Demographic characteristics associated with awareness of cigarette health warnings and thinking about quitting among current adult cigarette smokers in Zambia, 2017

Masauso M. Phiri[1], April D. Summers[2], Alissa C. Kress[2], Isabel Garcia de Quevedo[2], Ralph Caraballo[2], Evelyn Twentyman[2]

ABSTRACT

INTRODUCTION Noticing health warnings on cigarette packages has been associated with thinking about quitting. This study examined sociodemographic characteristics associated with awareness of health warnings on cigarette packages and thinking about quitting because of health warning labels among adults who currently smoked tobacco.

METHODS We analyzed data from the 2017 Zambia WHO STEPS survey (STEPwise approach to surveillance) for noncommunicable disease risk factors. Descriptive analyses and logistic regression were performed to assess the association of select sociodemographic characteristics with awareness of health warnings and thinking about quitting because of health warnings.

RESULTS Adults who currently smoked tobacco who were aged 30–44 years, of Chewa ethnicity, or with a formal education, were more likely to be aware of health warnings than those aged 18–29 years (adjusted prevalence ratio, APR=1.26; 95% CI: 1.02–1.54), of Bemba ethnicity (APR=1.43; 95% CI: 1.17–1.74), or with no formal education (APR: 2.61–5.95). Among all adults who currently smoked, those of Chewa ethnicity (APR=1.55; 95% CI: 1.03–2.35), or with a formal education (APR:1.80–4.38), were more likely to report thinking about quitting because of health warnings than those who were of Bemba ethnicity or with less than primary school education level. Women who currently smoked were 49% less likely (APR=0.51; 95% CI: 0.23–0.84) to report thinking about quitting than men. Among a subset of adults who currently smoked who were aware of health warning labels, no sociodemographic characteristics were significantly associated with thinking about quitting in unadjusted or adjusted models.

CONCLUSIONS Sociodemographic characteristics such as sex, ethnicity, and education level were significantly associated with awareness of cigarette health warnings. Among cigarette smokers aware of health warnings, no sociodemographic differences in thinking about quitting were found. Tobacco control campaigns may need to target people of ethnicities with the highest smoking prevalence in the country.

AFFILIATION
1 Tobacco Control Scholars Program Fellow Centre for Primary Care Research, School of Medicine, University of Zambia, Ridgeway, Zambia
2 Global Tobacco Control Branch, Office on Smoking and Health, National Center for Chronic Disease Prevention and Health Promotion, Centers for Disease Control and Prevention, Atlanta, United States

CORRESPONDENCE TO
Masauso M. Phiri. Tobacco Control Scholars Program Fellow Centre for Primary Care Research, School of Medicine, University of Zambia, Ridgeway Campus, Ridgeway, 10101 Lusaka, Zambia. E-mail: masauso@unza.zm ORCID ID: https://orcid.org/0000-0001-7653-7988

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INTRODUCTION

Tobacco use is one of the leading causes of preventable disease, disability, and death[1]. While tobacco use is declining in high-income countries, it is increasing in certain low- and middle-income countries (LMICs)[1,2]. In 2017, the prevalence of tobacco use and tobacco cigarette smoking in Zambia was 15.8% and 12.3%, respectively[3], and the most recent Demographic Health Surveys in Zambia suggest that the prevalence of tobacco use has been increasing especially among

males, from 15% in 2000–2001 to 19% in 2018[4-7]. In 2008, Zambia became a party to the World Health Organization Framework Convention on Tobacco Control (WHO FCTC) which provides evidence-based guidelines on how countries can implement and manage tobacco control measures[8-10]. The WHO FCTC outlines six proven measures toward tobacco demand reduction, including warning about the dangers of tobacco[11]. Article 11 of the WHO FCTC requires the adoption of health warnings on tobacco packages with specific recommendations that the warnings be large (i.e. cover at least 50% and no less than 30% of the principal display areas), clear, and legible, and include both pictures and words to enhance their effectiveness[8].

Health warning labels on cigarette packages serve as one of the primary means of communicating the harmful effects of cigarette smoking[12,13]. Awareness of the health harms of cigarette smoking has been associated with increased thinking about quitting and quit attempts among people who smoke[13]. Some countries in the African region such as Uganda and Mauritius are addressing the tobacco epidemic by strengthening implementation of the WHO FCTC; in particular, introducing pictorial health warnings covering more than 65% of tobacco product packaging[14,15]. Several studies that assessed the impact of health warnings concluded that pictorial health warnings were more effective than single-text warnings in achieving increased awareness and knowledge of tobacco harms, encouraging thinking about quitting among people who currently smoke, and preventing smoking initiation among people who do not smoke[13,16-22].

