

Smoking rates and risk factors among youth in the Republic of the Marshall Islands: results of a school survey

Abstract: Rapidly increasing tobacco use in developing countries will result in a large and increasing burden of tobacco-related illnesses as their populations age. The Republic of the Marshall Islands (RMI) is an island nation in the Pacific with a 1999 census population of 50,840, of whom more than fifty percent were under twenty years of age. There are limited data on the prevalence of smoking among youth in the RMI. A school survey of 3,294 RMI students in grades 5 through 12 was conducted in 2000. Urban and outer atoll schools were included in the sample. Demographic data and information on tobacco use and risk factors were collected. The overall smoking rate in this school sample was 10.6%. There were significantly higher smoking rates in the high school age group; the rate of smoking among 18 year olds was 33.5%. Smoking rates were higher among males compared to females (18.7% vs. 3.4%) and higher among outer atoll students compared to urban students (14.5% vs. 9.4%). The most prominent risk factors for smoking were: age, male gender, receiving or wearing tobacco-labeled equipment or clothing and willingness to participate in other high-risk behaviors. The survey provides an estimate of smoking rates among Marshallese school students and identifies and quantifies significant risk factors for smoking. This information can assist in guiding a comprehensive tobacco control strategy in the Republic of the Marshall Islands. **Key Words:** tobacco, Pacific Islander, youth risk behavior

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ready been noted to have significantly greater smoking prevalence rates than other countries in the region⁴.

The Republic of the Marshall Islands (RMI) is an island nation comprised of 29 atolls and 5 separate islands spread across 750,000 square miles of the Pacific. Two-thirds of the population live in two urban centers, Majuro and Ebeye, with the remaining one-third spread across 21 other atolls. The 1999 census noted that over 55% of the 50,840 population was less than 20 years of age. Prevalence data for tobacco use in the Marshall Islands are limited.

Introduction

The World Health Organization (WHO) has characterized the rapid increase of tobacco use in developing countries as an epidemic¹. It is estimated that tobacco was responsible for 4.8 million premature deaths in 2000, roughly divided evenly among developing and industrialized countries². WHO estimates that tobacco will cause more deaths than any single disease by the year 2020, with 70% of these deaths occurring in currently developing countries³. Pacific island countries may be at particular risk for increased tobacco-related illnesses and deaths since many have al-

Owing to the youthful population structure characteristic of many developing countries, including the RMI, tobacco use among youth will likely have a disproportionate impact on the health status in the future as the population ages. There are limited data on the prevalence of tobacco use among youth in the Pacific islands in general and the RMI specifically. The Marshall Islands was included in the 1995 U.S. Centers for Disease Control and Prevention Youth Risk Behavior Survey (YRBS). This survey included five questions related to tobacco use and reported that 23.8% of Marshallese high school students were current cigarette users as defined by having smoked at least one cigarette in the preceding 30 days, while 8.1% reported frequent use of at least 20 cigarettes in the preceding 30 days⁵. There has been little documentation of the risk factors associated with tobacco use in youth in the Marshall Islands.

Tobacco industry marketing in the RMI has been aggressive, using advertising and contests that offer prizes, including cash prizes (up to \$10,000 in a country where the annual salary of a full-time teacher may be \$6,000), boats and pickup trucks. There has been widespread distribution of tobacco-branded clothing. Tobacco industry sponsorship of games and activities is common.

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In 1997 the Government of the Republic of the Marshall Islands filed a lawsuit against U.S. tobacco companies, seeking compensation for the costs of tobacco-related illness and disability. The challenges of quantifying tobacco-related health expenditures in the RMI have been discussed previously⁶. Although judgment was made in favor of the U.S. tobacco companies, the activities surrounding the litigation have brought attention and continued resolve to implement tobacco prevention and cessation programs in the RMI.

