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Cigarette smoking risk-reducing beliefs: Findings from the United States Health Information National Trends Survey

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Abstract

Cigarette smoking risk-reducing beliefs are ideas that certain health promoting behaviors (e.g., exercise) may mitigate the risks associated with smoking. The objective of this study was to describe smoking risk-reducing beliefs and the belief that quitting can reduce the harmful effects of smoking among the U.S. adult population and the associations between these beliefs, current smoking status, and sociodemographics. Data were from the Health Information National Trends Survey 4 (HINTS 4) Cycles 3 and 4 (2013–2014;N = 6862). Descriptive analyses were conducted to examine bivariate associations among the quit smoking belief, smoking risk-reducing beliefs, and covariates. Weighted ordinal logistic regression models examined the adjusted associations between smoking status and sociodemographics, with quit smoking belief and risk-reducing beliefs. Eighty-two percent of the population reported that quitting cigarette smoking can help reduce the harmful effects of smoking a lot: former smokers and individuals with higher educational attainment were more likely to endorse this belief than never smokers and those with lower educational attainment. Many people endorsed smoking risk-reducing beliefs about exercise

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Contributors

ARK and ABN conceived the idea for this study. ARK drafted and revised the manuscript. KC conducted data analyses and edited the manuscript. ARK, ABN, and KC contributed to the interpretation of the study findings. ABN and KC provided feedback for drafts of the manuscript.

Conflict of interest

None.

Data sharing

Readers are encouraged to utilize the Health Information National Trends (HINTS) Data, a publicly available dataset which can be found online at <http://hints.cancer.gov/default.aspx>.

Ethics approval

HINTS 4 was approved by Westat IRB in an expedited review and deemed exempt from IRB review by the NIH Office of Human Subjects Research Protections at the National Institutes of Health.

Declaration of interests

None. The views and opinions expressed in this manuscript are those of the authors only and do not necessarily represent the views, official policy, or position of the USDHHS or any of its affiliated institutions or agencies.

(79.3%), fruits and vegetables (71.8%), vitamins (67.2%), and sleep (68.5%). Former smokers were less likely to subscribe to these beliefs than never smokers. Vulnerable populations who may be most at risk of smoking attributable morbidity and mortality were more likely to endorse risk-reducing beliefs. Future studies are needed to better understand how risk-reducing beliefs are formed and if modifying these beliefs may help to reduce cigarette smoking in the U.S.

Keywords

Smoking; Tobacco products; Population; Exercise; Diet; Vitamins; Sleep; Smoking cessation; Social class; Attitude; HINTS

1. Introduction

It is essential to understand the underlying factors and beliefs that influence individuals' smoking behavior and these beliefs may be multifaceted (Fiore et al., 2008; Waters et al., 2014; Nguyen et al., 2015). Research has shown that health promotion behaviors (Altekruse et al., 1995) and risk-taking behaviors tend to be related (Jessor and Jessor, 1977). Risk-reducing beliefs describe ideas that certain behaviors, such as exercise or diet, may lessen the risks associated with unhealthy behaviors (Haddock et al., 2004). Tobacco risk-reducing beliefs have existed and changed over time (e.g., those related to menthol cigarettes (Castro, 2004; Henningfield et al., 2003; Gardiner, 2004)) Research has shown that such beliefs have been propagated by the tobacco industry through communications including advertising and product features (Pollay and Dewhirst, 2002; Cummings et al., 2002).

Although domain-specific beliefs (e.g., those related to one specific health behavior) are important predictors of behavior (El-Shahawy et al., 2015), it may be that individuals' beliefs about behaviors are more complex and cross-over from one behavior to another. In particular, people may believe that engaging in health promoting behaviors reduces the risks associated with risk-taking behaviors. The purpose of this study was to describe both smoking risk-reducing beliefs as well as the belief that quitting smoking reduces the harmful effects of smoking in the U.S. non-institutionalized adult (18 and over) population.

2. Methods

Data were from the Health Information National Trends Survey (HINTS) 4 Cycle 3 (September–November 2013) and Cycle 4 (July–November 2014) (N = 6862). HINTS 4 was approved by Westat IRB in an expedited review and deemed exempt from IRB review by the National Institutes of Health Office of Human Subjects Research Protections. Items were tested through cognitive interviewing before the surveys were fielded. The survey response rate was 35.2% for Cycle 3 and 34.4% for Cycle 4. Additional sampling, design and weighting strategies for HINTS 4 have been published elsewhere (Westat, 2014, 2015).

