Association of Food Insecurity and Metabolic Syndrome among NHANES Participants 1999-2014

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Abstract

Introduction

Food Security is access at all times to enough food for an active, healthy life; food insecurity exists when ever the availability of nutritionally adequate and safe foods is limited or uncertain(1). In 2010, it was estimated that approximately 50 million Americans were food insecure (2). Houselholds reporting food insecurity report a decrease in the frequency of commsumption of fruits and vegetables(3). Previous has research has found an association between food insecurity and hyperlipidemia, hypertension, diabetes(4,5), peripheral arterial disease (6), and poor cardiovascular health (7).

Methods

Results

Table 1: Charactersitcs of Study Participants by Food Security Status $\,$

	Not Food Insecure	Food Insecure	Missing
	(n=8877)	(n=3594)	(n=240)
	N(%)	N(%)	N(%)
Gender	, ,	` '	. ,
Female	4340(49)	1869(52)	118(49)
Race	, ,	, ,	, ,
Non-Hispanic White	4318(49)	1101(31)	81(34)
Mexican American	1435(16)	1002(28)	66(28)
Other Hispanic	649(7)	403(11)	16(7)
Non-Hispanic Black	1655(19)	893(25)	58(24)
Other (including multiracial)	298(3)	82(2)	12(5)
Missing	522(6)	113(3)	7(3)
Education	` '	. ,	. ,
Less than 9th Grade	601(7)	606(17)	26(11)
9-11th Grade	1126(13)	826(23)	38(16)
High School Grad	1944(22)	891(25)	71(30)
Some College/AA	2705(30)	998(28)	68(28)
College Graduate or above	2497(28)	$267(7)^{'}$	36(15)
Missing	4(0)	$6(0)^{'}$	$1(0)^{'}$
Income	· /	· /	. ,
Under \$20,000	1407(16)	1595(44)	7(3)
\$20,000 - \$54,999	3100(35)	1487(41)	82(34)
\$55,000-\$74,999	1149(13)	185(5)	27(11)
\$75,000 and Over	2709(31)	130(4)	18(8)
Missing	$512(6)^{-}$	197(5)	106(44)
Alcohol Use	` '	. ,	, ,
Never	993(11)	467(13)	29(12)
Moderate	3297(37)	930(26)	73(30)
Heavy	2854(32)	1364(38)	76(32)
Missing	1733(20)	833(23)	62(26)
Smoking Status	` '	,	` /
Never	5047(57)	1748(49)	138(57)
Former	1935(22)	$586(16)^{'}$	50(21)
Current	1838(21)	1198(33)	50(21)
Missing	57(1)	62(2)	2(1)
Moderate Phys Act	` '	()	. ,
Yes	4642(52)	1738(48)	119(50)
No	3265(37)	1502(42)	107(45)
Missing	970(11)	354(10)	14(6)
	Mean(SD)	Mean(SD)	Mean(SD)
Age	43(13)	40(13)	41(13)

Table 2: Charactersitcs of Study Participants by Food Security Category $\,$

Fully Food Secure	Marginal Food Security	Low Food Security	Very Low Food Security	Missing
(n=8877)	(n=1405)	(n=1370)	(n=819)	(n=240)
N(%)	N(%)	N(%)	N(%)	N(%)