As part of the data collection effort for the anti-tobacco litigation, two separate surveys were commissioned to determine the prevalence of tobacco use and to attempt to quantify increased utilization of health services among tobacco users. A randomized household survey was conducted of over 2,000 adults and a school survey was conducted among more than 3,200 students in grades 5 through 12. This paper presents the detailed results of the cross-sectional school survey.

Methods

An in-school survey was conducted from February through March 2000 among 5th through 12th graders in selected public and private schools in the Republic of the Marshall Islands (RMI). The RMI has compulsory education from ages 6 through 14. Entrance to public high schools is determined by competitive examination administered in the 8th grade. The estimated combined enrollment for 5th through 12th grades in public and private schools for the academic year 1999-2000 was 8,874 students. According to the 1999 RMI census, there were a total of 13,829 children of ages 10 through 19.

Although the initial study design incorporated representative sampling of 3200 students from the 5th through 12th grades, the survey population was broadened to include all the students in each surveyed location at the request of the RMI Ministry of Education and Ministry of Health. In order to obtain responses from students in both urban and outer island sites, surveys were conducted in Majuro and Ebeye and in outer island schools. The outer islands surveyed included the atolls of Arno, Jaluit, Likiep and Wotje as well as school children on Kili Island. Jaluit and Wotje were selected since they are the only atolls with high schools outside of Majuro and Ebeye. The other outer island sites were selected at random. For Majuro atoll, Ebeye and the selected outer islands, all 5th through 12th grade school classes at private and public schools were surveyed. In total 3,294 survey responses were collected, with 2,401 responses from Majuro and Ebeye, and 668 responses from

the outer islands; 225 surveys were missing location data.

A twelve-member survey team, which included trained census takers, was recruited from staff at the Ministry of Health, the Ministry of Education, Youth to Youth in Health (a non-governmental youth organization), and the College of the Marshall Islands. Each survey team member was fluent in Marshallese and familiar with Marshallese customs. The survey activities were led on-site by two of the authors (AO and HH).

The survey instrument asked for each student's name and demographic data and consisted of 32 predominantly multiple-choice questions. The authors developed the survey tool, basing some questions on the Hawai'i Youth Tobacco Survey and the National Youth Tobacco Survey. Other questions were developed to be specific for this population. The survey tool was developed in English; translated into Marshallese; back-translated to assure accuracy, and field tested in the community by the survey team prior to use in this study.

Students were classified as smokers if they answered "Yes" to the question, "Have you smoked at least 100 cigarettes (5 packs) in your life?" This definition of a smoker is consistent with the criteria used by the U.S. National Center for Health Statistics. Students who answered "Yes" to this question were then directed to answer questions regarding current frequency of smoking, attempts at smoking cessation, source of cigarettes, age of onset and use of

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health resources.

All students were directed to answer questions about tobacco health risks, awareness of the addictive potential of tobacco, participation in tobacco promotions and contests, use of tobacco-labeled clothing or equipment, attitudes towards other high-risk behaviors such as riding in a speeding car or sailing between distant atolls in a small canoe, and whether family members smoked at home.

Following approval from the Ministry of Education and discussions with the principals of each school, two survey team members conducted surveys in each classroom of the appropriate grades. Marshallese and English versions of the survey were provided. Where possible, surveys were administered during the first morning session in the school day. Each survey session lasted approximately one hour. For schools with large populations of non-Marshallese speakers, the surveys were administered separately to Marshallese and English speaking groups.

Table 1a. Age and smoking				
Age	Total Number	Non-Smokers	Smokers*	% Smokers
9	8	8	0	0
10	80	80	0	0
11	273	271	2	0.7%
12	435	431	4	0.9%
13	532	520	12	2.3%
14	465	443	22	4.7%
15	435	382	53	12.2%
16	333	263	70	21.0%
17	248	189	59	23.8%
18	200	133	67	33.5%
19	78	53	25	32.1%
20	34	18	16	47.1%
Totals	3121	2791	330	10.6%

