

# Consensus statement on assessment of waterpipe smoking in epidemiological studies

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Received 30 January 2016  
 Accepted 20 April 2016

## ABSTRACT

Numerous epidemiological accounts suggest that waterpipe smoking (aka hookah, shisha, narghile) has become a global phenomenon, especially among youth. The alarming spread of waterpipe and accumulating evidence of its addictive and harmful effects represent a new threat in the global fight to limit tobacco-related morbidity and mortality. In response to waterpipe's alarming trends, major public health and tobacco control organisations have started or are considering systematic collection of data about waterpipe smoking to monitor its trends and assess its harmful effects in different societies. Such plans require coordination and agreement on epidemiological measurement tools that reflect the uniqueness of this tobacco use method, and at the same time allow comparison of waterpipe trends across time and place, and with other tobacco use methods. We started a decade ago our work to develop standardised measures and definitions for the assessment of waterpipe smoking in epidemiological studies. In this communication, we try to expand and update these assessment tools in light of our increased knowledge and understanding of waterpipe use patterns, its context and marketing, as well as the need for evidence-guided policies and regulations to curb its spread. We have assembled for this purpose a group of leading waterpipe researchers worldwide, and worked through an iterative process to develop the suggested instruments and definitions based on what we know currently about the waterpipe epidemic. While the suggested measures are by no means comprehensive, we hope that they can provide the building blocks for standard and comparable surveillance of waterpipe smoking globally.

Waterpipe smoking (aka. hookah, shisha, narghile, arghile) is a traditional tobacco use method associated with eastern societies, but has witnessed global spread in recent years, especially among youth.<sup>1</sup> In its most common form nowadays, waterpipe smoking involves the passage of charcoal-heated air through perforated aluminium foil and across a flavoured tobacco mixture, and the resulting smoke bubbles through the water before inhalation by the smoker. Surveillance data from around the world are documenting its dramatic increase, to the extent that it is competing with cigarettes for the most commonly used tobacco product by youth.<sup>1</sup> Accumulating evidence suggests that waterpipe smoking can lead to nicotine dependence

(ND), use of other forms of tobacco, and many of the known tobacco smoking-related diseases including cancer, cardiovascular disease and adverse pregnancy outcomes.<sup>2–4</sup>

The threat that waterpipe represents to global health has led major public health and tobacco control organisations to consider the need for systematic collection of data on waterpipe smoking to monitor its trends and to assess its harmful effects for individuals as well as societies.<sup>5–8</sup> Such plans require coordination and agreement on epidemiological measurement tools that reflect the uniqueness of this tobacco use method, and at the same time allow comparison of waterpipe trends across time and place, and the ability to contrast them with other tobacco use methods.<sup>1 9</sup>

More than a decade ago—early in the global waterpipe epidemic—we published a brief communication on the importance of using uniform assessment tools and definitions.<sup>10</sup> In it, we attempted to provide guidance about item wording and definitions that suit waterpipe use patterns and unique characteristics, and suggested a short list of 10 core items. Without deviating much from these items to allow for continuity, we aim here to expand and update these assessment measures and definitions in light of our increased knowledge and understanding of waterpipe use patterns, its context and marketing, as well as the need for evidence-guided policies and regulations to curb its spread. In August of 2015, WM was invited by the WHO to a workshop organised by the Global Tobacco Surveillance System collaboration to revise and update the 1998 ‘WHO Guidelines for Controlling and Monitoring the Tobacco Epidemic’.<sup>11</sup> As he was assigned to present an update about instruments to measure waterpipe smoking, he contacted experts in waterpipe research and surveillance (panel), and they started working on the development and updating of waterpipe-related instruments. After the workshop and additional feedback from workshop participants, the panel renewed communication to develop further and fine-tune the questions presented in this document. We believe that this issue is critical for the study and monitoring of waterpipe use globally, comparing use trends and evaluating control measures.

What we are proposing here is by no means a comprehensive list, because even for tobacco-specific surveillance there are usually many items competing for limited space. Therefore, the

**To cite:** Maziak W, Ben Taleb Z, Jawad M, et al. *Tob Control* Published Online First: [please include Day Month Year] doi:10.1136/tobaccocontrol-2016-052958

proposed items focus on main attributes relevant to 1: use patterns; 2: dependence; 3: exposure and 4: major policy/regulation (eg, flavour, labelling, promotion, access and price). The items proposed here are adapted from our previous suggested measures,<sup>10</sup> previous work,<sup>12–14</sup> instruments currently used for waterpipe assessment (eg, Global Tobacco Surveillance System)<sup>15 16</sup> and our expert opinions. The exact wording of items, response categories and follow-up questions are left to the researchers, who are most knowledgeable of the local context, as long as comparable measures are obtained. For example, researchers may ask about the number of waterpipes smoked per week for assessment of exposure or dependence in weekly smokers, which will not preclude any of the measures of exposure suggested, and perhaps provide a shorter time frame for recall.