Covariates included age, gender, education, marital status, imputed annual household income, and race/ethnicity. Participants' smoking status was defined as never, former, and current (everyday and some days) based on responses to two items: 1) Have you smoked at least 100 cigarettes in your entire life? (*yes/no*) and 2) Do you now smoke cigarettes every

day, some days or not at all? The quit-smoking belief, was assessed with the item, “How much do you think quitting cigarette smoking can help reduce the harmful effects of smoking.” Risk-reducing beliefs were assessed with four items, “How much do you think each of the following helps a current smoker reduce the harmful effects of smoking if the person continues to smoke?: Exercising, Eating fruits and vegetables, Taking vitamins, and Sleeping at least 8 hours per night.” Response options for these questions were *not at all, a little, somewhat, and a lot*.

Cross-tabulations analyses were utilized to examine the bivariate associations among demographic covariates, the quit smoking belief, and smoking risk-reducing beliefs. Variables that were significantly ($p < 0.05$) associated with the quit smoking belief and risk-reducing beliefs were selected as independent variables in weighted ordinal logistic regression models, in which the quit smoking belief and risk-reducing beliefs served as the dependent variables. Smoking status was included in all models regardless of significance at the bivariate level. All analyses were conducted using SAS 9.3 and SAS-callable SUDAAN 10.0 statistical software which allows for the incorporation of the jackknife replicate weights to estimate accurate variance estimates for statistical modeling and analyses were weighted to adjust for demographic oversampling and survey non-responsiveness, and to provide representative estimates of the adult U.S. population (Westat, 2014, 2015).

3. Results

Table 1 displays descriptive statistics for all covariates by the quit smoking belief and smoking risk-reducing beliefs. Approximately 82% of the population reported that quitting cigarette smoking can help reduce the harmful effects of smoking ‘a lot,’ followed by 12.6% reporting ‘somewhat,’ 4.1% ‘a little,’ and 1.7% ‘not at all.’ For the belief that exercise reduces the harmful effects of smoking: 29.5% of respondents reported ‘a lot,’ 28.5% reported ‘somewhat,’ 21.3% reported ‘a little,’ and 20.8% reported ‘not at all.’ For eating fruits and vegetables, 23.3% reported ‘a lot,’ 25.7% reported ‘somewhat,’ 22.9% reported ‘a little,’ and 28.0% reported ‘not at all.’ For vitamins undoing the harmful effects of smoking: 19.5% reported ‘a lot,’ 23.4% reported ‘somewhat,’ 24.3% reported ‘a little,’ and 32.7% reported ‘not at all.’ For sleep undoing the harmful effects of smoking 23.1% reported ‘a lot,’ 23.5% reported ‘somewhat,’ 21.9% reported ‘a little,’ and 31.4% reported ‘not at all.’

3.1. Quit smoking belief

In an ordinal logistic regression analysis (Table 2), former smokers were significantly more likely to endorse the quit smoking belief (OR = 1.68, 95% CI = 1.35–2.10) than never smokers and current smokers (OR: 2.13, 95% CI: 1.51, 3.01; data not shown). Belief that quitting smoking reduces the harmful effects of smoking was associated with education, such that those with high school/GED education (OR = 0.65, 95% CI = 0.47–0.89) and some college (OR = 0.69, 95% CI = 0.51–0.93) were less likely to endorse this belief than those with a college degree or more. Those with an income of \$15–34,999 were significantly less likely to endorse the quit smoking belief than were those with income \$75,000 or more (OR = 0.64, 95% CI = 0.45–0.93).