** Answered "Yes" to the question "Have you smoked at least 100 cigarettes (5 packs) in your life?"*

Prior to starting the survey, a disclosure statement was read to each class that described the purpose of the study: to study the use of tobacco products in the RMI and also to look at how tobacco use may have affected health. The disclosure statement also assured confidentiality of the results and gave students the option to not participate in the survey. At the start of the survey, one team member read each survey question aloud and noted the various choices. Students were given time to complete their answers to each question prior to the reading of the next question. The other team member circulated through the classroom to ensure that forms were completed correctly, that students did not confer with each other, and to clarify questions when

Table 1b. High school age and smoking				
Age	Total Number	Non-Smokers	Smokers*	% Smokers
14-20	1793	1481	312	17.4%

** Answered "Yes" to the question "Have you smoked at least 100 cigarettes (5 packs) in your life?"*

necessary. The survey team members collected the written surveys after they were completed.

Interim review of surveys conducted at the first two schools noted a very low response rate to the tobacco use questions when compared to results from youth in the RMI household surveys. The concern was raised that in an institutionalized school setting, students might be uncomfortable acknowledging their tobacco use on a survey form

Figure 1. Smoking rates vs. Age

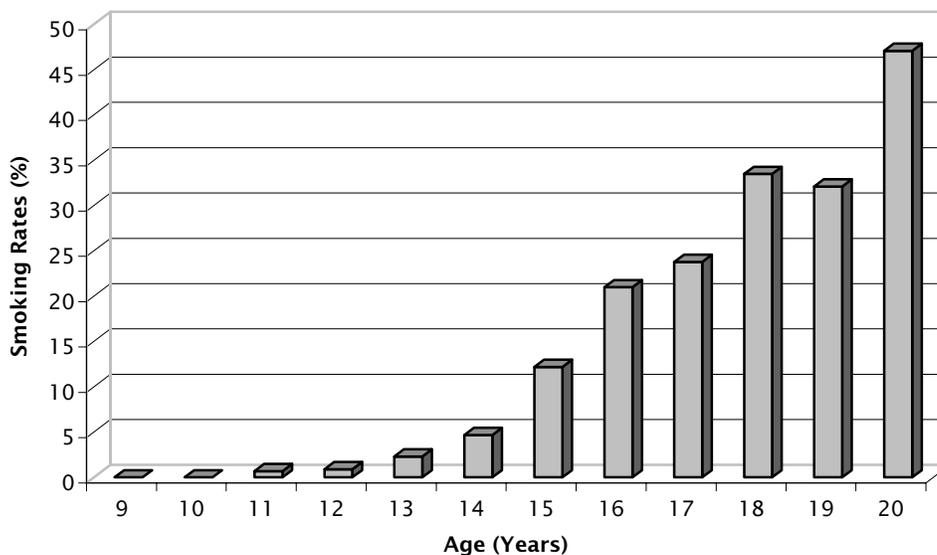


Table 2. Gender and geographical distribution of smokers

	Non-Smokers	Smokers	Total	%Smokers
Males	1239	291	1530	18.7%*
Females	1608	57	1665	3.4%*
Urban	2175	226	2401	9.4%†
Rural	571	97	668	14.5%†

*Percentages calculated based on total number of male (1558) and female (1700) respondents. Distribution statistically significant ($p < 0.001$) by Chi-square test.

Urban - Majuro and Ebeye schools.

Rural - Arno, Jaluit, Kili, Likiep and Wotje schools. Of the outer atolls, only Jaluit and Wotje have high schools.

† Distribution statistically significant ($p < 0.001$) by Chi-square test.

that also contained their name. To assure confidentiality, the decision was made for students not to write their names on the survey forms in subsequent sessions. Although this limited the potential for comparison with health records, it was felt that this modified methodology would provide for greater accuracy in estimating prevalence of tobacco use. Positive response rates to the tobacco questions were noted to be higher in subsequent surveys, similar to results from the household surveys. Time and resource constraints precluded resurveying the first two schools and their data

were included in the general analysis.

