

Chapter 15

**Global Smokeless Tobacco Use:
Future Research Needs and
Policy Recommendations**



Chapter Contents

Report Highlights.....	435
Prevalence and Patterns of Smokeless Tobacco Use.....	435
Health Effects and Impact of Smokeless Tobacco Products	436
Diversity of Smokeless Tobacco Products	437
Marketing Strategies and Production Practices: The Evolving Market.....	438
Policy and Personal Level Interventions.....	438
Overall Challenges: Smokeless Tobacco is a Complex Global Problem	439
Gaps and Research Needs.....	441
Surveillance and Monitoring.....	441
Products.....	441
Health Effects.....	441
Economics and Marketing	442
Interventions	442
Building Capacity	442
Intervention and Policy Needs	444
References.....	446

Report Highlights

Smokeless tobacco (ST) use is a global problem affecting an estimated 300 million people across about 70 low-, middle-, and high-income countries. All six World Health Organization (WHO) regions contain a substantial population of ST users, and almost all countries for which data are available report some level of ST use. In countries with the highest prevalence, most current users report daily use of smokeless tobacco. Smokeless tobacco use poses an extremely complex public health challenge, as product characteristics, patterns of use, health effects, marketing and production practices, and public health and policy responses vary widely between countries and regions.

Prevalence and Patterns of Smokeless Tobacco Use

Smokeless tobacco has a disproportionate impact in some countries and subpopulations. The majority of the world's adult ST users (89%, or approximately 268 million) live in low- and middle-income countries in South-East Asia. There are an estimated 220 million adult ST users in India alone, where overall adult prevalence is 26% (exceeding the prevalence of cigarette smoking), followed by Bangladesh with 28 million ST users (27%), and Myanmar with 11 million ST users (30%). Adult prevalence is high—10% or greater—in 11 countries (Bangladesh, Bhutan, India, Micronesia, Myanmar, Nepal, Norway, Sri Lanka, Sweden, Yemen, and Uzbekistan). Six of these 11 countries are located in the South-East Asia Region. The figures presented in this report represent only those countries for which data are available; data are lacking for some countries in each region.

Across countries at very different levels of economic development (high-income to low-income), ST use is generally higher among rural populations with lower education and lower socioeconomic status. In most countries ST use is more prevalent among men than women, but several countries reported high use of ST among both men and women. Eight countries (Bangladesh, Bhutan, Cambodia, India, Madagascar, Mauritania, Myanmar, and South Africa) reported prevalence of greater than 10% among adult women. In several countries in the African, South-East Asian, and Western Pacific Regions, prevalence of ST use among women significantly exceeded that of men. Some studies have found that women report initiating ST use during pregnancy because they believe it will alleviate symptoms of morning sickness,^{1,2} and ST use during pregnancy has been associated with adverse reproductive outcomes, such as pre-term birth or fetal growth restriction. More research is needed to understand the factors that lead to high prevalence of ST use among women in these countries.

Smokeless tobacco use is also prevalent among youth in many countries. All 57 countries for which sufficient national data were available to be included in this volume (using Global Youth Tobacco Surveys [GYTS] of students aged 13–15 years) reported some ST use among youth, and 33 reported overall use greater than 5%. As with adults, ST use is generally higher among males than females, but ST use prevalence greater than 10% among girls was reported for several African countries (Botswana, Congo, Lesotho, and Namibia). In many regions, ST products are marketed and sold in ways that may appeal to youth, such as in publications with a high youth readership or displayed next to candies and snacks in street stalls and kiosks.

A high prevalence of ST use is also seen among some population subgroups even within countries where overall prevalence is low compared with cigarette smoking, particularly among native populations and recent immigrants. For example, while prevalence of ST use among Alaskan non-Native adults is similar to the U.S. average, prevalence among Alaska Native adults is three times greater. Similarly, in Brazil the use of the ST product rapé is rare among urban populations but more common among rural native populations. Immigrants from regions where ST use is prevalent may bring their practices with them. For example, the use of gutka or betel quid with tobacco has been found to be very common among first-generation immigrants from Bangladesh and India living in New York and London. And reports suggest that some youth, such as those in Venezuela and Micronesia, may view ST products as a means to express national identity or traditional culture.

Health Effects and Impact of Smokeless Tobacco Products

There is substantial evidence that ST products cause addiction, precancerous oral lesions, cancer of the oral cavity, esophageal and pancreatic cancer, and adverse reproductive outcomes, including stillbirth, pre-term birth, and low birth weight. Data from some countries have demonstrated a link between ST and increased risk of fatal myocardial infarction or stroke. All ST products contain chemicals known to cause harm, such as tobacco-specific nitrosamines (TSNAs) and polycyclic aromatic hydrocarbons (PAHs). In fact, a well-developed model describes the mechanistic pathway by which the TSNAs *N*'-nitrosonornicotine (NNN) and 4-(methylnitrosamino)-1-(3-pyridyl)-1-butanone (NNK) are metabolically activated and induce primary DNA lesions that may ultimately lead to cancer. Thus, all ST products are hazardous to use.

