



NIH PUBLIC ACCESS

Author Manuscript

Tob Control. Author manuscript; available in PMC 2015 March 01.

Published in final edited form as:

Tob Control. 2014 March ; 23(2): 98–106. doi:10.1136/tobaccocontrol-2012-050807.

A Systematic Review of Store Audit Methods for Assessing Tobacco Marketing and Products at the Point of Sale

Joseph G. L. Lee, MPH, CPH¹, Lisa Henriksen, PhD², Allison E. Myers, MPH¹, Amanda L. Dauphinee², and Kurt M. Ribisl, PhD^{1,3,*}

¹Department of Health Behavior, Gillings School of Global Public Health, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA

²Stanford Prevention Research Center, Department of Medicine, Stanford University School of Medicine, Palo Alto, California, USA

³Lineberger Comprehensive Cancer Center, School of Medicine, The University of North Carolina at Chapel Hill, Chapel Hill, North Carolina, USA

Abstract

Objective—Over four-fifths of reported expenditures for marketing tobacco products occur at the retail point of sale (POS). To date, no systematic review has synthesized the methods used for surveillance of POS marketing. This review sought to describe the audit objectives, methods, and measures used to study retail tobacco environments.

Methods—We systematically searched 11 academic databases for papers indexed on or before March 14, 2012, identifying 2,906 papers. Two coders independently reviewed each abstract or fulltext to identify papers with the following criteria: (1) data collectors visited and assessed (2) retail environments using (3) a data collection instrument for (4) tobacco products or marketing. We excluded papers where limited measures of products and/or marketing were incidental. Two abstractors independently coded included papers for research aims, locale, methods, measures used, and measurement properties. We calculated descriptive statistics regarding the use of 4 P's of marketing (product, price, placement, promotion) and for measures of study design, sampling strategy, and sample size.

Results—We identified 88 store audit studies. Most studies focus on enumerating the number of signs or other promotions. Several strengths, particularly in sampling, are noted, but substantial improvements are indicated in the reporting of reliability, validity, and audit procedures.

Conclusions—Audits of POS tobacco marketing have made important contributions to understanding industry behaviour, the uses of marketing, and resulting health behaviours. Increased emphasis on standardization and the use of theory are needed in the field. We propose key components of audit methodology that should be routinely reported.

MeSH Keywords

questionnaires; tobacco industry; smoking; reproducibility of results; environments

*Corresponding author: Kurt M. Ribisl, PhD, Department of Health Behavior, The University of North Carolina at Chapel Hill, CB 7440, Chapel Hill, NC 27599 USA; kurt_ribisl@unc.edu; phone: +1 (919) 843-8042; fax: +1 (919) 843-3418.

Competing Interests

KM Ribisl is the Executive Director and AE Myers is the Deputy Director of Counter Tools (<http://countertools.org>), a nonprofit that distributes store mapping and store audit tools from which they receive compensation. KM Ribisl and AE Myers also have a pending royalty interest in a store audit and mapping system owned by the University of North Carolina at Chapel Hill. The tools and audit mapping system were not used in this study.

INTRODUCTION

Over the last 30 years, tobacco companies have transitioned their marketing from mass media to the point of sale (POS),[1] which provides a visible marketing environment for products that cut short the life of one person every six seconds around the globe.[2] POS marketing includes “powerwalls” of branded product, extensive price discounting, and calculated placement of tobacco products and advertisements for maximum visibility. The ubiquity of tobacco marketing at the POS is such that tobacco advertisements are the only indication of a grocer’s presence in some neighbourhoods.[3] Industry documents show careful attention to improving profits by leveraging retail environments,[4] with an emphasis on initiating or retaining smokers[5] and exploiting vulnerable markets.[6] POS tobacco marketing expenditures are significant. In the U.S. alone, the tobacco industry reported spending \$7.20 billion USD in 2010 on POS marketing, which constituted 85% of total reported marketing and is the equivalent of \$13,694 per minute.[7, 8]* POS expenditures account for 87% and 52% of 2010 marketing expenditures on cigarettes and smokeless tobacco, respectively.

The role of exposure to POS tobacco marketing in smoking initiation and uptake is well documented.[9–11] For example, one longitudinal study observed higher odds of trying smoking among never smokers who reported at least weekly exposure to POS marketing at baseline.[12] Other studies report adults’ exposure to POS marketing is associated with stymied quit attempts.[9, 13]

Measurement of tobacco marketing at the POS is essential to understanding the POS as an environmental determinant of tobacco use. However, no previous research has systematically examined methods for assessment of tobacco products and marketing in retail environments. This is in stark contrast to environmental assessment of food products and marketing, for which multiple reviews have examined measurement, reliability, and validity. [14–19]

Following previous work examining the properties and domains of retail food environment instruments,[16, 19] we conducted a systematic review of the peer-reviewed literature for protocols, approaches, and measures to study POS tobacco marketing. Two questions guided this review: (1) What are key uses of POS tobacco marketing audits? and (2) What are the measures and methods employed in implementing such audits?