Results

A total of 3,294 students were surveyed, representing 37% of students in private and public schools in the RMI in grades 5 through 12. There were 1,700 females (51.6%) and 1,558 males (47.3%), with 36 non-respondents for gender. Students' ages ranged from 9 to 20 years old, with a mean age of 14.

Of the 3,220 students who answered the question, "Have you smoked at least 100 cigarettes in your life?", 330 students answered, "Yes". This reflects a 10.6% mean percentage of smokers. This ranged from 0% of the nine and ten year olds, to 33.5% of eighteen year olds and 47.1% of the twenty year olds surveyed. There was a marked increase in smoking noted among 15-year old students compared to 14-year old students.

There was a general trend showing that the percentage of smokers increased with age in the surveyed group. The mean percentage of smokers among students ages 14 through 20, (reflecting the ages of students in the 9th through 12th grades population), was 17.4%.

Males were significantly more likely to report cigarette smoking than females (18.7% vs. 3.4%). Students in rural atolls were more likely to smoke than students in Majuro and Ebeye.

A majority of respondents (60.8%) understood that tobacco is addictive. Approximately half (49.6%) of the students answered that they could explain the concept of cancer. Over 97% of respondents indicated that they had an elder (father, mother, uncle or aunt) who smoked in their house and 82% indicated that there was a peer (brother, sister or cousin) who smoked at home.

Parameter estimates were calculated for each of the risk factors studied to determine the relative strength of the associations (Table 3). Statistically significant risk factors for smoking were (from strongest to weakest): increased age, male gender, having received or worn promotional items, willingness to participate in other high risk behaviors, having a peer (brother, sister or cousin) who smoked at home and participating in a tobacco-sponsored contest.

Table 3. Parameter estimates of risk factors and smoking

Risk Factor	Parameter Estimate Magnitude	Standard Error	p-value
Age	0.041	0.002	<0.0001 *
Gender	0.124	0.011	<0.0001 *
Equipment	0.079	0.018	<0.0001 *
Korkor	0.062	0.019	0.0015 *
Car	0.047	0.014	0.0008 *
Peer	0.018	0.006	0.0063 *
Contest	0.013	0.004	0.0032 *
Elder	0.004	0.006	0.5398
Cancer	0.017	0.011	0.1181
Addiction	0.009	0.011	0.4118

* $p < 0.05$

Age - for each additional year of age, smoking risk increased by 4.1%

Equipment - students who have worn or been given tobacco labeled clothing/equipment

Korkor - students who would want to ride in a small boat between Majuro and Kwajalein (over 200 miles)

Car - students who would want to ride in a car going over 100 mph

Peer - brother, sister or cousin smokes at home

Contest - ever participated in a tobacco-sponsored contest

Elder - father, mother, aunt or uncle smokes at home

Cancer - answered, "Yes" to the question "Can you explain what cancer is?"

Addiction - answered, "Yes" to the question "Do you know that tobacco... has a substance in it which makes it difficult to stop using once you start?"

The risk factors that did not show statistically significant associations with tobacco use were: knowledge about tobacco complications (including cancer), knowledge that tobacco is addictive, and having family elders who smoke at home.

Discussion

This study provides an estimate of smoking prevalence in the Republic of the Marshall Islands among students in grades 5 through 12. The percentage of students classified as smokers increased significantly among higher age groups in this cross-sectional survey. Among students aged 14 to 20, the percentage of smokers was determined to be 17.4%. Risk factors associated with smoking in Marshallese students were also identified and quantified. The large sample of students in this survey provides a strong estimate of smoking rates and risk factors among students in the RMI.