Below, we briefly expand on the main rationale for the selection of suggested items and domains for assessment, provide a short list of suggested items (table 1) and then present the main definitions derived from these (table 2). The comparative reference here will be cigarette smoking because it is the most widely studied tobacco use method,<sup>17</sup> and because cigarette-derived measures dominate the assessment of other tobacco use methods. We hope that the proposed assessment measures will be helpful to researchers and public health professionals embarking on the study of waterpipe use patterns and trends, and will meet the need for standard assessment tools and definitions for waterpipe smoking. We also hope that these items reflect waterpipe's unique use patterns and context as they have become better understood in the past decade or so.

### ASSESSMENT OF WATERPIPE USE PATTERNS

The main difference between waterpipe and cigarette smoking is that waterpipe smoking is a stationary tobacco use method that requires time and a specialised apparatus. Waterpipe smokers spend on average 1 h in each session, in addition to set-up time.<sup>18–20</sup> This time requirement influences the frequency and regularity of waterpipe use, because access is not as readily available as with cigarettes. Studies from around the world and in different age groups show that intermittent, non-daily use predominates among waterpipe smokers.<sup>1 21–24</sup> The social nature of waterpipe use also contributes to its distinct and variable use patterns compared with cigarettes. This variability in use patterns occurs within the same individuals depending on the social context and availability of time. For example, young waterpipe smokers in the USA tend to increase use during the weekends and holidays and within certain contexts such as fraternities and sororities.<sup>21 25</sup> These factors mean that within the broad label of intermittent or current waterpipe use, there is considerable variability that is not captured with common cigarette-based assessment tools. So, while we need to adopt measures of waterpipe use that allow for the comparison with patterns of cigarettes and other tobacco use methods, such as current and daily smoking, we also need to capture important variation in intermittent use patterns. Accordingly, we suggest here the further categorisation of current waterpipe use into monthly, weekly and daily smoking (table 1), as these categories reflect meaningful gradients in patterns of use for a predominantly intermittent and social tobacco use behaviour.<sup>12 26</sup> Definitions of main waterpipe use profiles associated with these categories of waterpipe use patterns are listed in table 2. We are also mindful that some waterpipe smokers practice it with substances other than tobacco or with different types of tobacco,<sup>27</sup> so in order not to miss those we suggest starting with a broad

question about waterpipe smoking, then follow-up with the type of product they usually smoke with it.

### ASSESSMENT OF WATERPIPE DEPENDENCE

The predominance of intermittent waterpipe use patterns does not preclude nicotine/tobacco dependence in waterpipe users, as evidenced by laboratory, epidemiological and toxicological studies.<sup>3</sup> Understandably, dependence is a complex concept that requires elaborate tools that are currently being developed.<sup>28 29</sup> This ongoing development effort does not preclude however the need to assess dependence briefly in epidemiological studies.<sup>10 30</sup> Recent research shows that young waterpipe smokers develop dependence earlier and at lower frequency of use compared with cigarettes (6 days/month for waterpipe vs 13.5 days/month for cigarettes).<sup>31</sup> This earlier dependence development perhaps is due to the length of the waterpipe session (1 h on average compared with 5 min for a cigarette), and the substantial exposure to nicotine during protracted smoking sessions.<sup>32 33</sup>

Owing to the intermittent use patterns, length of session and the social nature of waterpipe smoking, items commonly used to measure dependence in cigarette smokers may not be appropriate. For example, items of the Fagerström test for nicotine dependence (FTND), widely used for cigarette smokers,<sup>34 35</sup> have been adapted repeatedly for the waterpipe.<sup>36 37</sup> Several FTND items however, such as time of first cigarette in the morning, smoking more frequently in the morning, number of cigarettes smoked per day and the cigarette most hard to go without, are not compatible with common patterns of waterpipe smoking. In waterpipe smoking, less than daily smoking predominates and time restraints and availability of the waterpipe apparatus likely have more to do with when and where waterpipe is smoked.<sup>9 38</sup> In fact, waterpipe is unique in the sense that the balance between dependence and access/availability can be the most important determinant of use. Owing to the limited access and portability compared with cigarettes, this balance will likely drive the more dependent waterpipe smokers to smoke cigarettes or other readily available tobacco/nicotine (eg, electronic cigarettes) to deal with abstinence symptoms.<sup>4</sup>