Although Zambia became a Party to the WHO FCTC in 2008, Zambia's policy on health warnings does not yet comply with WHO FCTC recommendations: current legislation fails to specify any minimum size of health warnings with respect to the cigarette package, and no pictures are required[2,23]. A 2014 International Tobacco Control (ITC) country-wide survey found that only 69.0% of cigarette packages in Zambia had a visible text health warning in English, with the rest being either not visible or in another language[23]. In the 2017 WHO STEPwise approach to Surveillance (STEPS) survey, two-thirds (66.9%) of adults who currently smoked tobacco who saw text-only health warning labels on cigarette packages in Zambia thought about quitting smoking, and the survey report did not delineate the factors that influenced such thinking about quitting[3]. Prior studies from high-income countries have suggested that the responses to health warnings vary based on many factors, including socioeconomic or sociodemographic factors such as sex, age, education level, and income levels[24,25]; however, there is a paucity of literature from LMICs in general[26], and Zambia in particular. As has been stated in a number of studies[25-27], there is a clear need for local data to support policy and in-country tobacco control strategies, especially in developing countries. The purpose of this study was, therefore, two-fold: 1) to examine sociodemographic characteristics associated with awareness of health warnings on cigarette packages among Zambian adults who currently smoke; and 2) to examine sociodemographic characteristics associated with thinking about quitting smoking because of the health warnings among adults who currently smoke.

METHODS

This study was a secondary analysis using data from the 2017 Zambia WHO STEPS survey. The aim of the survey was to establish a non-communicable disease (NCD) surveillance platform that collects baseline indicators on determinants of NCDs and their risk factors for policy and planning purposes. The survey integrated modified questions from the Tobacco Questions for Surveys (TQS), a subset of key questions from the Global Adult Tobacco Survey (GATS)[28,29]. The 2017 Zambia STEPS survey was the first nationally representative cross-sectional survey that collected comprehensive information on risk factors for NCDs, mental and oral health in adults aged 18–69 years in Zambia. A multi-stage cluster sampling technique was used to select a nationally representative sample of 5791 adults in Zambia, of which 4302 completed the survey, resulting in an overall response rate of 74.3%[3]. More details on the sampling methods of the 2017 Zambia STEPS survey can be publicly accessed[3]. The University of Zambia Biomedical Research Ethics Committee (UNZABREC) approved the STEPS survey, and informed consent was obtained from participants[3]. Because deidentified secondary data were used, this study was considered exempt from CDC institutional review board approval.

Measures and variables

The study population for this analysis included adults aged 18–69 years in Zambia who currently smoked tobacco. Adults who currently smoked tobacco were defined as those who answered 'Yes' to the question: 'Do you currently smoke any tobacco products, such as cigarettes, shisha, cigars or pipes?'. Two measures identified as key indicators in promoting thinking about quitting smoking[16,18,19] were assessed in this study: 1) awareness of health warnings, and 2) thinking about quitting because of health warnings on cigarette packages. Health warning label awareness among adults who currently smoked tobacco was measured by the question: 'During the past 30 days, did you notice any health warnings on cigarette packages?'. The responses were 'Yes', 'No', 'Did not see any cigarette packages', or 'Don't know'. Responses other than 'Yes' were considered unaware of health warnings; these respondents were not questioned further regarding thinking about quitting smoking because of health warning labels as they were assumed to have no such intention per GATS/TQS guidelines[28,29].

Respondents who indicated they were aware of health warnings were further asked about thinking about quitting using the question: 'During the past 30 days, have warning labels on cigarette packages led you to think about quitting?'. The responses were 'Yes', 'No' or 'Don't know'; 'Don't know' was categorized as 'No' for the purposes of this analysis. We calculated 2 measures of thinking about quitting smoking because of health warning labels; the first with a denominator of all adults who currently smoked, the second with a denominator of just those adults who currently smoked who were aware of health warnings. The numerator for both measures was the number of current smokers who thought about quitting smoking in the last 30 days because of the warning labels on cigarette packages. The first indicator assesses the prevalence of thinking about quitting smoking because of health warning labels among the total population of adult tobacco smokers in Zambia, consistent with GATS and TQS guidelines[28,29], while the second measure assesses thinking about quitting among the subset of smokers with awareness of the labels.

Sociodemographic variables included four age groups (18–29, 30–44, 45–59, 60–69 years), sex (male, female), ethnicity (Bemba, Chewa, Tonga, other), education level (no formal schooling, less than primary school, primary school completed, junior secondary school completed, secondary higher school completed or higher), marital status (currently married, not married), and annual household income (≤10000, >10000 and ≤20000, >20000 ZMW).

Statistical analysis

Descriptive analyses, including percentages and 95% confidence intervals (CIs) of awareness of health warnings and thinking about quitting were computed by sociodemographic characteristics. Chi-squared tests were performed to test for significant differences in the distribution of demographic characteristics between those who were and were not aware of health warnings and those who did and did not intend to quit because of the health warnings; two-sided $p<0.05$ was considered statistically significant. Logistic regression was performed to calculate crude (PR) and adjusted prevalence ratios (APR) for the association of sociodemographic characteristics with awareness of health warnings and thinking about quitting. Adjusted models included all sociodemographic characteristics of interest except for income, which was not included in the model due to a high proportion (approximately 24%) of missing data. Results were suppressed if the unweighted denominator was <25[28,29]. Analyses were conducted using SAS-callable SUDAAN version 11.0.