The impact of ST use is related to the disease risks associated with particular products, their prevalence, manner of use, and the underlying burden of disease (which may also be influenced by other risk factors). Currently available data are insufficient to support an estimate of the total global disease or mortality burden of ST use. Additionally, because smokeless tobacco use is a limited or relatively recent practice in many countries, particularly in higher income countries, research and data collection have lagged. However, estimates of attributable risk for countries where adequate data are available show wide variation in the attributable disease burden. For example, most studies from Sweden have not shown an association between ST use and oral cancer, but studies in India have shown very high relative risks (from 2 to 14) for oral cancer.³ These differences may be due in part to differing levels of harmful constituents in the products. For example, reported levels of TSNAs in ST product samples from a variety of countries, and within the same country, vary by many orders of magnitude. One laboratory study comparing samples of products from India found that total TSNA content varied from 0.1 to 127.9 micrograms per gram ($\mu\text{g/g}$). Likewise, an analysis of U.S. moist snuff products showed a 70-fold difference in NNAL content across leading brands, whereas products in Sweden show less variation in TSNAs because they adhere to specific standards for TSNA levels.

In general, the greatest disease burden from ST use occurs in low- and middle-income countries where the highest relative risks have been recorded and the greatest numbers of users live. An example is India's high oral cancer rates⁴. It is estimated that more than 50% of oral cancers in India can be attributed to ST use.⁵ In addition to high disease burden, low- and middle-income countries face a multi-pronged challenge: They are home to the most diverse array of products, some of which are extraordinarily high in toxicants, but their ability to regulate ST products and implement effective tobacco control measures is hampered by limited resources and the local, unorganized nature of tobacco manufacturing and retailing.

Diversity of Smokeless Tobacco Products

The term “smokeless tobacco” covers a large and extremely diverse group of products. They differ in color, appearance, consistency, packaging, and manner of use. They also vary in their mode of manufacture or preparation (premade vs. custom-made), in the scale of production (large-scale manufacturing, cottage industry, or individual vendor preparation), and in their ingredients (type of tobacco leaf, alkaline agents, flavorants, and other non-tobacco content, such as areca nut or tonka bean). The best estimates indicate that, by volume, 91.3% (648.2 billion tons) of ST worldwide (710.2 billion tons) is sold in traditional cottage industry markets.⁶ Chapter 3 of this report proposes a method of categorizing ST products into four groups based on the addition of specific classes of ingredients, including alkaline agents, areca nut, and other active chemical or plant ingredients. Though this categorization may have some utility, the product-associated risks may vary greatly even within these categories.

Smokeless tobacco products also vary greatly in their chemical composition, with some products containing extremely high levels of carcinogens, nicotine, and free nicotine (the most rapidly absorbed form). For example, levels of TSNAs in ST products vary by as much as 400-fold.⁷ A 2008 survey of 39 top-selling brands of U.S. moist snuff showed a more than fivefold variation in total nicotine levels and a more than 500-fold range in free nicotine.⁸ Levels of toxicity, carcinogens, and free nicotine are influenced by a wide range of factors, including species of tobacco plant used, characteristics of the soil in which the tobacco was grown (e.g., the concentration of nitrite and certain metals), curing methods (air-cured vs. fire-cured), processing methods (pasteurized vs. fermented), addition of certain ingredients (tonka bean, areca nut, alkaline agents), and conditions under which the final products were stored. Based on research to date, steps could be taken to reduce the presence of carcinogens or other toxicants in ST products, including reduction or elimination of the use of fire-cured tobacco, improved prevention of microbial contamination, changes in fermentation, elimination of ingredients such as areca nut and tonka bean, and improvements in storage conditions.

Despite the enormous product diversity, some important common cross-product observations can be made. The practice of adding alkaline agents to boost nicotine delivery is commonly found in a number of traditional and manufactured ST products around the world (such as punk ash added to iqmik in Alaska, slaked lime added to khaini in India, or sodium bicarbonate added to toombak in Sudan). Adding flavorings (e.g., menthol, cocoa, licorice, rum, aniseed, cinnamon, clove) and sweeteners (e.g., molasses, honey, dextrose, sorbitol, fruit juices) is also a common practice and may make the product more appealing to youth and new users.⁹ Additionally, there appears to be a growing emphasis on increased convenience and ease of use in the marketing of ST products in countries at different income

levels. Gutka, a dried, prepackaged version of the fresh betel quid traditionally mixed to order by a vendor or user, has become increasingly popular in India and is now a large-scale industry. At the same time, in high-income countries such as the United States, tobacco product manufacturers have packaged moist snuff in pouches that do not require spitting, marketing them to smokers as a discreet and convenient alternative for settings where they cannot smoke.