Averaging the frequency of use such as daily cigarette consumption, a common question in epidemiological surveys of tobacco use, and a proxy of dependence, also becomes harder to assess for an intermittent and not as regular tobacco use method as the waterpipe. Subsequently, measuring average number of waterpipes/heads (the small bowl in which tobacco is contained and exposed to heat while smoking waterpipe) smoked per month might be a better indicator of waterpipe use pattern that conveys regularity that cannot be captured using shorter time frames. Another useful measure for the quick assessment of dependence in epidemiological surveys can be self-perceived dependence (being 'hooked'), which has been shown to correlate with waterpipe use frequency.<sup>12</sup> Cessation-related measures (eg, quit attempts) are also an index of dependence and need to be adapted to a predominantly intermittent tobacco use method. For example, some abstinence measures usually employed with cigarette smokers (eg, 7-day point prevalence abstinence) fail to capture quit attempts in waterpipe smokers who are not daily smokers for the most part.<sup>39</sup> As monthly smoking is a common denominator for most tobacco use methods, and is the least smoking frequency category proposed here to be assessed for the waterpipe, using the same time frame (1 month) for abstinence resulting from waterpipe quit attempts can be a suitable measure for waterpipe cessation (tables 1 and 2).

**Table 1** Suggested core items for the assessment of waterpipe use**ESSENTIAL USE PATTERNS****Q1. Have you ever smoked waterpipe (use local name) (even one or two inhalations)?** Yes  No*For yes response, ask the following:***Q2. At what age did you first smoke waterpipe?** \_\_\_\_\_ years**Q3. Which statement best describes your waterpipe smoking during the past month (30 days)?** I did not smoke waterpipe in the past month  I smoked less than once a week I smoked at least once a week, but not every day  I smoked at least once a day or on most days**DEPENDENCE/CESSATION****Q4. In your opinion, how 'hooked' are you on the waterpipe?** Not hooked  Somewhat hooked  Very hooked**Q5. On average, how many waterpipes/heads you usually smoke per month?\*** \_\_\_\_\_ waterpipes (heads)**Q6. When waterpipe is not available, do you feel the need to smoke a cigarette or use another nicotine/tobacco product instead?** Yes  No**Q7. How would you characterise your waterpipe use frequency since you started?** Decreased  Stayed the same  Increased**Q8. During the past year, have you stopped waterpipe smoking for at least 1 month in an attempt to quit?** Yes  No**Q9. Do you intend to quit waterpipe?** Not at all  In the next month  In the next 6 months  In the future**Q10. Have you ever received help or advice to stop smoking waterpipe?** No  Yes, from a health professional  Yes, from a friend Yes, from a family member  Yes, other**EXPOSURE (current smokers)****Q11. What is the average time you usually spend during a waterpipe smoking session?** Less than 30 minutes  30–60 minutes  More than 60 minutes**Q12. On average, how many waterpipes/heads you usually smoke per month?\*** \_\_\_\_\_ waterpipes (heads)**Q13. On average, how many days per month do you smoke waterpipe?** \_\_\_\_\_ days**Q14. For how many years have you smoked waterpipe?** \_\_\_\_\_ years**EXPANDED USE RELATED ITEMS****Q15. What do you usually smoke the waterpipe with?** Flavoured tobacco  Unflavoured tobacco  Non-tobacco product/s  Mixture of tobacco and non-tobacco products**Q16. Who do you usually smoke waterpipe with?** Friends  Family  Alone  Other**Q17. Where do you usually smoke waterpipe?\*** At home  At a friend's  In public places (eg, a café/restaurant)  Other places**Q18. Do you usually share the same waterpipe with friends or family?** Yes  No**Q19. Compared with cigarettes, how harmful do you think the waterpipe is?** Less harmful  Equally harmful  More harmful  Don't know**Q20. Compared with cigarettes, how addictive do you think the waterpipe is?** Less addictive  Equally addictive  More addictive  Don't know**Q21. Does the waterpipe help you socialise?** Yes  No  Don't know**Q22. What was the first tobacco/nicotine product you ever tried?** Waterpipe tobacco  Cigarette  E-cigarettes/other vaping devices  Cigar/little cigars/cigarillos  Smokeless tobacco (eg, chewed tobacco, spit/dip, snus)  Other tobacco/nicotine product**Q23. At any time during the next 12 months, do you think you will start smoking waterpipe? (for non-smokers only)** Yes  No  Don't know**POLICY/REGULATION RELATED****Q24. Where do you usually obtain your waterpipe and its accessories/products?** Internet  Café  Friends/family  Retail/shops  Other**Q25. During the past month, were you able to buy waterpipe or its products at a café or shop? (for children <18)** Yes  No  I do not buy waterpipe;**Q26. During the past month, were you able to buy waterpipe or its products on the internet? (for children <18)** Yes  No  I do not buy waterpipe**Q27. Where do you usually smoke waterpipe?\*** At home  At a friend's  In public places (eg, a café/restaurant)  Other places**Q28. What do you think about the waterpipe in terms of the money you spend on it?** Inexpensive  Reasonable  Expensive**Q29. In the past month, have you noticed any health warnings on any of waterpipe parts (eg, tobacco, waterpipe instrument, charcoal) or purchasing places (eg, internet, waterpipe café)?** Many  Some  None**Q30. Have you ever smoked waterpipe to help you quit cigarettes?** Yes  No**Q31. How often do you read the labelled contents on waterpipe tobacco or accessories (eg, charcoal)?** Always  Sometimes  Not at all**Q32. In the past month, have you seen any advertisement for the waterpipe (eg, TV, radio, newspapers, billboards, magazines, internet/social media or movies)?** Yes, many  Yes, some  No, not at all**Q33. On average, how many hours per week were you in the same place/room with someone smoking waterpipe? (for non-smokers)** At home \_\_\_\_\_ hours  Waterpipe Café \_\_\_\_\_ hours  Other \_\_\_\_\_ hours