Several limitations to this study are to be noted. The lack of representative sampling does not allow for the calculation of a true smoking prevalence rate for 5th through 12th graders in the RMI. However, the large sample size of the survey makes it likely that the smoking rate estimate is a close approximation of the actual prevalence rate. Unsurprisingly, this school survey of smokers shows lower percentages than the YRBS based on different and more stringent criteria. Those students who indicated that they had not smoked 100 cigarettes in their lifetime were directed to skip the questions related to frequency of smoking. It is possible that a significant additional number of students might have fallen into the YRBS category of “current cigarette use” if the question regarding “any smoking in the past 30 days” had been asked of all students. Hence it is difficult to compare rates of tobacco use between this survey and the YRBS. In order to allow a direct comparison with results from the CDC YRBS program, any follow-up survey should direct all students to answer questions regarding lifetime cigarette use, lifetime daily cigarette use, current cigarette use (smoked at least once in the preceding 30 days) and current frequent cigarette use (smoked cigarettes on at least 20 of the preceding 30 days).

The methodology was modified after the first two schools were surveyed. In response to a perceived high rate of false negative answers to the tobacco questions in the initial surveys, students in later sessions were asked not to include their names on the forms. The increased reporting of tobacco use in subsequent surveys appears to support this concern. Since the surveys from the initial two schools were included in the analysis of smoking rates, the overall

smoking rates reported are likely to reflect an underestimate of the true rates. Experience from this survey highlights the importance of assuring anonymous responses by not collecting identifying data on the questionnaire.

Since compulsory education in the RMI ends at age 14 or after the 8th grade, a number of youth in the age ranges corresponding to high school age would not have been surveyed by conducting this sample in schools alone. The relative smoking rate among this group of youth not attending school is not known. Comparison with data from the associated household survey data will provide insight into this issue.

Cultural factors and the social desirability bias may also play roles in underestimating smoking and tobacco use with this survey methodology. In the RMI and many other Pacific countries, smoking is considered less acceptable among women. Conceivably, female respondents might have been inclined to under-report tobacco use. It is difficult to ascertain to what degree this occurred among female students in this cohort. An additional cause of under-reporting might have been the prohibition of tobacco use by some religious groups active in the RMI; this would affect both genders. A future study should compare the responses of students who were surveyed individually and

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anonymously with that of students surveyed in a class setting among their peers to determine if the class survey method might result in under-reporting of tobacco use. Smoking might also be underestimated if people who roll their own cigarettes or cigars did not report tobacco use if they did not consider these to be the same as store-bought cigarettes, especially since the survey questions specifically refer to the number of cigarette packs they used. Revising the questionnaire to clarify the inclusion of self-rolled cigarettes would address this issue.

Data on the use of smokeless tobacco, chewed with or without betel nut, were collected in the survey but not reported in this paper since the analysis of these results is ongoing. Although the epidemiology of smokeless tobacco use in the Pacific is less well defined than for smoking, it is acknowledged to be a significant health problem in the region. The 1999 Youth Tobacco Survey in Palau noted that two-thirds of high school students were current users of betel nut with tobacco⁴. Smokeless tobacco has been clearly associated with significant health risks, including oral cancer. The analysis of these data will provide useful information on the use of oral tobacco in the RMI.

Despite these limitations, this extensive survey presents an estimate of smoking rates and risk factors in a population

that has not previously been well studied. Findings from this study can assist in guiding tobacco prevention and public policy interventions in the RMI.

Considering the accumulation of health risks from tobacco use over time and the youthful population structure of the RMI, it is expected that continued high rates of tobacco use in the population will have potentially devastating effects on mortality and disability rates in the future. The health care system, other government services and existing traditional social support structures will be placed under significant additional strain by tobacco-related illnesses as this population ages. It is therefore especially important to target youth in any comprehensive plan for tobacco prevention and control in the RMI. By highlighting the risk factors most strongly associated with smoking in Marshallese youth, several key areas for intervention can be identified. Although the cross-sectional survey design cannot determine causality, the associations that are noted can be useful for identifying youth at high-risk for tobacco use and targeting interventions to these groups. The findings of this study can assist in guiding tobacco prevention programs and public policy in the Republic of the Marshall Islands.