RESULTS

Characteristics of the sample

Overall, this study included a total of 475 adults who reported they currently smoked tobacco, which represents 916182 adults when survey weights were applied or 12.3% of adults in Zambia. Approximately 59.2% of tobacco smokers (unweighted n=240) reported awareness of cigarette health warning labels. Among all tobacco smokers, 37.4% (unweighted n=162) reported thinking about quitting because of health warning labels; among those with awareness of the labels, 66.9% of respondents reported thinking about quitting because of the labels.

About three-quarters of all adults who currently smoked were aged 18–29 years (38.4%; 95% CI: 32.2–44.9) and 30–44 years (36.6%; 95% CI:

31.4–42.0), and 91.7% (95% CI: 88.7–93.9) of all adults who currently smoked were male (Table 1). The highest proportion of adults who currently smoked had less than primary school education (28.9%; 95% CI: 24.2–34.2), followed by those who had completed primary school (24.0%; 95% CI: 19.6–29.1). Most were married (67.5%; 95% CI: 61.1–73.3) and close to half had earnings ≤10000 ZMW (1000 Zambian Kwacha about US$56) per annum (42.4%; 95% CI: 36.7–48.3). About one-third (34.0%; 95% CI: 27.3–41.5) of adults who currently smoked identified as Bemba while smaller proportions identified as Chewa and Tonga (8.1%; 95% CI: 5.3–12.2, and 7.3%; 95% CI: 4.9–10.7, respectively); half identified as some other ethnicity (50.3%; 95% CI: 43.2–57.4).

Distributions of sociodemographic characteristics by awareness of health warnings and thinking about quitting

Among adults who currently smoked, significant differences in the distribution of sex, ethnicity, education level, and income were observed between those who were aware of health warning labels and those who were not (Table 1). Almost 95% of adult current smokers (94.6%; 95% CI: 91.1–96.7) who were aware of warning labels were male compared to 88.1% (95% CI: 83.2–91.7) among those who were not aware. More than one-third (35.6%; 95% CI: 26.6–45.9) of those who were aware were of Bemba ethnicity, 11.1% (95% CI: 7.07–17.0) of Chewa ethnicity, and almost half (46.8%; 95% CI: 37.3–56.5) belonged to other ethnic groups while among those not aware 32.0% (95% CI: 24.2–40.9), 4.3% (95% CI: 1.9–9.3), and 54.9% (95% CI: 45.9–63.5) were of Bemba, Chewa, and other ethnicities, respectively. Most of those who were aware of health warnings had completed primary school (27.6%; 95% CI: 21.1–35.2) or junior secondary school (28.1%; 95% CI: 20.6–37.2), and secondary or higher (24.6%; 95% CI: 18.3–32.2) while, among those who were not aware, less than 40% had completed primary school (19.4%; 95% CI: 14.1–26.1), or junior secondary school (10.2%; 95% CI: 6.49–15.8), and secondary or higher (9.7%; 95% CI: 4.94–18.3). Among those who were aware, 38.0% (95% CI: 30.6–46.0) had an annual income of ≤10000 ZMW and 36.4% (95% CI: 27.8–45.9) had an annual income of >20000 ZMW, while among those who were not aware, nearly half (48.0%; 95% CI: 40.1–56.0) and 18.6% (95% CI: 12.7–26.3) had an annual income of ≤10000 ZMW and >20000 ZMW, respectively. About 14.6% (95% CI: 9.8–21.3) and almost 3 in 10 (28.6%; 95% CI: 22.3–35.9) of those who were aware and not aware, respectively, did not have information on income. The distributions of age and marital status did not differ significantly between those who were aware and were not aware of health warnings.

Among all adults who currently smoked, a higher percentage of adults who currently smoked who self-reported thinking about quitting because of health warnings on cigarette packages (from here on referred to as 'thinking about quitting') were male (96.2%; 95% CI: 92.6–98.1), 29.1% (95% CI: 21.1–38.5) had completed primary school and 29.4% (95% CI: 19.8–41.2) completed junior secondary school, with similar proportions of those who had income levels ≤10000 ZMW (37.8%; 95% CI: 28.9–47.6), and >20000 ZMW (37.9%; 95% CI: 27.1–50.2). Among those who were not thinking about quitting, 89% (95% CI: 84.6–92.3) were male, half completed less than primary school (37.5%; 95% CI: 31.5–44.0) or had no formal schooling (12.1%; 95% CI: 8.25–17.4), and 45% (95% CI: 38.4–52.0) had an income level ≤10000 ZMW (Table 1).