\*Item is cross listed between multiple domains.

**Table 2** Main definitions derived from the suggested items

Domain	Definition
Ever smoker	Ever smoking or experimenting with waterpipe
Current smoker	Smoking waterpipe at least once in the past month
Daily smoker	Smoking waterpipe every day or on most days of the week
Weekly smoker	Smoking waterpipe at least once a week but not every day
Monthly smoker	Smoking waterpipe at least once a month but less than once a week
Former smoker	Smoking waterpipe in the past, but not currently (not in the past month)
Age of initiation	Age when first started smoking waterpipe
Waterpipe-years	Number of waterpipes smoked per month divided by 30 and multiplied by numbers of years of smoking
Cessation	Not smoking waterpipe for at least a month in an attempt to quit

### ASSESSMENT OF LONG-TERM EXPOSURE TO WATERPIPE

Measures of patterns of use and of exposure may overlap, yet can be differentiated depending on the research focus and target segments of the society. For example, in youth where measures of patterns of use and initiation are particularly important, items assessing ever smoking, current smoking, concurrent tobacco/nicotine use, first tobacco/nicotine product tried and age of initiation become important. For adults, in comparison, especially when the health effects of waterpipe smoking are the focus, indices of exposure such as average length of waterpipe session, years of waterpipe smoking, frequency of waterpipe smoking, dependence and cessation represent important domains for assessment (table 1). Given the recentness of the waterpipe epidemic compared with the long latency for the development of major smoking-related health outcomes, assessment of exposure will likely become very important for studies trying to assess waterpipe risk for lung cancer, cardiovascular disease and chronic pulmonary disease.<sup>2</sup> Understandably, the assessment of long-term risks of exposure to waterpipe smoking will be likely confounded by common dual waterpipe/cigarette smoking, which will require additional care in collecting detailed information on other forms of tobacco use.<sup>9</sup>

A derived measure for long-term exposure that is similar to commonly used pack-years for cigarettes, but more in tune to waterpipe use patterns, has been suggested and implemented in waterpipe health effects studies.<sup>10–13</sup> According to this measure, 1 waterpipe-year is the equivalent of smoking 1 waterpipe/day for a whole year (eg, someone smoking on average 15 waterpipes/month for 2 years has 1 waterpipe-year). Finally, for the assessment of exposure to secondhand smoke associated with waterpipe smoking, cigarette-based items need to be adapted to some of the waterpipe-specific setting such as the waterpipe café (table 1).

### ASSESSMENT OF WATERPIPE REGULATORY AND POLICY DOMAINS

The development and evaluation of waterpipe-specific regulations and policies require evidence that comes from a variety of disciplines, including epidemiology. As for policy/regulation and epidemiology, where the unit of focus is the population at large, assessment of policy/regulatory domains are essential for the planning and monitoring of tobacco control policies. However, given the breadth of these domains, we only suggest here a few items that tap major policy/regulatory areas as identified by evidence of effectiveness,<sup>40</sup> and by major international policy

frameworks such as the WHO Framework Convention for Tobacco Control (FCTC).<sup>41</sup> These items include price, age restrictions, indoor smoking bans, advertising and promotion, content labelling and mislabelling, cessation and health warnings (table 1).