3.2. Risk-reducing beliefs

In ordinal logistic regression models (Table 2), smoking status was associated with risk-reducing beliefs for diet, vitamins, and sleep, such that former smokers were at decreased odds of endorsing these beliefs compared to never smokers: fruits and vegetables (OR = 0.78, 95% CI = 0.62–0.99), vitamins (OR = 0.74, 95% CI = 0.59–0.93), and sleep (OR = 0.74, 95% CI = 0.60–0.91). Age was associated with the risk-reducing belief about exercise: compared to those 18–29 years, individuals 70 years or older were significantly less likely to endorse the belief that exercise reduces harm (OR = 0.71, 95% CI = 0.50–0.99). Those in the lowest income category (\$0–14,999) were more likely to endorse the risk-reducing beliefs about vitamins and sleep compared to those with an income of \$75 k or more (OR = 1.80, 95% CI = 1.21–2.68; OR = 1.65, 95% CI = 1.14–2.38, respectively). Race/ethnicity was significantly associated with all risk-reducing beliefs. Hispanic (OR = 1.38, 95% CI = 1.05–1.81) and Other (OR = 1.40, 95% CI = 1.02–1.92) respondents were more likely to endorse the risk-reducing belief about exercise than Whites and similar patterns emerged for vitamins and sleep. Black (OR = 1.35, 95% CI = 1.05–1.72), Hispanic (OR = 1.49, 95% CI = 1.15–1.94), and Other (OR = 1.62, 95% CI = 1.21–2.15) respondents were more likely to endorse the risk-reducing belief about fruits and vegetables than Whites.

4. Discussion

Our findings suggest many people in the United States subscribe to risk-reducing beliefs that exercise (79.3%), fruits and vegetables (71.8%), sleep (68.5%), and vitamins (67.2%) help current smokers reduce the harmful effects of smoking.¹ Former smokers were less likely to subscribe to these beliefs than never smokers. In addition, more than 98% of the population believed that quitting smoking can help reduce the harmful effects of smoking.¹ Former smokers were significantly more likely than never and current smokers to endorse the quit smoking belief. There were no statistically significant differences between current and never smokers on risk-reducing beliefs or the quit smoking belief.

Our study revealed that former smokers were the least likely to subscribe to risk-reducing beliefs. Research has shown that smokers are unrealistically optimistic about their smoking, and that this is associated with rationalizations about cancer risk (Dillard et al., 2006). In addition, prior research has shown that many smokers endorse risk-reducing beliefs (e.g. exercise undoes most smoking effects) (Haddock et al., 2004; Weinstein et al., 2005). While risk-reducing beliefs may be highly self-relevant for current smokers and may serve as validation for their smoking behavior, for never smokers these risk-reducing beliefs are likely something they rarely think about. Our adjusted ordinal logistic regression analyses did not replicate these findings, but rather showed that former smokers are less likely to endorse risk-reducing beliefs about diet, vitamins, and sleep compared to never smokers and most likely to endorse the belief about quitting smoking. Former smokers may have experienced health benefits of quitting smoking or believe that quitting is the only health behavior that can reduce the harmful effects of smoking. The cross-sectional nature of the current study limits our ability to understand temporal patterns at the individual level (e.g.,

¹Proportions indicate those who responded with either ‘a little,’ ‘somewhat,’ or ‘a lot.’

was endorsement of risk-reducing belief determined pre- versus post-quitting) and future longitudinal research is needed to explore these potential explanations.

The current study also reveals significant differences in risk-reducing beliefs by vulnerable populations (e.g., lower education, income, racial/ ethnic minority) that are more at risk for smoking attributable morbidity and mortality (U.S. Department of Health and Human Services, 2014). These findings build on prior research showing that age, race/ethnicity, and education were significantly associated with risk-reducing beliefs and that current smokers were most likely to endorse these beliefs (Finney Rutten et al., 2008). However, unlike this prior study, ours did not reveal an association of gender with risk-reducing beliefs and our study suggests that former smokers are less likely to endorse risk-reducing beliefs than never smokers. Differences between the present study and past literature may be explained by changes in beliefs over time and question wording.

This study must be interpreted in light of some limitations. The study's cross-sectional design does not allow determination of causal relationships. The definition of current smoker was assessed by asking participants if they smoked 100 cigarettes in their life and if they currently smoke every day, some days or not at all. HINTS did not assess past 30-day smoking. The response rate for HINTS is low which may lead to biases in the data, however achieving response representativeness is more important for reducing potential bias (Cook et al., 2000).