When restricted to the subset of those with awareness of health warnings, the sociodemographic distribution among those thinking about quitting was similar to the distribution for those thinking about quitting among all adults who currently smoked with the exception of education level, marital status, and income level (Table 1). Approximately 29.1% (95% CI: 21.1–38.5) and 29.4% (95% CI: 19.8–41.2) of those aware of health warning labels and thinking about quitting completed primary school and junior secondary school, respectively, and 37.8% (95% CI: 28.9–47.6) and 37.9% (95% CI: 27.1–50.2) had income levels ≤10000 and >20000, respectively. Among those who were not thinking about quitting, 24.6% (95% CI: 14.2–39.1) had completed primary school while a quarter (25.6%; 95% CI: 16.2–38.0) had completed junior secondary school and another quarter (25.0%; 95% CI: 14.4–39.8) had completed secondary high school or higher; 38.3% (95% CI: 25.9–52.4) and 33.2% (95% CI: 20.7–48.7) had ≤10000 and >20000

Table 1. Distribution of selected sociodemographic characteristics, overall and by awareness of health warnings and thinking about quitting, among adults who currently smoked tobacco aged 18–69 years in Zambia, STEPS Survey 2017

Characteristics	Overall				Aware of health warnings on cigarette packages				Thinking about quitting because of health warnings on cigarette packages among adults who currently smoked				Thinking about quitting because of health warnings on cigarette packages among those aware of health warning labels			
					Yes		No		Yes		No		Yes		No	
	Unweighted n	Weighted n	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Age (years)																
18–29	130	351661	38.4	32.2–44.9	39.1	30.2–48.8	37.5	29.7–45.9	41.1	29.9–53.4	36.7	30.0–44.1	41.1	29.9–53.4	35.0	22.5–49.9
30–44	175	334976	36.6	31.4–42.0	40.2	32.5–48.4	32.0	25.6–39.1	40.9	30.9–51.8	33.9	28.3–40.1	40.9	30.9–51.8	38.7	28.2–50.3
45–59	120	169037	18.5	15.0–22.4	15.4	11.1–20.9	22.4	17.0–28.9	12.8	8.60–18.7	21.8	17.2–27.2	12.8	8.6–18.7	20.5	12.5–31.8
60–69	50	60508	6.6	4.6–9.5	5.4	2.80–10.0	8.2	5.2–12.6	5.1	2.31–10.9	7.5	4.88–11.3	~		~	
Sex[a,b]																
Male	414	840219	91.7	88.7–93.9	94.6	91.1–96.7	88.1	83.2–91.7	96.2	92.6–98.1	89.0	84.6–92.3	96.2	92.6–98.1	91.3	82.2–95.9
Female	61	75963	8.3	6.1–11.3	5.4	3.26–8.88	11.9	8.35–16.8	3.8	1.90–7.39	11.0	7.73–15.4	~		~	
Ethnicity[a]																
Bemba	160	311684	34.0	27.3–41.5	35.6	26.6–45.9	32.0	24.2–40.9	36.1	24.9–49.1	32.8	25.7–40.7	36.1	24.9–49.1	34.7	21.9–50.1
Chewa	39	74285	8.1	5.3–12.2	11.1	7.07–17.0	4.3	1.9–9.3	12.7	7.7–20.1	5.4	2.89–9.82	12.7	7.7–20.1	7.9	2.9–19.8
Tonga	38	66618	7.3	4.9–10.7	6.1	3.24–11.0	8.8	5.3–14.4	6.0	2.7–12.7	8.0	5.09–12.4	~		~	
Other	237	461230	50.3	43.2–57.4	46.8	37.3–56.5	54.9	45.9–63.5	44.6	32.9–56.9	53.8	46.0–61.4	44.6	32.9–56.9	51.2	37.2–65.0
Missing/refused	1	2366	0.3	0.04–1.8	~		~		~		~		~		~	
Education level[a,b]																
No formal schooling	48	77953	8.5	6.0–12.0	2.3	1.13–4.43	16.5	11.1–23.7	2.5	1.1–5.7	12.1	8.25–17.4	~		~	
Less than primary school	154	265145	28.9	24.2–34.2	17.0	12.0–23.5	44.1	36.7–51.8	14.6	9.3–22.4	37.5	31.5–44.0	14.6	9.3–22.4	21.7	12.7–34.7
Primary school completed	116	219896	24.0	19.6–29.1	27.6	21.1–35.2	19.4	14.1–26.1	29.1	21.1–38.5	21.0	15.8–27.2	29.1	21.1–38.5	24.6	14.2–39.1
Junior secondary school completed	88	185605	20.3	15.4–26.1	28.1	20.6–37.2	10.2	6.49–15.8	29.4	19.8–41.2	14.8	10.7–20.1	29.4	19.8–41.2	25.6	16.2–38.0
Secondary high school completed or higher	68	165300	18.0	13.8–23.3	24.6	18.3–32.2	9.7	4.94–18.3	24.4	17.5–32.9	14.3	9.38–21.1	24.4	17.5–32.9	25.0	14.4–39.8
Missing/refused	1	2284	0.3	0.03–1.8	~		~		~		~		~		~	

