12 (1.01, 1.23)	.026
	\$25k-\$49k vs. <\$25k	92.9 vs. 86.4	1.08 (1.03, 1.12)	.001	75.2 vs. 68.1	1.10 (1.02, 1.19)	.010
Education	Bachelor's degree or higher vs. Some college	96.0 vs. 95.0	1.01 (0.99, 1.03)	.210	73.5 vs. 76.6	0.96 (0.92, 1.00)	.043
	Bachelor's degree or higher vs. High school	96.0 vs. 91.7	1.04 (1.02, 1.06)	.001	73.5 vs. 73.1	1.02 (0.96, 1.09)	.535

		95.4 vs. 90.0	1.03) 0.98 (0.95, 1.01)		76.6 vs. 68.0		1.01 (0.92, 1.10)	.837
	Excellent vs. Good			.273				
		95.4 vs. 94.1	0.97 (0.94, 1.00)		76.6 vs. 74.0		0.98 (0.92, 1.05)	.596
	Excellent vs. Very good			.051				
Region		95.4 vs. 93.8	1.02 (1.00, 1.04)		76.8 vs. 74.7		1.03 (0.98, 1.08)	.301
	Northeast vs. Midwest			.128				
		95.4 vs. 92.8	1.03 (1.01, 1.05)		76.8 vs. 74.4		1.03 (0.98, 1.09)	.196
	Northeast vs. South			.013				
		95.4 vs. 92.5	1.03 (1.01, 1.06)		76.8 vs. 70.9		1.08 (1.02, 1.15)	.005
	Northeast vs. West			.012				
		92.5 vs. 93.8	0.99 (0.96, 1.01)		70.9 vs. 74.7		0.95 (0.90, 1.00)	.058
	West vs. Midwest			.265				
		92.5 vs. 92.8	1.00 (0.97, 1.02)		70.9 vs. 74.4		0.95 (0.91, 1.00)	.065
	West vs. South			.788				
-		93.8 vs. 92.8	1.01 (1.00, 1.03)		74.7 vs. 74.4		1.00 (0.96, 1.05)	.843
	Midwest vs. South			.350				
Metropolitan status		93.7 vs. 91.3	1.03 (1.00, 1.06)		74.6 vs. 70.2		1.06 (1.00, 1.13)	.037
	Metro vs. Non-metro			.082				

¹ The second category or number listed is the reference level for the prevalence ratio.

² Prevalence Ratio (PR)

³ Confidence Interval (CI)

Bold indicates significant comparisons (p<.05).

Discussion

These data from a nationally representative sample suggest that in the spring of 2020, most U.S. adults were taking hygiene-related precautions to prevent COVID-19. The fact that almost all adults surveyed said that they were washing their hands often with soap and water to prevent COVID-19 is encouraging, as handwashing is an important way to prevent the spread of COVID-19 and other viruses.

Nearly three-quarters of adults said that they were disinfecting surfaces at home and work often to prevent COVID-19. This percentage, although high, is not as high as the percentage for handwashing. Compared to handwashing, disinfecting surfaces often may be a relatively novel behavior (i.e., people may be less familiar with the importance of frequent disinfection than they are with frequent

handwashing) potentially making it harder to adopt this practice [6]. Disinfecting surfaces frequently could be more time-consuming and difficult than handwashing; this could contribute to the lower adherence to this practice. Unfamiliarity with how to disinfect surfaces [7] and, possibly, unavailability and cost of disinfectant, may also contribute to this lower adherence percentage.

This study identified several demographic characteristics associated with hygiene-related practices. Men less often reported both handwashing and disinfecting; this finding is consistent with previous research showing that men engage in protective behaviors (e.g., handwashing) less often than women, even during epidemics [8, 9], and a finding consistent with work conducted during the COVID-19 pandemic [10]. Additionally, those with self-rated poor health were less likely to report handwashing and disinfecting to prevent COVID-19. As evidence indicates that COVID-19 disproportionately affects men and people with underlying health conditions, it may be particularly important for men and people in poor health to take preventive action to protect themselves from COVID-19 [11, 12].