Different waterpipe features make it distinct from cigarettes and affect the way we assess policy/regulatory domains. For example, from a regulatory perspective, packaging and labelling represent important areas for product regulation.<sup>42–43</sup> While these domains can be addressed directly and evaluated for standard cigarette packaging, they are more nuanced for waterpipe for a number of reasons. Unlike cigarettes, the waterpipe is composed of three main components (ie, waterpipe tobacco, device/accessories and charcoal) that influence the way it is marketed, obtained and used. As many waterpipe users are young, substantial marketing of waterpipe products takes place online.<sup>44–45</sup> These online marketing activities involve several important policy/regulatory aspects, such as concealment or inaccurate listing of harmful constituents, deceptive health claims, non-compliance with age restrictions for sale and use, and the lack of health warnings. Moreover, the waterpipe is associated with a particular setting—the waterpipe café (ie, hookah lounge/bar), which has implications on minor access, exposure to secondhand smoke, pricing and inadequate packaging and labelling of waterpipe products. In this setting, the café menu becomes perhaps an essential component of disclosing product constituents and associated health risks, given that smokers are served a ready-to-consume waterpipe and are not exposed to product packaging.<sup>46–48</sup> Our proposed policy/regulatory items therefore are only the first step for in-depth assessments that tap different policy/regulatory domains in a way that is compatible with unique waterpipe features and context (table 1).

### CONCLUSIONS

With the emergence of waterpipe smoking as a global threat to public health, monitoring its trends in a consistent and comparable way is becoming necessary. Such monitoring requires the use of assessment tools and definitions that reflect the unique features of waterpipe smoking, can tap into its specific use patterns and users' beliefs, and at the same time allow for comparison of trends and with other tobacco use products. We began working on the development of unified assessment tools for the waterpipe in epidemiological studies about a decade ago, and here we provide an updated and expanded revision in light of increased understanding of waterpipe use patterns and context. Our suggested items are by no means comprehensive, nor should they be taken in a literal sense in terms of how they are articulated. Adaptation to the local culture, context and target population will likely involve revision of some items, as well as selection from and expansion on the suggested items to cover important local aspects of waterpipe use. In particular, cognitive interviews with a sample of the target population can be very helpful in adapting survey instruments to the target population and increasing their clarity and understandability.<sup>49</sup> As work to gain a better understanding of waterpipe smoking and the development of waterpipe-specific markers of use and exposure continues, items that are more sensitive at capturing its use patterns and predicting future outcomes will be needed. This is particularly relevant to the development of valid and waterpipe-specific measures of dependence, which is expected to help in advancing effective interventions to curb waterpipe use.<sup>9</sup> Recent work on assessing the evolution of ND in waterpipe smokers point to the likelihood that ND can develop earlier and at lower levels of

waterpipe use compared with cigarettes.<sup>31</sup> In the end, local norms and research focus continue to be of major importance on how researchers can adapt and expand our suggested items in a way that addresses a particular context, while allowing for comparison with other surveillance efforts for waterpipe smoking.

### What this paper adds

- ▶ This paper suggests expanded and updated waterpipe assessment measures and definitions for epidemiological studies based on accumulated evidence of common waterpipe use patterns and context.
- ▶ Provides an evidence-based rationale for the suggested assessment tools and definitions based on current knowledge.

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**Contributors** WM originated and synthesised the idea for the manuscript. ZBT, MJ, RA, RN, EAA, KDW, RGS, TEB, BAP, SS, COC, ELS and TE participated in reviewing, drafting and editing the items and manuscript.

**Funding** WM is supported by the National Institute on Drug Abuse of the National Institutes of Health under Award Number R01 DA035160. TE is supported by the National Institute on Drug Abuse of the National Institutes of Health under Award Number P50DA036105 and the Center for Tobacco Products of the US Food and Drug Administration. SS is supported by the National Institute on Drug Abuse of the National Institutes of Health under Award Number 1K24DA038345-1. The content is solely the responsibility of the authors and does not necessarily represent the views of the NIH or the FDA.

**Competing interests** None declared.

**Provenance and peer review** Not commissioned; externally peer reviewed.

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## Consensus statement on assessment of waterpipe smoking in epidemiological studies

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*Tob Control* published online May 10, 2016

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