Marketing Strategies and Production Practices: The Evolving Market

Tobacco industry marketing strategies also show some common trends. Across high-, middle-, and low-income countries, tobacco product manufacturers utilize colorful packaging, suggestive names and slogans, cross-branding with non-tobacco products, price discounts, health or medicinal associations, and lifestyle marketing appeals to sell their products. In the United States, U.S. Smokeless Tobacco Company aggressively promoted low-nicotine products starting in the mid-1970s to young people in an attempt to graduate these new users to products containing higher amounts of nicotine as they become more nicotine dependent.¹⁰ Longitudinal data provide evidence that switching from lower to higher nicotine products does occur among youthful snuff users.¹¹

In middle- and low-income countries, marketing strategies may pose a particular challenge for tobacco control efforts by circumventing existing tobacco control measures, using the same brand names for their tobacco products as for non-tobacco products, and using packaging that appeals to youth. For example, manufacturers in India use the same brand names for their non-tobacco products as for tobacco-containing products in an effort to circumvent India's ban on tobacco product advertisements on television. Use of small single-use packaging makes products inexpensive and more easily available to youth and may dilute the impact of tobacco taxes. In addition, large-scale marketing campaigns are generally absent for traditional cottage industry products, but large multinational companies have entered markets in some low- and middle-income countries and have begun to produce some traditionally cottage industry products on a larger, commercial scale.

In high-income countries such as the United States, a number of manufacturers have introduced novel ST products, using new product formulations (e.g., reduced nitrosamines, dissolvable formulations, spitless pouches, new flavorings) and marketing practices (e.g., targeting current smokers and devising innovative packaging). These products and practices may appeal to new groups of users. For example, novel snus products have been marketed to smokers for use in settings where they cannot or do not want to smoke, using imagery that emphasizes trendiness, urbanity, freedom, and sophistication for both men and women. And U.S. cigarette manufacturers have introduced ST products with popular cigarette brand names such as Marlboro and Camel. These new marketing strategies raise concern because they may increase initiation, deter people from quitting smoking or other tobacco use, or result in dual use or use of multiple tobacco products.

Policy and Personal Level Interventions

In all regions, evidence-based interventions tailored to the prevention and cessation of ST use are limited. The available evidence suggests that school-based and community prevention programs can lead to short-term reduction in prevalence among youth, and that clinic and dental office interventions (involving multiple sessions and counselor support) can increase cessation among adults.

Pharmacotherapies, with the possible exception of varenicline, have not been found to be effective in improving cessation in ST users in the United States and Great Britain (chapter 7). In some regions, knowledge about the health effects of ST use is limited even among health professionals. The existing evidence for treatment programs comes largely from high-income countries, and data on smokeless tobacco quit rates are not available for most countries. Thus, there is a particular need to develop and test interventions targeted at low-income populations or countries where the burden of ST use is greatest.

A diverse range of programs and policies have been implemented in different countries and municipalities to address ST use; however, limited data are available to evaluate the impact of these interventions. Some countries and municipalities have banned entire classes of tobacco products, such as the ban on gutka sales imposed by some states and subregions in India. In many countries, a lower standard has been applied to ST products compared with cigarettes. For example, in many regions, even those where ST use is highly prevalent, policies and programs aimed at ST use prevention and cessation are generally weaker than those for smoked tobacco products: prices are lower, warning labels are weaker or nonexistent, surveillance is weaker, fewer resources are devoted to prevention and control programs, and fewer proven interventions are available. While restrictions on smoking in public places, even outdoors, have been vigorously pursued in many countries around the world, few efforts have been made to apply these rules to non-smoked tobacco products.

Overall Challenges: Smokeless Tobacco is a Complex Global Problem

Considering the magnitude and complexity of the smokeless tobacco problem (including industry marketing, trends and patterns of use, and a lack of effective interventions), the public health challenge of ST warrants far greater attention and action than it has so far received. According to Euromonitor International, the global market for both modern and traditional snuff products is projected to increase by 24 percentage points between 2011 and 2016, compared to only a projected 7 percentage point increase in the market for cigarettes.¹² Moreover, while the WHO Framework Convention on Tobacco Control (FCTC) applies to all tobacco products, many of the strategies developed under the Conference of Parties to date are focused on cigarettes, and no specific guidance has been developed regarding ST products.