Female		Fully Food Secure	Marginal Food Security	Low Food Security	Very Low Food Security	Missing
Female 4340(49) 741(53) 697(51) 431(53) 118(49) Race Non-Hispanic 4318(49) 391(28) 372(27) 338(41) 81(34) White Mexican 1435(16) 405(29) 442(32) 155(19) 66(28) American Other Hispanic 649(7) 146(10) 159(12) 98(12) 16(7) Non-Hispanic 1655(19) 381(27) 320(23) 192(23) 58(24) Black Other 298(3) 28(2) 39(3) 15(2) 12(5) (including multiracial) Missing 522(6) 54(4) 38(3) 21(3) 7(3) Education Less than 9th 601(7) 183(13) 294(21) 129(16) 26(11) Grade 9-11th Grade 1126(13) 297(21) 331(24) 198(24) 38(16) High School 1944(22) 374(27) 308(22) 209(26) 71(30) Grad Some 2705(30) 415(30) 336(25) 247(30) 68(28) College/AA College 2497(28) 132(9) 100(7) 35(4) 36(15) Graduate or above Missing 4(0) 4(0) 1(0) 1(0) 1(0) 1(0) Income Under \$20,000 1407(16) 525(37) 616(45) 454(55) 7(3) \$20,000 - 310(35) 626(45) 553(40) 308(38) 82(34) \$524,999 \$35,000-874,999 1149(13) 108(8) 58(4) 19(2) 27(11) \$75,000 and 2709(31) 78(6) 43(3) 9(1) 18(8) Ove Missing 512(6) 68(5) 100(7) 29(4) 106(44) Alcohol Use Never 993(11) 191(4) 187(14) 89(11) 29(12) Moderate 3297(37) 361(26) 342(25) 227(28) 73(30) Heavy 2854(32) 531(38) 527(38) 306(37) 76(32) Missing 173(20) 322(23) 314(23) 197(24) 62(26) Missing 54(4) 19(2) 241(11) 29(12) Current 1838(21) 407(29) 440(32) 351(43) 59(21) Missing 57(1) 29(2) 23(2) 10(1) 2(1) Moderate Phys Act Ves 464(252) 671(48) 651(48) 4416(51) 111(9) Moderate Phys Act Ves 464(252) 671(48) 651(48) 4416(51) 119(50 No 3265(37) 581(41) 580(42) 341(42) 107(45) Mean(SD) Mean(SD) Mean(SD) Mean(SD) Mean(SD)	Gender					
Race		4340(49)	741(53)	697(51)	431(53)	118(49)
Non-Hispanic 4318(49) 391(28) 372(27) 338(41) 81(34) White		-0-0(-0)	. ==(00)	001(0-)	-0-(00)	()
White		4318(49)	391(28)	372(27)	338(41)	81(34)
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No $3265(37)$ $581(41)$ $580(42)$ $341(42)$ $107(45)$ Missing $970(11)$ $153(11)$ $139(10)$ $62(8)$ $14(6)$ Mean(SD) Mean(SD) Mean(SD) Mean(SD) Mean(SD)		4642(52)	671(49)	651(49)	416(51)	110(50)
Missing $970(11)$ $153(11)$ $139(10)$ $62(8)$ $14(6)$ Mean(SD) Mean(SD) Mean(SD) Mean(SD) Mean(SD)		` '	` ,	` '	` ,	` '
Mean(SD) $Mean(SD)$ $Mean(SD)$ $Mean(SD)$			` ,		` /	
	mineema			` /		
(A CPC) /(31/31 /(11/4) /(1/19) /(1/19) /(1/19)	Age	43(13)	40(14)	41(13)	40(13)	41(13)