Continued

Table 1. Continued

Characteristics	Overall				Aware of health warnings on cigarette packages				Thinking about quitting because of health warnings on cigarette packages among adults who currently smoked				Thinking about quitting because of health warnings on cigarette packages among those aware of health warning labels			
					Yes		No		Yes		No		Yes		No	
	Unweighted n	Weighted n	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI	%	95% CI
Marital status																
Currently married	326	618673	67.5	61.1–73.3	62.8	53.6–71.2	73.6	65.6–80.2	65.4	54.1–75.2	68.8	61.4–75.4	65.4	54.1–75.2	57.5	42.7–71.0
Not married	149	297509	32.5	26.7–38.9	37.2	28.8–46.4	26.4	19.8–34.4	34.6	24.8–45.9	31.2	24.6–38.6	34.6	24.8–45.9	42.5	29.0–57.3
Income level[a,b] (ZMW)																
≤10000	207	388352	42.4	36.7–48.3	38.0	30.6–46.0	48.0	40.1–56.0	37.8	28.9–47.6	45.1	38.4–52.0	37.8	28.9–47.6	38.3	25.9–52.4
>10000 and ≤20000	42	76062	8.3	5.9–11.6	11.0	7.4–16.3	4.8	2.42–9.40	11.8	7.1–19.0	6.2	3.77–10.0	11.8	7.1–19.0	9.4	4.7–18.1
>20000	112	261343	28.5	22.7–35.2	36.4	27.8–45.9	18.6	12.7–26.3	37.9	27.1–50.2	22.9	17.0–30.0	37.9	27.1–50.2	33.2	20.7–48.7
Missing/don't know/refused	114	190425	20.8	16.6–25.7	14.6	9.8–21.3	28.6	22.3–35.9	12.4	7.3–20.4	25.8	20.3–32.1	12.4	7.3–20.4	19.0	10.1–32.9

a Statistically significant difference p<0.05 in distribution of adults with awareness of health warning labels and those with no awareness of the labels, based on chi-squared test. b Statistically significant difference p<0.05 in distribution of adults with thinking about quitting based on cigarette health warning labels and those who do not intend to quit based on warning labels among all current smokers, based on chi-squared test. ~ Insufficient sample size; estimates where the unweighted denominator was <25 have been suppressed. ZMW: 1000 Zambian Kwacha about US$56.

Table 2. Prevalence ratios (PR) for the association of selected sociodemographic characteristics with awareness of health warnings and thinking about quitting among adults who currently smoked tobacco aged 18–69 years in Zambia, STEPS survey 2017

Characteristics	Aware of health warnings on cigarette packages						Thinking about quitting because of health warnings on cigarette packages among all adults who currently smoked						Thinking about quitting because of health warnings on cigarette packages among those aware of health warning labels					
	%	95% CI	PR	95% CI	APR	95% CI	%	95% CI	PR	95% CI	APR	95% CI	%	95% CI	PR	95% CI	APR	95% CI
Age (years)																		
18–29 (Ref.)	57.0	45.1–68.1	1		1		40.1	28.6–52.9	1		1		70.4	55.0–82.3	1		1	
30–44	61.5	52.8–69.5	1.08	0.85–1.36	1.26	1.02–1.54[a]	41.9	33.4–51.0	1.04	0.72–1.52	1.11	0.79–1.56	68.2	57.2–77.4	0.97	0.75–1.24	0.86	0.66–1.11
45–59	46.6	36.1–57.4	0.82	0.60–1.11	1.06	0.81–1.38	26.0	18.3–35.6	0.65	0.41–1.02	0.78	0.50–1.20	55.8	39.5–71.0	0.79	0.56–1.13	0.72	0.50–1.04
60–69	45.5	27.4–64.9	0.80	0.49–1.29	1.19	0.85–1.65	29.0	14.1–50.4	0.72	0.36–1.45	1.03	0.62–1.72	~		~		~	
Sex																		
Male (Ref.)	57.7	51.0–64.2	1		1		39.3	32.8–46.2	1		1		68.1	59.5–75.6	1		1	
Female	36.6	24.9–50.1	0.63	0.44–0.92	0.78	0.60–1.01	17.1	8.70–30.8	0.43	0.23–0.84[b]	0.51	0.27–0.96[b]	~		~		~	
Ethnicity																		
Bemba (Ref.)	58.6	48.1–68.4	1		1		39.7	28.8–51.8	1		1		67.8	51.7–80.5	1		1	
Chewa	76.5	59.3–87.9	1.31	1.01–1.68[b]	1.43	1.17–1.74[b]	58.4	41.7–73.5	1.47	0.98–2.22	1.55	1.03–2.35[b]	76.4	51.8–90.7	1.13	0.80–1.59	1.11	0.77–1.60
Tonga	46.6	28.0–66.2	0.79	0.50–1.27	0.79	0.53–1.18	30.9	15.3–52.6	0.78	0.39–1.55	0.83	0.44–1.56	~		~		~	
Other	52.0	42.7–61.1	0.89	0.69–1.14	1	0.81–1.22	33.1	24.8–42.7	0.83	0.56–1.25	0.96	0.68–1.37	63.8	51.6–74.4	0.94	0.71–1.25	0.97	0.74–1.27
Education level																		
No formal schooling	14.8	7.4–27.4	0.52	0.26–1.03	0.41	0.20–0.82[b]	11.2	5.0–23.1	0.59	0.25–1.41	0.56	0.23–1.37	~		~		~	
Less than primary school (Ref.)	32.9	24.4–42.6	1		1		18.9	12.6–27.5	1		1		57.6	39.0–74.3	1		1	
Primary school completed	64.3	53.1–74.2	1.89	1.38–2.58[b]	1.77	1.31–2.39[b]	45.3	34.0–57.2	2.39	1.49–3.84[b]	2.27	1.43–3.62[b]	70.5	54.3–82.8	1.22	0.83–1.79	1.27	0.87–1.85
Junior secondary school completed	77.8	65.5–86.6	2.17	1.61–2.93[b]	2.10	1.57–2.79[b]	54.3	39.6–68.4	2.87	1.78–4.64[b]	2.76	1.72–4.41[b]	69.9	54.3–82.0	1.21	0.84–1.76	1.21	0.84–1.74