The prevalence of ST use is particularly high in some low- and middle-income countries and among low-income populations. The major challenge that faces these countries is the limited data to help craft policies and programs. For example, data on pricing, tax structures, and sale of ST products are very limited, especially in those countries where ST use is most prevalent. Cottage industry production makes collection of taxes more challenging and probably less effective. Additionally, information on the cost of health care to treat ST-related diseases is extremely limited. This is a particularly significant gap in the data needed to inform the control of ST use.

While the public health burden falls disproportionately on low- and middle-income countries, the findings and gaps identified in this report have substantial public health importance for high-income countries as well. Countries with the largest populations of ST users include the United States, with 9 million users. Between 2005 and 2010, sales of moist snuff grew by US\$2.04 billion following increased marketing of these products.¹³ National surveys also suggest that between 2000 and 2010,

ST use in the United States rose among youth, particularly high school males.^{14–16} The major challenges faced by the United States and possibly other high-income countries include the large number of different types of tobacco products that are emerging in the market. As noted previously, novel snus-type products using familiar cigarette brand names (Camel and Marlboro Snus) are being marketed to smokers for use in settings where they cannot smoke.^{17,18} This trend may adversely impact smoking cessation efforts by encouraging dual use as an alternative to tobacco use cessation. Additionally, dual use of ST and cigarette smoking could have greater health risks than smoking alone.^{19,20} Although cigarette smokers who permanently switched to exclusive ST use decreased their risk of some diseases specific to smoke exposure, those who quit tobacco use altogether lowered their mortality rates from lung cancer, coronary heart disease, and stroke more than those who switched to ST use, as indicated by the single study that examined this effect.²¹

Another challenge revolves around the smokeless tobacco harm-reduction debate. Some have suggested that ST products, particularly those low in nitrosamines, could act as harm-reduction agents for cigarette smokers, especially in high-income countries with lower disease burdens related to ST use. However, as this report suggests, the assessment of risks and benefits in such a strategy, particularly on a population level, is complex and uncertain. In almost all countries, ST products have widely varying levels of addictive potential and toxicity. Furthermore, available data do not allow for identifying specific levels of product constituents with quantifiable risk reductions. Additionally, no rigorous studies have demonstrated the effectiveness of an ST product for smoking cessation or as a complete substitution for cigarettes.

To summarize, ST use poses distinct public health challenges in different regions. In some low- and middle-income countries ST use is highly prevalent, it is associated with high disease risks, and the market is poorly regulated. In contrast, in some high-income nations, overall tobacco use has decreased, use of ST products is associated with markedly lower disease risks compared with smoking, and active tobacco control programs exist, but the types and products for sale are quickly proliferating and marketing of these products is expanding to new populations. While the promotion and use of ST products pose serious public health challenges across a wide spectrum of different environments, it is important to recognize that this is a complex problem and that solutions need to be tailored to the needs of each country.

Nevertheless, the complexity of this problem should not impede research, capacity building, and policy development and evaluation around smokeless tobacco. At the fifth session of the Conference of the Parties (COP5) to the WHO Framework Convention on Tobacco Control, held in November 2012, the Convention Secretariat provided a background report that emphasized the need to prioritize measures to specifically address ST use as part of the full implementation of the Framework Convention.²² Some participants argued against making specific recommendations on ST given the wide variation in ST products around the world and different marketing dynamics and regulatory experience.²³ In the end, the COP requested additional information, including identifying and evaluating best practices in prevention and control of ST products and identifying research gaps and needs, before taking any action.²⁴ While deliberations continue in the global community, it is important to continue to build a global research and capacity-building agenda around smokeless tobacco.

Gaps and Research Needs

This volume has identified a number of research, capacity-building, and policy needs. This summary offers guidance to researchers, public health practitioners, and policymakers on addressing the public health impact of ST use around the world.

Surveillance and Monitoring

Ongoing, comprehensive surveillance is needed to assess the scope of ST use and changes in patterns of use, and to evaluate the impact of policies, interventions, and other steps that could be taken to address ST use. However, many countries lack data on ST use; where such data are collected, information on the use of specific products is very limited or unavailable. Moreover, in a product category that has changed and continues to change dramatically, particularly in recent years, existing survey data may not fully reflect the current situation. Surveillance and monitoring of trends in ST use should include information on populations and subpopulations of users, types of products, patterns and intensity of use, combined use of other tobacco products, and attitudes, beliefs, and perceptions about tobacco products. For example, the existing CDC-led Global Tobacco Surveillance System and WHO STEPS surveys could be expanded to provide greater coverage of ST, or in-depth analyses could be undertaken to document survey findings. Smaller targeted surveys are needed in order to assess the impact of novel products or rapid changes in use and to understand patterns among specific subgroups. Standardized measures of ST use and exposure, including quantity and frequency of use, are also needed. The WHO's Tobacco Questions for Surveys²⁵ provides a subset of basic questions that can be added to existing surveys, and this resource could be further expanded and tailored to specific products and regions. The new U.S. Surgeon General's 50th anniversary report, *The Health Consequences of Smoking—50 Years of Progress*, includes as one of its key recommendations the need to ensure that surveillance activities in the different countries monitor use of smokeless tobacco and combined use with other tobacco products.²⁶