Table 3: Weighted Charactersitcs of Study Participants by Food Security Status

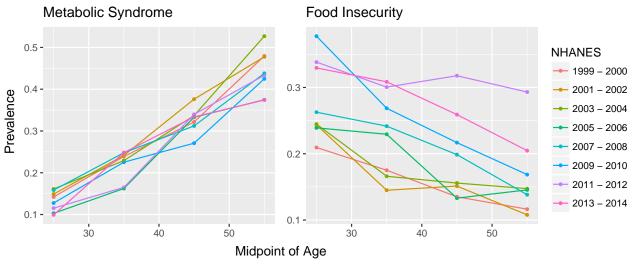
	Not Food Insecure	Food Insecure	p-value
	(n=88177828)	(n=22997275)	
	N(%)	N(%)	
Gender	, ,	()	1.00
Female	42872281(49)	11179567(49)	
Moderate Phys Act	` '	,	< 0.01
No	31515063(36)	9824629(43)	
Race	` '	, ,	< 0.01
Non-Hispanic White	67376239(76)	11878482(52)	
Mexican American	5656507(6)	3818366(17)	
Other Hispanic	3753298(4)	2180826(9)	
Non-Hispanic Black	7963019(9)	4482271(19)	
Other (including multiracial)	3428764(4)	$637329(3)^{'}$	
Education	` '	` '	< 0.01
Less than 9th Grade	2359155(3)	2249538(10)	
9-11th Grade	7787500(9)	5147999(22)	
High School Grad	18563491(21)	6102111(27)	
Some College/AA	28338608(32)	7617569(33)	
College Graduate or above	31129074(35)	1880058(8)	
Income			< 0.01
$\mathbf{Under~\$20,}000$	10738495(12)	10047850(44)	
\$20,000 - \$54,999	27895252(32)	9972909(43)	
\$55,000-\$74,999	13673503(16)	1710333(7)	
\$75,000 and Over	35870577(41)	1266183(6)	
Alcohol Use			< 0.01
Never	9328890(11)	3048910(13)	
Moderate	42648439(48)	7914297(34)	
Heavy	36200499(41)	12034069(52)	
Smoking Status			< 0.01
Never	50532364(57)	10343630(45)	
Former	19755416(22)	3542494(15)	
Current	17890047(20)	9111150(40)	
	Mean(SD)	Mean(SD)	
Age	42(0.3)	37(0.4)	< 0.01

Table 4: Weighted Charactersitcs of Study Participants by Food Security Category

	Fully Food Secure	Marginal Food Security	Low Food Security	Very Low Food Security	p- value
	(n=88177828) N(%)	(n=8934150) N(%)	(n=8276011) N(%)	(n=5787114) N(%)	
Gender Female Moderate Phys	42872281(49)	4441789(50)	3973027(48)	2764751(48)	0.90 <0.01
Act No Race	31515063(36)	3806635(43)	3568694(43)	2449300(42)	< 0.01

	Fully Food	Marginal Food	Low Food	Very Low Food	p-
	Secure	Security	Security	Security	value
Non-Hispanic	67376239(76)	4247902(48)	4213178(51)	3417402(59)	
White					
Mexican	5656507(6)	1633376(18)	1617242(20)	567748(10)	
American					
Other Hispanic	3753298(4)	935038(10)	685617(8)	560171(10)	
Non-Hispanic	7963019(9)	1865360(21)	1509963(18)	1106949(19)	
Black					
Other	3428764(4)	252474(3)	250010(3)	134845(2)	
(including					
$\operatorname{multiracial})$					
Education					< 0.01
Less than 9th	2359155(3)	814175(9)	924848(11)	510514(9)	
Grade					
9-11th Grade	7787500(9)	1641976(18)	2174825(26)	1331199(23)	
High School	18563491(21)	2464206(28)	1926733(23)	1711172(30)	
Grad					
Some	28338608(32)	3032930(34)	2566631(31)	2018008(35)	
$\operatorname{College}/\operatorname{AA}$					
$\mathbf{College}$	31129074(35)	980862(11)	682974(8)	216221(4)	
Graduate or					
above					
Income					< 0.01
Under \$20,000	10738495(12)	3287677(37)	3675740(44)	3084433(53)	
\$20,000 -	27895252(32)	4000244(45)	3551965(43)	2420701(42)	
\$54,999					
\$55,000-\$74,999	13673503(16)	982134(11)	565526(7)	162673(3)	
\$75,000 and	35870577(41)	664095(7)	482780(6)	119307(2)	
Over					
Alcohol Use					< 0.01
Never	9328890(11)	1222689(14)	1088843(13)	737377(13)	
Moderate	42648439(48)	3045107(34)	2811894(34)	2057296(36)	
Heavy	36200499(41)	4666354(52)	4375274(53)	2992441(52)	
Smoking Status					< 0.01
Never	50532364(57)	4352677(49)	3892901(47)	2098053(36)	
Former	19755416(22)	1547773(17)	1204353(15)	790368(14)	
Current	17890047(20)	3033700(34)	3178757(38)	2898693(50)	
	Mean(SD)	Mean(SD)	Mean(SD)	Mean(SD)	
Age	42(0.3)	37(0.6)	38(0.6)	37(0.8)	< 0.01