Continued

Table 2. Continued

Characteristics	Aware of health warnings on cigarette packages						Thinking about quitting because of health warnings on cigarette packages among all adults who currently smoked						Thinking about quitting because of health warnings on cigarette packages among those aware of health warning labels					
	%	95% CI	PR	95% CI	APR	95% CI	%	95% CI	PR	95% CI	APR	95% CI	%	95% CI	PR	95% CI	APR	95% CI
Secondary high school completed or higher	76.2	58.7–87.8	2.13	1.52–2.98[b]	1.98	1.41–2.78[b]	50.5	36.3–64.7	2.67	1.66–4.30[b]	2.43	1.49–3.98[b]	66.3	49.9–79.5	1.15	0.78–1.69	1.18	0.80–1.73
Marital status																		
Currently married (Ref.)	52.0	44.9–59.1	1		1		36.3	29.6–43.5	1		1		69.7	59.9–78.0	1		1	
Not married	64.1	52.9–74.0	1.23	1.00–1.52[b]	1.17	0.96–1.43	39.9	28.7–52.2	1.10	0.78–1.55	0.98	0.70–1.39	62.2	47.2–75.2	0.89	0.69–1.16	0.81	0.60–1.08

PR: prevalence ratio. APR: adjusted prevalence ratio. a Calculated in logistic regression models adjusted for all covariates in table. b Statistically significant, p<0.05. ~ Insufficient sample size; estimates where the unweighted denominator was <25 have been suppressed.

ZMW income levels, respectively. Almost two-thirds (65.4%; 95% CI: 54.1–75.2) of those who were thinking about quitting were married compared to 57.5% (95% CI: 42.7–71.0) who were not thinking about quitting.

Prevalence and associated sociodemographic characteristics of awareness of health warnings and thinking about quitting

The prevalence of awareness of health warnings among adults who currently smoked was relatively high among the 30–44 years age group (61.5%; 95% CI: 52.8–69.5), men (57.7%; 95% CI: 51.0–64.2), those of Chewa ethnicity (76.5%; 95% CI: 59.3–87.9), those who had completed junior secondary (77.8%; 95% CI: 65.5–86.6) or secondary high school (76.2%; 95% CI: 58.7–87.8), and those who were not married (64.1%; 95% CI: 52.9–74.0) (Table 2). In the unadjusted model, those of Chewa ethnicity were 1.31 times (95% CI for PR: 1.01–1.68) more likely to be aware of health warnings compared with those of Bemba ethnicity. Those who had no formal schooling were 0.52 times (95% CI: 0.26–1.03) less likely to be aware than those with less than primary school. Those who had completed primary school (PR=1.89; 95% CI: 1.38–2.58), junior secondary school (PR=2.17; 95% CI: 1.61–2.93) or secondary high school (PR=2.13; 95% CI: 1.52–2.98) were more likely to be aware than those with less than primary schooling. Those who were not married were 1.23 times (95% CI for PR: 1.00–1.52) more likely to be aware of health warnings compared to those who were married. Women (PR=0.63; 95% CI: 0.44–0.92) were less likely to be aware of health warnings compared to men. In the adjusted model, being in the 30–44 age group (APR=1.26; 95% CI: 1.02–1.54), Chewa ethnicity (APR=1.43; 95% CI: 1.17–1.74) and education: without formal schooling (APR=0.41; 95% CI: 0.20–0.82), primary school (APR=1.77; 95% CI: 1.31–2.93), junior secondary school (APR=2.10; 95% CI: 1.57–2.79) and secondary high school (APR=1.98; 95% CI: 1.41–2.78) remained significantly more or less likely to be aware of health warnings. Sex and marital status were no longer significant after adjusting for other sociodemographic variables.