Existing evidence fails to support engaging in health promoting behaviors, other than quitting, as a means to reduce the health risks of smoking [e.g. McBride and Ostroff, 2003]. Despite this, individuals hold risk-reducing beliefs and these beliefs differ by sub-groups in the population. Future public health efforts, particularly around health communication, to correct these misperceptions may positively influence smoking and health behavior. Research is needed to understand where risk-reducing beliefs originate and how risk-reducing beliefs may impact health-promoting and risk-taking behaviors.

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Table 1

Weighted unadjusted prevalence (unweighted N) of belief about quitting smoking and risk reducing beliefs: Health Information National Trends Survey, United States, 2013–2014 (N = 6862).

How much do you think quitting cigarette smoking can help reduce the harmful effects of smoking? weighted % (unweighted N)					How much do you think each of the following helps a current smoker reduce the harmful effects of smoking if the person continues to smoke? weighted % (unweighted N)				
Total	Not at all	A little	Somewhat	A lot	Exercise				
					Not at all	A little	Somewhat	A lot	
Total	1.7 (133)	4.1 (254)	12.6 (844)	81.6 (5350)	20.8 (1456)	21.3 (1313)	28.5 (1664)	29.5 (1985)	
Age									
18–29	18.5 (499)	26.6 (24)	21.7 (64)	18.1 (393)	16.1 (85)	21.7 (111)	33.9 (146)	28.3 (148)	
30–49	39.0 (1849)	34.5 (28)	35.6 (221)	40.1 (1490)	17.7 (324)	22.3 (393)	27.5 (470)	32.4 (609)	
50–69	30.5 (2984)	34.7 (57)	30.5 (126)	31.7 (378)	23.4 (647)	21.6 (575)	27.1 (737)	27.9 (867)	
70+	11.9 (1245)	12.9 (27)	11.0 (152)	11.9 (966)	29.5 (345)	17.7 (206)	27.8 (265)	25.0 (293)	
Gender									
Male	48.3 (2621)	45.3 (44)	43.4 (279)	50.3 (2018)	19.5 (519)	20.8 (486)	29.6 (664)	30.1 (732)	
Female	51.8 (4090)	54.7 (69)	56.6 (508)	49.7 (2924)	21.7 (837)	22.3 (748)	27.9 (882)	28.1 (1082)	
Education									
Less than HS	10.6 (605)	10.8 (28)	10.5 (66)	9.9 (433)	22.9 (141)	16.2 (81)	24.0 (111)	37.0 (195)	
HS graduate	21.3 (1369)	30.5 (34)	22.8 (194)	20.3 (1001)	22.8 (331)	18.3 (243)	30.1 (316)	28.9 (377)	
Some college	31.4 (2023)	38.9 (86)	34.5 (254)	30.6 (1591)	21.5 (436)	24.0 (391)	27.1 (484)	27.5 (611)	
College graduate or more	36.7 (2627)	15.4 (21)	32.2 (307)	39.2 (2195)	17.9 (509)	22.3 (572)	30.2 (714)	29.5 (748)	
Marital status									
Married/living as married	57.6 (3412)	49.7 (49)	57.6 (399)	57.9 (2739)	21.9 (724)	21.8 (685)	28.2 (889)	28.1 (957)	
Single	26.6 (1127)	30.8 (29)	25.0 (147)	26.7 (863)	16.5 (218)	21.4 (230)	30.8 (269)	31.2 (358)	
Divorced/separated/widowed	15.8 (2051)	19.5 (46)	17.4 (267)	15.4 (1592)	23.6 (471)	18.5 (363)	26.3 (461)	31.6 (606)	
Income									
\$0 to \$14,999	13.9 (1089)	22.9 (51)	13.4 (135)	12.6 (748)	21.1 (221)	16.1 (168)	27.8 (210)	35.0 (341)	
\$15,000 to \$34,999	19.8 (1384)	29.2 (31)	23.3 (173)	18.2 (1004)	21.0 (293)	22.7 (249)	27.1 (300)	29.2 (397)	
\$35,000 to \$74,999	32.2 (1967)	31.1 (30)	31.5 (234)	32.9 (1502)	20.7 (402)	22.2 (384)	28.2 (471)	28.8 (553)	
\$75,000 or more	34.2 (1861)	5.0 (7)	31.9 (202)	36.4 (1503)	20.0 (362)	22.0 (398)	30.8 (510)	27.2 (476)	