Additional demographic characteristics were associated with a higher prevalence of hygiene-related COVID-19 prevention practices. Generally, frequent handwashing and disinfecting increased with age, although the pattern was stronger for handwashing. Compared to non-Hispanic Whites, non-Hispanic Blacks and Hispanics reported higher disinfecting rates. Current data indicate that COVID-19 causes a disproportionate burden of severe illness and death among older people and among racial and ethnic minority groups [11-13]. It is unclear why these particular groups had higher rates of prevention practices, while other vulnerable groups (i.e., men and people in poor health) did not. More research is needed to clarify these relationships. These data, along with data showing a high rate of cloth face covering use among non-Hispanic Blacks and Hispanics [14], also suggest that individual adherence to CDC guidance is unlikely to explain the racial/ethnic disparity in rates and outcomes of COVID-19; rather, this may be due to systemic racial inequity issues.

Our findings also suggest that people with lower income and education levels are less likely to take these precautions, although these patterns were, again, stronger for handwashing. People with lower income or education levels may face barriers to engaging in these behaviors. For example, they may be more likely to be classified as essential workers and work outside the home during the pandemic [15] and therefore have less time to clean. They may also have less access to water to use for handwashing; recent data indicate that lower income communities disproportionately lack access to clean water and indoor plumbing [16]. More research is needed to better understand the relationship between income, education, and these hygiene practices.

Where people live seems to be related to hygiene-related prevention practices. Those in the south and west regions of the U.S. had lower rates of handwashing compared to those living in the northeast and people living in non-metropolitan areas had lower rates of disinfecting surfaces than those living in metropolitan areas. These findings may be related to the fact that when the survey was conducted, most COVID-19 cases were in more densely populated metropolitan areas and a large COVID-19 outbreak was occurring in in the northeast region of the U.S. [17].

Conclusions

During March 19 – April 9, 2020 most survey respondents reported frequent handwashing and surface disinfection to prevent COVID-19. These practices are important components of a layered approach to COVID-19 prevention, which also includes wearing masks and physical distancing. We also identified gaps in these self-reported practices; 7% of respondents said they were not handwashing often and 26% said they were not disinfecting surfaces often. We also found that men, younger people, people with lower incomes and lower education levels, and people in self-rated poor health generally reported lower rates of both frequent handwashing and surface disinfection. These practice gaps among sub-populations vulnerable to COVID-19 (men and people in poor health) [11, 12] are of particular concern. Practice gaps for those with low incomes are also concerning, given that [underlying health conditions are more prevalent in](#) this group [18]. Communication efforts could be informed and enhanced by research delineating why some sub-populations have lower rates of hygiene-related COVID-19 prevention practices. Additionally, more work is needed to understand how hygiene behaviors fit in with other recommended COVID-19 prevention behaviors, such as wearing masks and physical distancing.

Limitations

This study has several limitations. First, although the data were weighted to be nationally representative and computers and internet access were provided to respondents who needed them, the results may not be fully representative of the US adult population (e.g., those uncomfortable with the internet may have had lower participation). Second, the data might be affected by social desirability bias, resulting in an overreporting of socially desirable behaviors (e.g., handwashing). Third, these data only measure self-reported practices, not actual practices. Fourth, many of the demographic characteristics covary, which may confound results. Finally, these data do not allow causal inferences about the reasons for differences by demographic characteristics found in self-reported practices.

List Of Abbreviations

CDC: Centers for Disease Control and Prevention

CI: confidence interval

COVID-19: coronavirus disease 2019

PR: prevalence ratio

Declarations

Ethics approval and consent to participate

Consent for publication

Not applicable

Availability of data and materials

The dataset supporting the conclusions of this article can be licensed from Porter Novelli Public Services by contacting Deanne Weber (deanne.weber@porternovelli.com).

Competing interests

The authors declare that they have no conflicts of interest.

Funding

The Centers for Disease Control and Prevention purchased the survey data license from Porter Novelli.

Author contributions

LB assisted in data analysis and interpretation and drafted the manuscript. ERH led data analysis. KVE and SC conducted initial data analyses and replication. AGW conceived of the project, interpreted data, and reviewed and edited the manuscript. CB reviewed and edited the manuscript. All authors read and approved the final manuscript.