Measures to prevent youth initiation of smoking have been evaluated by the U.S. Task Force on Community Preventive Services. Increasing the unit price on tobacco products (especially by imposing a sin-tax) and developing extensive ongoing mass media campaigns that are integrated with other prevention activities are evidence-based methods that have proven to be effective in reducing youth tobacco use⁷. These measures are also recommended by the WHO Framework Convention on Tobacco Control adopted in 2003⁸. This school survey identifies target populations that might benefit the most from extensive media campaign and other tobacco prevention activities.

Although the association between smoking and increasing age is not unexpected, it is useful to note the dramatically higher smoking rates among 15-year-olds compared to 14-year-old students. Programs to prevent the initiation of smoking among youth should target students by age 14 at the latest and continue through adolescence. Experience from the U.S. suggests that adolescents who remain tobacco-free into adulthood are unlikely to start using tobacco later in life⁹. A follow-up study of these surveyed cohorts will help determine if this pattern is also applicable to the RMI.

This survey suggests that adolescent boys are at higher risk for tobacco use than girls. Although under-reporting may account for some of this difference, this disparity is also consistent with the cultural disapproval of smoking among

women. Despite the higher prevalence of smoking among male students, it remains important to also involve female students in tobacco prevention activities. A recent survey of Pacific Islander high school students on Guam noted that girls had high rates of smoking (46 percent) that were even greater than boys¹⁰. Prevention of a similar increase in smoking rates among girls should also be priority in the RMI and throughout the region.

Students who wear or receive tobacco-related paraphernalia in this sample were more likely to smoke. Distinguishing between cause and association is difficult for this finding; it is possible that smokers have more opportunities to receive such tobacco-branded items. Determining if non-smokers who receive such items are more likely to become smokers was outside the scope of this study. However, the World Health Organization recommends restrictions on tobacco-related advertising, promotions and sponsorship in

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the recently adopted Framework Convention on Tobacco Control⁸. A ban on direct distribution of tobacco-labeled clothing items to young people and restrictions on youth participation in tobacco-sponsored contests should be considered.

Students surveyed on rural outer atolls had a significantly higher rate of smoking than students in Ebeye and Majuro. The factors behind this difference are not clear from this survey. Perhaps the poor transportation and communication infrastructure on the outer islands limit access to the tobacco prevention and cessation programs of the Ministry of Health. Interventions to prevent and reduce tobacco use should address this increased estimated prevalence among youth in outer atolls. Further specific investigation is warranted into possible associated factors for smoking among outer atoll students, including family economic status, recreational activities, availability of cigarettes to youth, smoking patterns among family members as well as tobacco pricing and marketing.

Among RMI students, the positive association of the habit of smoking with increased interest in other risky behaviors is consistent with findings among adolescents in other countries. There were no negative correlations noted between knowledge about cancer, or the addictive potential of tobacco and smoking rates. This study does identify peer tobacco use as a risk factor associated with higher rates of smoking. Reducing the prevalence of smoking among youth and changing peer attitudes may have additional benefits on reducing initiation of smoking in adolescents. A comprehensive tobacco control strategy should identify and support active community leaders who have been trained to promote tobacco prevention activities. Continued surveillance to monitor ongoing trends and direct the

activities of prevention programs is also important in the effort to control tobacco use, prevent disability, and improve the health of the population¹¹.

In conclusion, this survey represents an extensive study of smoking and its associated risk factors in a population that had not been well studied previously. The survey provides estimates of smoking prevalence among 5th through 12th graders in the Republic of the Marshall Islands. Risk factors associated with youth smoking are identified and their relative significance is quantified. This study is especially significant given the importance of tobacco prevention among youth in developing countries with similar population structures. The results of this school survey can be used to assist in guiding a comprehensive tobacco prevention and control strategy in the Republic of the Marshall Islands. Consideration should be given to conducting revised follow-up surveys and implementing a public health surveillance system to track the scope of adolescent smoking and to evaluate the effectiveness of youth anti-tobacco interventions in the Republic of the Marshall Islands.

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The sea cucumber sleeps too much
and does not have enough food.
The eel moves and hunts and has a lot of food.
Proverb from the Outer Islands of Yap