Among all adults who currently smoked, thinking about quitting had similar findings to those of awareness of health warnings (Table 2). The prevalence was relatively high among those aged 18–29 and 30–44 years (40.1%; 95% CI: 28.6–52.9, and 41.9%; 95% CI: 33.4–51.0, respectively), men (39.3%; 95% CI: 32.8–46.2), those of Chewa ethnicity (58.4%; 95% CI: 41.7–73.5), those who had completed junior secondary and secondary high school (54.3%; 95% CI: 39.6–68.4, and 50.5%; 95% CI: 36.3–64.7, respectively) and those who were not married (39.9%; 95% CI: 28.7–52.2). In the unadjusted model, those with any formal education (PR range: 2.39; 95% CI: 1.49–3.84 [primary school completed] to 2.67; 95% CI: 1.66–4.30 [secondary high school completed]) were more likely to report thinking about quitting than those with no formal schooling (PR=0.59; 95 CI: 0.25–1.41). Women (PR=0.43; 95% CI: 0.23–0.84) were less likely to report thinking about quitting than men. In the adjusted model, sex and education level remained significant; additionally, those of Chewa ethnicity (APR=1.55; 95% CI: 1.03–2.35) were more likely to report thinking about quitting than those of Bemba ethnicity.

When restricted to current smokers who were aware of health warning labels, the prevalence of thinking about quitting was 70.4% (95% CI: 55.0–82.3) among those aged 18–29 years, 76.4% (95% CI: 51.8–90.7) among those of Chewa ethnicity, 70.5% (95% CI: 54.3–82.8) and 69.9% (95% CI: 54.3–82.0), respectively, among those who had completed primary and junior secondary schools, and 69.7% (95% CI: 59.9–78.0) among those who were married (Table 2). There were no sociodemographic characteristics that were significantly associated with thinking about quitting in unadjusted or adjusted models.

DISCUSSION

Our analyses found that among adults who currently smoke, sociodemographic differences exist in awareness of health warning labels on cigarette packages, particularly in sex, ethnicity, and education level, but no sociodemographic differences were found in thinking about quitting among tobacco smokers aware of the health warnings on cigarette packages. Generally, those who had completed primary school or above were more likely to be aware of health warnings, with the magnitude of the association increasing with higher education level. Findings from

this study may highlight the need for clear and easy to understand pictorial health warnings on cigarette packages that could be understood by all adults of any level of education, sex, or ethnicity in Zambia.

We found that certain sociodemographic characteristics were significantly associated with awareness of health warnings and thinking about quitting among all adults who currently smoked. Even though the proportion of female current tobacco smokers in Zambia was relatively low, our finding that women were less likely to notice health warnings and think about quitting than men is like that reported in some Asian countries such as Vietnam, Malaysia and Thailand[20,21,26,30-32]. Women, especially those of low socioeconomic status, may be generally less responsive to tobacco control interventions than men not only because fewer women attain higher levels of education compared to men in Zambia[7], but there has also been limited integration of gender considerations into multiple elements of tobacco control policies, including messages on the harms of tobacco use[33-35]. This may, in part, explain our findings that suggest that women may be less likely to have awareness of health warning labels or thinking about quitting. We also found that those of Chewa ethnicity were more likely to be aware of health warnings and thinking about quitting than were those of Bemba ethnicity. Most adults of Chewa ethnicity reside in the Eastern Province, where smoking prevalence is one of the highest in Zambia[32] and tobacco farming is common[36]; however, there is very little research on differences in tobacco use, awareness of health warnings, and thinking about quitting across ethnic groups, particularly in Zambia. While more research is required to understand these findings, it is important to ensure tobacco control interventions and campaigns are implemented equitably across sex and ethnic groups.

Previous studies have shown that smoking prevalence is highest among those with lower education level, decreasing as the level of education increases[7,25,32]. Not only are those with less education more likely to smoke, but they are also less likely to be aware of health warnings[7,25,32,37], a finding like those observed in our study. We observed low levels of awareness of health warnings among those with no formal schooling (14.8%); those who had some levels of education were 1.89 to 2.13 times as likely to be aware of health warnings, as opposed to those who had no formal schooling. A study conducted in 2014 showed that 40.0% of Zambian adults who currently smoked could not read the health warning at all, and another 14.0% read it with difficulty[23]. Several studies, including those from the United States and Europe, have concluded that people with less education were more responsive to graphic health warnings or perceived them as more effective than text-only warnings[16,19,21,25,38]. Furthermore, Zambian adults who currently smoked were reported to be less likely to be aware of several important smoking-related health effects such as lung cancer, heart disease, and stroke compared to smokers in other countries[23].