Author affiliations

Centers of Disease Control and Prevention, COVID-19 Response, 1600 Clifton Road, Atlanta GA

Laura G. Brown (lrg0@cdc.gov), Catherine Barrett (ohi6@cdc.gov), Kayla L. Vanden Esschert (oys6@cdc.gov), Sarah Collier (sau9@cdc.gov), Amanda Garcia-Williams (gvl8@cdc.gov)

Centers for Disease Control and Prevention, National Center for Environmental Health, 4770 Buford Highway, Atlanta, GA

E. Rickamer Hoover (xmo2@cdc.gov)

Acknowledgements

We thank Fred Fridinger with CDC and Deanne Weber with Porter Novelli.

References

1. CDC. Coronavirus disease 2019 (COVID-19): cases of coronavirus disease 2019 (COVID-19) in the U.S. 2020. <https://www.cdc.gov/coronavirus/2019-ncov/cases-in-us.html>. Accessed 18 August 2020.
2. CDC. How COVID-19 Spreads. 2020. <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/how-covid-spreads.html>. Accessed 18 August 2020.

3. CDC. How to protect yourself and others. 2020. <https://www.cdc.gov/coronavirus/2019-ncov/prevent-getting-sick/prevention.html>. Accessed 18 August 2020.
4. PorterNovelli. ConsumerStyles & YouthStyles. 2020. <http://styles.porternovelli.com/consumer-youthstyles/>. Accessed 18 August 2020.
5. Zou G. A modified poisson regression approach to prospective studies with binary data. *Am J Epidemiol*. 2004;159:702-6.
6. Kelly S., et al., Barriers and facilitators to the uptake and maintenance of healthy behaviours by people at mid-life: A rapid systematic review. *PLoS One*. 2016;11: e0145074.
7. Gharpure R, et al., Knowledge and practices regarding safe household cleaning and disinfection for COVID-19 prevention - United States, May 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69:705-9.
8. Borchgrevink C, Cha J, S. Kim S, Handwashing practices in a college town environment. *J Environ Health*. 2013;75:18-24.
9. Moran KR, Del Valle SY. A meta-analysis of the association between gender and protective behaviors in response to respiratory epidemics and pandemics. *PLoS One*. 2016;11:e0164541.
10. Alsan M, et al. Disparities in Coronavirus 2019 reported incidence, knowledge, and behavior among US adults. *JAMA Netw Open*. 2020;3:e2012403.
11. Garg S, et al. Hospitalization rates and characteristics of patients hospitalized with laboratory-confirmed Coronavirus Disease 2019 – COVID-NET, 14 States, March 1–30, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69:458-4.
12. Killerby ME, et al. Characteristics associated with hospitalization among patients with COVID-19 – Metropolitan Atlanta, Georgia, March–April 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69:790-4.
13. CDC. COVID-19 in Racial and Ethnic Minority Groups. 2020. https://www.cdc.gov/coronavirus/2019-ncov/need-extra-precautions/racial-ethnic-minorities.html?deliveryName=USCDC_2067-DM26555. Accessed 18 August 2020.
14. Fisher KA, et al. Factors associated with cloth face covering use among adults during the COVID-19 pandemic – United States, April and May 2020. *MMWR. Morbidity and Mortality Weekly Rep*. 2020;69:933-7.
15. Tomer A, Kane K. How to protect essential workers during COVID-19. 2020. <https://www.brookings.edu/research/how-to-protect-essential-workers-during-covid-19/>. Accessed 18 August 2020.
16. Deitz S, Meehan K. Plumbing poverty: Mapping hot spots of racial and geographic inequality in U.S. household water insecurity. *Annals of the American Association of Geographers*. 2019;109:1092-109.
17. New York City Department of Health Mental Hygiene and Covid-Response Team, preliminary estimate of excess mortality during the COVID-19 outbreak - New York City, March 11-May 2, 2020. *MMWR Morb Mortal Wkly Rep*. 2020;69:603-605.
18. Blackwell D, Lucas J, Clarke T. Summary health statistics for U.S. adults: National Health Interview Survey, 2012. , in *Vital and Health Statistics*. 2014, National Center for Health Statistics: Washington,

DC.