Prevalence of Metabolic Syndrome and Food Insecurity by Age and NHANES Cycle



Prevalence of Food Security Categories by Age and NHANES Cycle

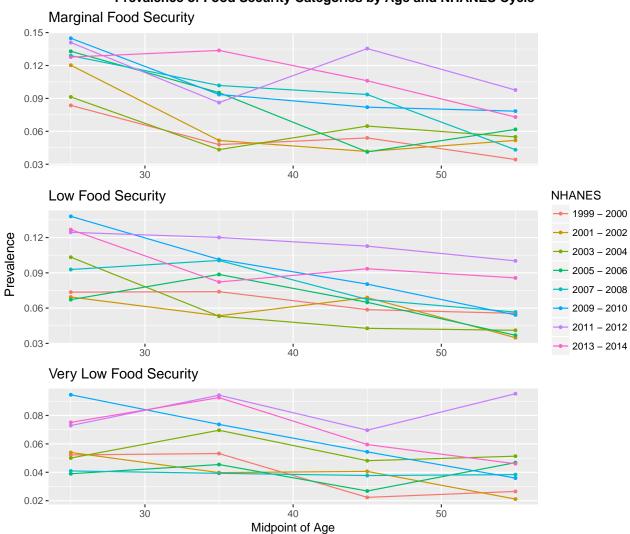


Table 5: Unadjusted Prevalence and Relative Risk Ratio of Metabolic Syndrome

	Metabolic Syndrome (missing alc excl)	Metabolic Syndrome (missing alc not excl)
Unadjusted Prevalence		
Food Secure	0.29(0.27 - 0.30)	0.31(0.29 - 0.32)
Food Insecure	0.31(0.28 - 0.34)	0.33(0.30 - 0.36)
Crude Risk Ratio	1.06(0.96 - 1.17)	1.07(0.98 - 1.17)

Table 6: Unadjusted Prevalence and Relative Risk Ratio of Metabolic Syndrome

	Metabolic Syndrome (missing alc excl)	Metabolic Syndrome (missing alc not excl)
Unadjusted Prevalence		
Full food security	0.29(0.27 - 0.30)	0.31(0.29 - 0.32)
Marginal food security	0.29(0.25 - 0.34)	0.31(0.27 - 0.35)
Low Food security	0.31(0.27 - 0.36)	0.34(0.29 - 0.38)
Very low Food security	0.32(0.27 - 0.37)	0.34(0.29 - 0.39)
Crude Risk Ratio (vs full		
food security)		
Marginal food security	1.00(0.86 - 1.17)	1.02(0.90-1.15)
Low food security	1.08(0.94-1.24)	1.10(0.98 - 1.24)
Very low food security	1.10(0.93 - 1.31)	1.11(0.95-1.31)

Table 7: Adjusted Risk Ratio Metabolic Syndrome by Food Insecurity Status $\,$

	Adj RR	Adj RR not adj for alc
Male	1.08(0.78-1.50)	1.11(0.81-1.52)
Female	1.36(0.95-1.93)	1.37 (1.01 - 1.85)

Table 8: Adjusted Risk Ratio Metabolic Syndrome by Food Security Category

	Males	Females
Adj RR (vs full food security)		
Marginal food security	1.11(0.63-1.96)	1.22(0.66-2.23)
Low food security	1.28(0.80-2.05)	2.14(1.35-3.38)
Very low food security	0.86(0.53-1.41)	1.36(0.77-2.39)
Adj RR not adj for alc (vs full food security)	,	` '
Marginal food security	1.11(0.65-1.89)	1.17(0.69-1.99)
Low food security	1.25(0.82 - 1.91)	1.94(1.31-2.87)
Very low food security	0.99(0.57 - 1.72)	1.49(0.84-2.63)

Discussion

Conculsions

References

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