Products

Given the diversity of products and modes of manufacture around the world, a more comprehensive characterization of the properties of different products, their constituents, and methods of manufacture is needed. Where resources are available, biomarker studies to examine actual human uptake (absorption and excretion) of nicotine and toxicants as a result of active, secondhand, and fetal exposure to ST would be valuable. Additionally, attention should be given to non-tobacco products that are frequently used in conjunction with tobacco, such as areca nut. Further research is needed to develop standardized testing methods for diverse products. The laboratory standards being developed by the WHO Tobacco Laboratory Network for testing cigarettes could be expanded and adapted for ST products.

Health Effects

While there is a significant body of research on particular health effects of ST use in a few countries, the diversity of products, practices, and patterns of use precludes broad generalizations about health effects. Most studies of health effects have been conducted in Scandinavian countries, the United States, and India. Because of the diversity in toxicant and nicotine levels across ST products and patterns of use, applying results from one country to another country is problematic. Even within a country, ST products

can vary tremendously. Also, mixed results for some health outcomes and disease endpoints in some studies (such as in cardiovascular disease effects) and small numbers of participants in others suggest the need for further investigation. Across countries there is consensus on the adverse effects of nicotine on pregnancy, fetal brain and lung growth, and birth outcomes, such as pre-term birth and stillbirth. However, the effects of ST use on birth outcomes need further characterization, especially considering the high prevalence of ST use among some subgroups of women of reproductive age. In order to link specific types of products with particular health effects, studies are needed that link the constituent profile and biomarkers of exposure and biomarkers of effect to specific ST products with health consequences; establishing these links may be extremely challenging for custom-made and cottage industry products with little or no standardization. Studies should also investigate the health effects of other ingredients and combinations of ingredients frequently used in ST products, such as areca nut or tonka bean.

Economics and Marketing

Very little information is currently available on pricing and sales volume of ST products in many countries. While many studies have been conducted on the price elasticity of cigarettes, for example, comparable data for ST are very limited. Given the high prevalence of ST use in some low- and middle-income countries and among poor and rural populations, pricing information may be especially important for understanding patterns of use and developing effective public health interventions. Information on price, taxes, affordability, and trade should be collected routinely. Additionally, locally relevant data are needed to demonstrate the economic benefits of tobacco control measures, because some countries with active tobacco industries may seek to delay or defeat actions to reduce ST use out of concern for the potential impacts on national economies. Lastly, ongoing surveillance of tobacco industry marketing strategies is important, particularly following the implementation of new policies or regulations or the entrance of new multinational tobacco companies into the market.

Interventions

New interventions for ST use prevention and cessation should be developed and tested at both the population and individual levels along with their impact on use of combustibles, cessation, and relapse. Interventions tailored to ST users and to specific populations of users, taking into account cultural differences within and across regions, are needed. Effective interventions can be developed based on a clearer understanding of the factors associated with initiation and maintaining use, the reasons why some ST users want to quit, the barriers to quitting, and how best to disseminate treatments based on the resources of a particular region. Given that most of the current evidence base for effectiveness of interventions comes from high-income countries, development and evaluation of interventions for use in low- and middle-income countries and in diverse health care settings are needed.

Building Capacity

Enhancing surveillance and synthesis of data, pursuing a research agenda, and implementing new policies and interventions to address ST use will require increased scientific and public health capacity in low- and middle-income countries, particularly those that are confronted with high burdens of ST use. Increased in-country capacity to conduct tobacco control research is critical to the development and

implementation of effective interventions, as these interventions must be responsive to local populations and contexts. In addition, robust local capacity enhances the sustainability and adaptability of evidence-based policies and programs, as local researchers and institutions are well positioned to respond to changes in the tobacco control environment over time by generating new relevant knowledge to inform modifications or new approaches.