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How much do you think each of the following helps a current smoker reduce the harmful effects of smoking if the person continues to smoke? weighted % (unweighted N)												
	Fruits and vegetables				Vitamins				Sleep			
	Not at all	A little	Somewhat	A lot	Not at all	A little	Somewhat	A lot	Not at all	A little	Somewhat	A lot
College graduate or more	25.3 (696)	25.8 (607)	25.7 (665)	23.2 (572)	31.5 (853)	27.2 (646)	22.4 (589)	18.9 (444)	30.4 (797)	22.9 (592)	23.5 (608)	23.2 (543)
Marital status												
Married/living as married	29.0 (922)	22.2 (712)	26.4 (840)	22.4 (755)	34.1 (1098)	24.2 (763)	23.6 (761)	18.2 (595)	33.0 (1049)	22.3 (702)	23.3 (751)	21.5 (728)
Single	25.2 (292)	26.8 (251)	23.3 (242)	24.7 (282)	29.4 (350)	26.4 (245)	22.3 (237)	21.9 (232)	27.1 (325)	23.4 (235)	23.9 (230)	25.7 (276)
Divorced/separated/widowed	28.9 (575)	19.6 (341)	26.5 (454)	25.0 (516)	33.1 (662)	22.6 (381)	24.0 (414)	20.2 (421)	33.0 (639)	17.9 (339)	24.3 (427)	24.8 (491)
Income												
\$0 to \$14,999	23.9 (244)	17.3 (166)	28.3 (219)	30.5 (293)	27.6 (281)	16.7 (176)	25.7 (211)	30.9 (247)	27.5 (286)	16.3 (156)	24.9 (203)	31.4 (281)
\$15,000 to \$34,999	29.2 (365)	21.9 (224)	26.5 (294)	23.2 (336)	32.1 (408)	24.6 (254)	23.9 (285)	19.5 (273)	31.7 (394)	21.3 (225)	23.5 (277)	23.5 (332)
\$35,000 to \$74,999	27.6 (525)	25.3 (405)	25.1 (443)	22.1 (437)	33.0 (619)	25.5 (423)	22.0 (393)	19.5 (365)	31.4 (597)	22.5 (384)	22.8 (402)	23.3 (426)
\$75,000 or more	28.8 (499)	24.1 (425)	26.7 (464)	20.4 (351)	34.5 (619)	26.2 (438)	23.8 (409)	15.6 (273)	32.7 (563)	24.9 (430)	23.7 (412)	18.7 (336)
Race/ethnicity												
White	29.8 (1068)	25.0 (818)	26.4 (867)	18.8 (667)	34.6 (1269)	26.7 (865)	23.3 (756)	15.4 (526)	32.4 (1165)	24.3 (818)	25.0 (815)	18.2 (630)
Black	25.6 (252)	22.1 (163)	21.2 (215)	31.2 (265)	30.1 (289)	21.1 (171)	19.6 (200)	29.1 (228)	30.7 (292)	17.9 (152)	17.6 (179)	33.8 (268)
Hispanic	23.2 (231)	20.4 (158)	23.5 (221)	33.0 (335)	26.8 (264)	19.8 (168)	26.6 (242)	26.9 (264)	27.2 (271)	18.5 (145)	21.0 (203)	33.4 (332)
Other	17.9 (90)	23.3 (108)	30.2 (110)	28.6 (124)	24.3 (119)	25.4 (106)	26.0 (108)	24.3 (100)	23.1 (118)	23.4 (98)	28.2 (102)	25.3 (116)
Smoking status												
Never	26.5 (1023)	22.9 (770)	26.9 (936)	23.8 (933)	30.6 (1212)	23.9 (813)	25.0 (860)	20.4 (767)	29.2 (1147)	22.5 (759)	23.7 (843)	24.6 (920)
Former	34.1 (574)	21.7 (359)	23.0 (383)	21.1 (400)	38.7 (663)	24.0 (390)	19.9 (345)	17.4 (307)	37.9 (644)	20.5 (353)	21.6 (353)	20.0 (371)
Current	24.7 (235)	24.8 (199)	25.9 (256)	24.6 (256)	30.9 (283)	26.4 (210)	23.1 (240)	19.6 (209)	29.6 (267)	21.9 (189)	26.1 (245)	22.5 (246)

Weighted ordinal logistic regression analyses: Health Information National Trends Survey, United States, 2013–2014, odds ratio (95% confidence interval).