We found similar patterns in the associations between sociodemographic characteristics and thinking about quitting as we did for awareness of health warnings; however, in our model that included only those who were already aware of health warnings, these associations were no longer observed. This could be due, in part, to the small sample size observed in our study. Alternatively, it could possibly demonstrate that, while there are disparities in awareness across sociodemographic groups, warning labels are similarly effective at causing adults who smoke to think about quitting once they are aware of warning labels[25,39-42]. While results varied by sociodemographic group, over half of those who were aware of health warnings also indicated thinking about quitting, highlighting the importance of increasing awareness. This may present an opportunity for using health warnings as a means of educating smokers about the harms of smoking with messages such as 'smoking causes lung cancer' or 'smoking can lead to gangrene' or implementing pictorial health warnings[15,23,43]. Article 11 of the WHO Framework Convention on Tobacco Control (FCTC) requires the adoption of health warnings on tobacco packages and recommends, in part, that the warnings are large, clear, visible, legible and include pictures to enhance their effectiveness[8].

Several studies from developed countries such as the USA, Japan, United Kingdom, Canada and Australia have reported that large text and pictorial health warnings are associated with an increased likelihood of quitting as opposed to single text-

only warnings, regardless of the age or education of those who smoke[13,16,18,19,21,38,43-45]. Another study showed that while effectiveness of health warnings on cigarette packages varied, pictorial warnings with personal testimonials were the most effective across more than 100 countries[41]. Pictorial warnings have several advantages relative to text-only warnings, including ability to attract and hold attention, elicit more negative smoking attitudes, and increase thinking about quitting[37,46]. Some Sub-Saharan African countries such as Uganda and Mauritius have adopted pictorial health warnings[14]. For example, Mauritius adopted large pictorial warning labels covering over 60–70% of cigarette packages, which resulted in increased awareness of health warnings from 58.0% to 83.4% over the course of two years post-implementation[15]. Zambia may have a similar opportunity to increase the awareness of health warnings and thinking about quitting among those who smoke and deter initiation among those who do not smoke. Implementing the WHO-FCTC recommendation of large and pictorial health warnings may mitigate the sociodemographic differences related to awareness and thinking about quitting.

Limitations

This study has several limitations. First, this was a secondary analysis of a cross-sectional survey so causality cannot be determined between sociodemographic factors and awareness of health warnings and thinking about quitting. Second, self-report responses could be subject to recall or social desirability biases, leading to underreporting of smoking or overreporting of thinking about quitting (e.g. some participants may intend to quit smoking for reasons other than noticing health warnings and thus would not be captured), although several studies have reported a high correlation between self-reports and biomarkers of smoking[47-49]. Third, we were not able to measure important variables with STEPS data such as language, region, or knowledge of health harms of tobacco, therefore we were unable to account for these factors in our analyses. For example, although English is the official language in Zambia, it is not the first language for most Zambians. Evidence suggests that about 69% of cigarette packages in Zambia carry a single text-only warning in English, 14% are in another foreign language, and 18% have no visible warnings[23], underscoring the significant role language could play in responsiveness to health warnings. Additionally, we opted not to include income in our models due to a high proportion of missing data; thus, were unable to assess any associations between household income with awareness of health warnings and/or thinking about quitting. Despite these limitations, our study is unique in that, to our knowledge, this is the first time a study describing sociodemographic characteristics associated with awareness of health warnings and thinking about quitting has been conducted in Zambia. Another strength of this study lies in the ability to generalize its findings as it was based on the nationally representative 2017 Zambia STEPs survey.

CONCLUSIONS

Sociodemographic characteristics such as sex, ethnicity, and education level were significantly associated with awareness of cigarette health warnings. Among cigarette smokers aware of health warnings, no sociodemographic differences in thinking about quitting were found. Findings from this study indicated that current tobacco smokers who had primary school or above education were more likely to be aware of health warnings, which suggests the need for clear, easy to understand, pictorial health warnings on cigarette packages in Zambia. Implementation of stronger policies requiring health warnings with these characteristics may increase awareness of health warnings and thinking about quitting smoking, particularly among those with lower levels of education. Additionally, while a small percentage of women currently smoke tobacco in Zambia, there may be a need for targeted campaigns among women as they were less likely to be aware of health warnings and thinking about quitting. Equitable implementation of tobacco control campaigns may need to target regions or ethnicities (e.g. Chewa) in which smoking prevalence is higher compared to other regions of the country.

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CONFLICTS OF INTEREST
The authors have completed and submitted the ICMJE Form for Disclosure of Potential Conflicts of Interest and none was reported.

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DATA AVAILABILITY
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