At the same time, greater capacity for communication and collaboration across countries is increasingly important. As tobacco use trends change, innovative policies and interventions are introduced in different countries, and the tobacco industry adopts new marketing strategies, an enormous “natural experiment” is under way that provides unique opportunities for research and evaluation. Making use of these opportunities will require coordinated surveillance, information sharing, and research efforts. The following recommendations, some of which have been described in Article 20 of the FCTC, are made to enhance collaboration and infrastructure development:

- Create regional information clearinghouses for ST that can be readily accessed electronically by people from all parts of the world. These clearinghouses can inform stakeholders within and outside a region about ST product characteristics, patterns of use, policies and other interventions that have been implemented, and the results of any research or evaluation conducted.
- Strengthen the infrastructure for networking, communication, and collaboration. One mechanism for facilitating this goal would be to develop a Web portal to serve as a repository and index to information on ST product characteristics, constituents and ingredients, manufacturing and promotion methods, product price, and packaging and marketing materials. This Web portal could also bring together the regional clearinghouses described above and provide a forum for discussion about research design, research results, and policies.
- Build collaborations among scientists, tobacco control advocates, and policymakers. These collaborations are critical for translating research into policy and ensuring that policy needs inform research studies. Collaborations across countries and regions are especially important to making comparisons between different products, environments, and interventions. Countries with more mature tobacco control programs can provide expertise and assistance to countries that are in earlier stages of implementing programs and policies.
- Develop innovative and sustainable approaches to build research capacity by better leveraging existing resources such as the Tobacco Laboratory Network, the Global Adult Tobacco Survey and Global Youth Tobacco Survey, and the Tobacco Harm Reduction Network. Research capacity can also be enhanced by attracting and training new researchers—especially those in middle- and low-income countries—and encouraging collaborations between new and experienced researchers.

Intervention and Policy Needs

Tobacco control policies, programs, and interventions applied to cigarettes and smoked tobacco products should be applied to ST products and enforced and monitored with equal strength, particularly in regions where the burden of ST use is high. Prevention and cessation of ST use should form an integral part of every comprehensive tobacco control effort. At the same time, ST products pose some distinct challenges compared with smoked products, and specific policy needs may vary across countries, depending on products, patterns of use, industry marketing, and the tobacco control environment. These recommendations are consistent with those made in the 2014 U.S. Surgeon General's Report.²⁶ In particular, the following measures for controlling ST products should be addressed:

- Effective interventions tailored specifically to ST users should be developed, evaluated, and implemented where appropriate, and support for further research in this area is needed. As of this writing, few studies have been conducted of interventions targeted to ST users, and pharmacotherapies used with cigarette smokers (with the possible exception of varenicline) have not generally been found effective with ST users. However, some community-wide prevention efforts (especially if they involve youth and parents) have shown success across countries of different income levels. The engagement of oral health professionals in recommending or providing ST cessation counseling has been shown to be effective in some countries and may be applicable to a variety of other communities and nations.
- Specific guidelines are needed to ensure that the FCTC requirements and MPOWER guidelines²⁷ can be and are appropriately applied by the Parties to ST products as well as cigarettes. For example, the FCTC binds Parties to ban or restrict sponsorship and marketing of tobacco products, prohibit sale to minors, and track and monitor illicit trade. Additional guidance can help ensure that the FCTC and other requirements are fully applied to a diverse array of ST products as well.
- In all regions, greater awareness is needed about ST use and its health effects, including education of health professionals, consumers (with particular attention to youth and women of childbearing age), policymakers, and community leaders. Dissemination of information about the toxicity of tobacco products may be particularly important in geographic areas where tobacco products are premade through cottage industries, or custom-made at home or at the point of sale. Greater awareness is also needed among policymakers, health professionals, and the public regarding the public health impact of ST use and changing patterns in industry marketing and consumer use.
- Product standards for ST need to be developed, implemented, and evaluated. Levels of known toxicants in ST products vary widely, as does the impact of storage and processing practices on toxicant levels. Feasible measures for reducing toxicant levels include reducing the use of *Nicotiana rustica*, limiting bacterial contamination that can promote nitrite formation, nitrosation and carcinogen formation, and requiring tobacco to be air-cured, pasteurized, and refrigerated. The WHO Study Group on Tobacco Product Regulation has recommended mandating upper limits on ST toxicants; this would include setting the upper limit of NNN plus NNK at 2 micrograms per gram of dry weight tobacco, and the upper limit for benzo[*a*]pyrene at 5 nanograms per gram of dry weight tobacco.