Table 2

	Unweighted n	How much do you think quitting cigarette smoking can help reduce the harmful effects of smoking? (N = 5739)	How much do you think each of the following helps a current smoker reduce the harmful effects of smoking if the person continues to smoke?			
			Exercise (N = 5579)	Fruits and vegetables (N = 5580)	Vitamins (N = 5527)	Sleep (N = 5510)
Smoking status						
Never	3967	Ref	Ref	Ref	Ref	Ref
Former	1817	1.68 (1.35–2.10)	0.91 (0.75–1.10)	0.78 (0.62–0.99)	0.74 (0.59–0.93)	0.74 (0.60–0.91)
Current	984	0.71 (0.49–1.03)	1.05 (0.86–1.28)	1.05 (0.84–1.31)	0.86 (0.67–1.11)	0.88 (0.69–1.12)
Age						
18–29	499	–	Ref	Ref	Ref	Ref
30–49	1849	–	1.07 (0.81–1.43)	1.17 (0.89–1.55)	1.12 (0.87–1.44)	1.16 (0.87–1.56)
50–69	2984	–	0.91 (0.69–1.19)	1.07 (0.81–1.40)	0.97 (0.75–1.25)	1.02 (0.78–1.33)
70+	1245	–	0.71 (0.50–0.99)	0.93 (0.67–1.29)	0.72 (0.52–1.01)	0.83 (0.59–1.16)
Education						
Less than HS	605	0.86 (0.58–1.28)	1.30 (0.91–1.86)	1.35 (0.98–1.86)	1.21 (0.84–1.74)	1.10 (0.77–1.55)
HS graduate	1369	0.65 (0.47–0.89)	0.95 (0.76–1.17)	0.98 (0.78–1.21)	1.06 (0.84–1.35)	0.96 (0.75–1.23)
Some college	2023	0.69 (0.51–0.93)	0.86 (0.70–1.06)	0.90 (0.74–1.11)	0.96 (0.77–1.20)	0.90 (0.73–1.11)
College graduate or more	2627	Ref	Ref	Ref	Ref	Ref
Marital status						
Married/living as married	3412	–	Ref	–	–	Ref
Single	1127	–	1.18 (0.92–1.51)	–	–	1.15 (0.93–1.41)
Divorced/separated/widowed	2051	–	1.19 (0.96–1.47)	–	–	1.16 (0.94–1.43)
Income						
\$0 to \$14,999	1089	0.66 (0.42–1.04)	–	–	1.80 (1.21–2.68)	1.65 (1.14–2.38)
\$15,000 to \$34,999	1384	0.64 (0.45–0.93)	–	–	1.15 (0.86–1.54)	1.11 (0.83–1.48)
\$35,000 to \$74,999	1967	0.92 (0.66–1.27)	–	–	1.15 (0.94–1.40)	1.16 (0.95–1.42)
\$75,000 or more	1861	Ref	–	–	Ref	Ref
Race/ethnicity						
White	3544	Ref	Ref	Ref	Ref	Ref

	Unweighted n	How much do you think quitting cigarette smoking can help reduce the harmful effects of smoking? (N = 5739)	How much do you think each of the following helps a current smoker reduce the harmful effects of smoking if the person continues to smoke?			
			Exercise (N = 5579)	Fruits and vegetables (N = 5580)	Vitamins (N = 5527)	Sleep (N = 5510)
Black	955	1.14 (0.79–1.65)	1.17 (0.93–1.48)	1.35 (1.05–1.75)	1.30 (0.98–1.71)	1.23 (0.93–1.63)
Hispanic	1051	1.03 (0.73–1.46)	1.38 (1.05–1.81)	1.49 (1.15–1.94)	1.41 (1.09–1.84)	1.42 (1.07–1.88)
Other	448	1.46 (0.89–2.39)	1.40 (1.02–1.92)	–1.62 2.15 (1.21	1.48 (1.10–2.01)	1.33 (1.00–1.77)