- Research is needed that can form the basis for establishing maximum levels of pH in ST products. Additives that increase pH in tobacco products boost the amount of free nicotine available for absorption, and products with higher free nicotine levels are more addictive.
- Some countries, such as the United States and Canada, have banned flavorings in cigarettes (except menthol), but they have placed no such limits on the use of flavorants in ST products. A variety of flavors and other additives are used to enhance the appeal of tobacco products and facilitate uptake.^{9,28} A recent U.S. study showed that more ST users (who were seeking an intervention) had initiated with or switched to a mint-flavored ST product than non-flavored products.²⁹ Banning or limiting certain additives and flavorants may serve as an effective tool for reducing the attractiveness of ST, especially among youth and pregnant women.
- Stronger, more effective public health warnings are needed on ST products (as recommended in Article 11 of the FCTC). Many countries require health warning labels on ST packaging, but most of these labels contain only textual warnings and lack the graphic images that have been implemented for cigarette labels. For cigarettes, Article 11 of the FCTC recommends pictorial warning labels and mandates that health warnings cover at least 50% of the cigarette packet. These standards have not been uniformly applied to ST products.
- Increasing the price of ST products could be implemented, and increasing taxes on ST products (as recommended in Article 6 of the FCTC) is the simplest way to increase price. As noted in chapter 5, a WHO expert panel recommended that ST be taxed at “a level sufficient to act as a disincentive, and at least at the level at which cigarettes are taxed.”^{30,p.64} The same FCTC guidelines for taxing cigarettes could be applied to ST and all other tobacco products. These recommendations include an excise tax that makes up at least 70% of the retail price, with the use of specific excise tax being favored over ad valorem taxes. Having a more uniform tax structure across tobacco products would help curtail the practice of substituting less expensive tobacco products for more expensive ones, which would be of particular concern in countries where very toxic ST products may be less costly. Due to challenges inherent in tax collection in traditional markets, especially from small-scale local producers or sellers, taxation of tobacco leaves or a presumptive tax (a compounded levy per manufacturing machine) may be considered in countries with diverse ST products and markets. Earmarking a portion of ST tax revenues to fund ST prevention and cessation interventions, other tobacco control efforts, or public health in general could further increase the overall benefit of taxation.

References

1. Senn M, Baiwog F, Winmai J, Mueller I, Rogerson S, Senn N. Betel nut chewing during pregnancy, Madang province, Papua New Guinea. *Drug Alcohol Depend.* 2009;105(1–2):126–31.
2. Singh PN, Yel D, Sinn S, Khieng S, Lopez J, Job J, et al. Tobacco use among adults in Cambodia: evidence for a tobacco epidemic among women. *Bull World Health Org.* 2009;87:905–12.
3. International Agency for Research on Cancer. Smokeless tobacco and some tobacco-specific *N*-nitrosamines. IARC monographs on the evaluation of carcinogenic risks to humans. Vol. 89. Lyon, France: World Health Organization, International Agency for Research on Cancer; 2007. Available from: <http://monographs.iarc.fr/ENG/Monographs/vol85/index.php>
4. Ferlay J, Shin HR, Bray F, Forman D, Mathers C, Parkin DM. GLOBOCAN 2008: cancer incidence, mortality and prevalence worldwide in 2008. IARC CancerBase no. 10 [Internet database]. Lyon, France: International Agency for Research on Cancer; 2010 [cited 2012 Sept 28]. Available from: <http://globocan.iarc.fr>
5. Boffetta P, Hecht S, Gray N, Gupta P, Straif K. Smokeless tobacco and cancer. *Lancet Oncol.* 2008 Jul;9(7):667–75. doi: 10.1016/S1470-2045(08)70173-6
6. Euromonitor International. Global market information database. Smokeless tobacco retail volumes. 2010. Available by subscription from: <http://www.euromonitor.com>
7. Stanfill SB, Connolly GN, Zhang L, Jia LT, Henningfield JE, Richter P, et al. Global surveillance of oral tobacco products: total nicotine, unionised nicotine and tobacco-specific *N*-nitrosamines. *Tob Control.* 2011;20(3):e2. Epub 2010 Nov 25. doi: 10.1136/tc.2010.037465
8. Richter P, Hodge K, Stanfill S, Zhang L, Watson C. Surveillance of moist snuff: total nicotine, moisture, pH, un-ionized nicotine, and tobacco-specific nitrosamines. *Nicotine Tob Res.* 2008 Nov;10(11):1645–52.
9. Henningfield JE, Hatsukami DK, Zeller M, Peters E. Conference on abuse liability and appeal of tobacco products: conclusions and recommendations. *Drug Alcohol Depend.* 2011;116(1–3):1–7.
10. Connolly GN. The marketing of nicotine addiction by one oral snuff manufacturer. *Tob Control.* 1995;4(1):73–9.
11. Tomar SL, Giovino GA, Eriksen MP. Smokeless tobacco brand preference and brand switching among US adolescents and young adults. *Tob Control.* 1995 Mar;4(1):67–72.
12. Euromonitor International. Tobacco market sizes: forecast of cigarettes and smokeless tobacco growth in retail volume, 2011–2016 [Dataset]. Available by subscription from: <http://www.euromonitor.com>
13. Euromonitor International. Country report: smokeless tobacco in the U.S. 2011. Available by subscription from: <http://www.euromonitor.com>
14. Centers for Disease Control and Prevention. Youth Risk Behavior Surveillance—United States, 2011. *MMWR Surveill Summ.* 2012 Jun 8;61(SS-4):1–162. Available from: <http://www.cdc.gov/mmwr/pdf/ss/ss6104.pdf>
15. Johnston LD, O'Malley PM, Bachman JG, Schulenberg JE. Monitoring the Future: national survey results on drug use, 1975–2010. Volume I: Secondary school students. Ann Arbor, MI: University of Michigan, Institute for Social Research; 2011. Available from: http://monitoringthefuture.org/pubs/monographs/mtf-vol1_2010.pdf
16. Substance Abuse and Mental Health Services Administration. Smokeless tobacco use, initiation, and relationship to cigarette smoking: 2002 to 2007. The NSDUH Report. Rockville, MD: Substance Abuse and Mental Health Services Administration, Office of Applied Studies; 2009 March 5. Available from: <http://www.oas.samhsa.gov/2k9/smokelessTobacco/smokelessTobacco.pdf>
17. Timberlake DS, Pechmann C, Tran SY, Au V. A content analysis of Camel Snus advertisements in print media. *Nicotine Tob Res.* 2011 Jun;13(6):431–9.
18. Mejia AB, Ling PM. Tobacco industry consumer research on smokeless tobacco users and product development. *Am J Public Health.* 2010;100(1):78–87.
19. U.S. Department of Health and Human Services. How tobacco smoke causes disease: the biology and behavioral basis for smoking-attributable disease: A report of the Surgeon General. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2010. Available from: <http://www.ncbi.nlm.nih.gov/books/NBK50317>
20. Teo KK, Ounpuu S, Hawken S, Pandey MR, Valentin V, Hunt D, et al. Tobacco use and risk of myocardial infarction in 52 countries in the INTERHEART study: a case-control study. *Lancet.* 2006 Aug 19;368(9536):647–58.
21. Henley SJ, Connell CJ, Richter P, Husten C, Pechacek T, Calle EE, et al. Tobacco-related disease mortality among men who switched from cigarettes to spit tobacco. *Tob Control.* 2007;16(1):22–8. doi: 10.1136/tc.2006.018069

22. World Health Organization, Conference of the Parties to the WHO Framework Convention on Tobacco Control, fifth session. Control and prevention of smokeless tobacco products. Report by the Convention Secretariat. Seoul, Republic of Korea: World Health Organization; 2012. Available from: http://apps.who.int/gb/fctc/PDF/cop5/FCTC_COP5_12-en.pdf
23. Framework Convention Alliance. FCA policy briefing: smokeless tobacco; [no date] [cited 2012 September 28]. Available from: http://fctc.org/images/stories/Smokeless_tobacco_brief_Final.pdf
24. World Health Organization, Conference of the Parties to the WHO Framework Convention on Tobacco Control, fifth session. Decision: FCTC/COP5(10) Control and prevention of smokeless tobacco products and electronic nicotine delivery systems, including electronic cigarettes. Seoul, Republic of Korea: World Health Organization; 2012. Available at: [http://apps.who.int/gb/fctc/PDF/cop5/FCTC_COP5\(10\)-en.pdf](http://apps.who.int/gb/fctc/PDF/cop5/FCTC_COP5(10)-en.pdf)
25. Centers for Disease Control and Prevention, World Health Organization. Tobacco questions for surveys. A subset of key questions from the Global Adult Tobacco Survey (GATS), 2nd ed.; 2011. Available from: <http://www.who.int/tobacco/surveillance/tqs/en/index.html>
26. U.S. Department of Health and Human Services. The health consequences of smoking—50 years of progress: a report of the Surgeon General. Atlanta: U.S. Department of Health and Human Services, Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2014 [accessed 2014 Feb 14].
27. World Health Organization. WHO report on the global tobacco epidemic, 2013. Enforcing bans on tobacco advertising, promotion and sponsorship. Geneva: World Health Organization; 2013. Available from: http://www.who.int/tobacco/global_report/2013/en/
28. Tobacco Products Scientific Advisory Committee. Menthol cigarettes and the public health: review of the scientific evidence and recommendations. Washington, DC: U.S. Food and Drug Administration; 2011 July 21. Available from: <http://www.fda.gov/downloads/AdvisoryCommittees/CommitteesMeetingMaterials/TobaccoProductsScientificAdvisoryCommittee/UCM269697.pdf>
29. Oliver AJ, Jensen JA, Vogel RI, Anderson AJ, Hatsukami DK. Flavored and nonflavored smokeless tobacco products: rate, pattern of use, and effects. *Nicotine Tob Res.* 2012;15(1):88–92. Epub 2012 April 22.
30. World Health Organization Study Group on Smokeless Tobacco Control. Smokeless tobacco control: report of a WHO study group. Geneva: World Health Organization; 1988.