METHODS

Search Strategy

We developed keywords to identify articles about POS tobacco marketing until new keywords generated no relevant new articles.[†] We searched 11 databases for peer-reviewed literature: Business Source Complete, Cumulative Index to Nursing and Allied Health Literature (CINHAL), Communication and Mass Media Complete, Education Resources

*The most recent year for which data are available. This underestimates total POS marketing expenditure by excluding outdoor expenditures, some of which are for retail locations. We calculated based upon 2010 FTC lines for (1) point-of-sale, (2) price discounts, (3) promotional allowances – retailers, (4) retail-value-added – bonus tobacco products, (5) retail-value-added – non-tobacco bonus.

[†]Example of final PubMed search string: (store[tw] OR stores[tw] OR “point of sale” [tw] OR “points of sale”[tw] OR “point-of-sale” [tw] OR “points-of-sale”[tw] OR retail[tw] OR retailers[tw] OR retailer[tw] OR shop[tw] OR “gas station”[tw] OR “gas stations”[tw] OR “point of purchase”[tw] OR “points of purchase”[tw] OR “points-of-purchase”[tw] OR “point-of-purchase”[tw] OR outlet[tw] OR outlets[tw] OR milkbar*[tw] OR petrol[tw] OR garage*[tw] OR pharmacy[tw] OR pharmacies[tw] OR druggist*[tw] OR supermarket*[tw]) AND (“tobacco”[MeSH Terms] OR “tobacco”[All Fields] OR “smoking”[MeSH Terms] OR “smoking”[All Fields] OR cigarette[All Fields] OR cigarettes[All Fields] OR cigar[All Fields] OR cigars[All Fields] OR cigarillo[All Fields] OR cigarillos[All Fields])

Information Center (ERIC), Health And Psychosocial Instruments (HAPI), Public Administration Abstracts, and PsycINFO via EBSCO; EMBASE; ISI Web of Knowledge; PubMed; and, Public Affairs Information Service (PAIS) via ProQuest. We used no language, date, or geographic limitations in the search, but limited it to peer-reviewed journals in the seven EBSCO-based sources. Exact search strings and settings for each database are available from the first author. Searching was first conducted on September 9, 2011, and we updated and expanded our search with additional keywords on March 14, 2012. We included advance access publications; thus, some papers show publication dates after the search. We did not search the grey literature or review actual instruments, which were often unavailable. We did not collect data on the *findings* of identified papers, as the purpose of this review was to examine *measures* and *methodologies*.

Inclusion Coding

Two coders (JGLL, AEM) independently coded each abstract or full-text, when necessary, for the following inclusion criteria: Studies reporting results where (1) data collectors visited and assessed (2) retail environments using (3) a data collection instrument for (4) tobacco products or marketing. Articles not meeting these criteria were coded either as background articles or as excluded. Background articles addressed published research related to POS tobacco marketing without the use of an audit instrument (e.g., classroom surveys of youth exposure to convenience store tobacco marketing). We excluded articles not written in English, French, or Spanish. We excluded studies that reported youth purchase attempts where environmental data characteristics (e.g., sign posting minimum age of sale) were incidental to the attempted buy. We also excluded studies where product availability or advertising was coded simply as present or absent (e.g., nutrition environment studies that solely documented the presence of tobacco products). Finally, we excluded the few content analysis studies that obtained data from coding in-store photographs because our focus was on studies that conducted real-time and in-person store audits. The two coders reviewed articles with divergent coding and agreed upon a code. In the event that agreement could not be reached, a third author (KMR) decided.

Data Abstraction

We trained a team of eight graduate student and staff research assistants and associates who independently reviewed the papers and entered information about the audit instrument, methodology, and findings into a web-based abstraction form. One author reviewed and reconciled divergent information (JGLL) from each pair of reviews. When the reviewing author was also one of the data abstractors, a third author (KMR) provided additional review.

Measures

The aims of each paper were coded under more than one category to fully capture study objectives. First, we coded for papers describing the environment, under which we also coded for (a) assessing compliance with regulations, (b) investigating disparities in exposure to POS marketing or attendant health risks, and (c) looking at the relationship between POS marketing and underage sales of tobacco products. Second, we coded for quasi-experimental tests of the relationship between POS marketing and health-related behaviours, under which we also coded for (a) youth behaviour and (b) adult behaviour. Third, we coded for interventions to reduce POS tobacco marketing. We noted if a theory or framework was explicitly mentioned in guiding the research question and/or measurement. We coded multiple aspects of the audit methodology including sampling, training of auditors, data collection modality, and study design (cross-sectional or longitudinal). To characterize the types of measures, we used the 4 P's marketing mix,[20] which has previously been adapted

for tobacco marketing.[21] Specifically, we coded information about product (availability of cigarettes, smokeless tobacco, cigars, pipes/pipe tobacco, emerging products, e-cigarettes, and aggregated/undefined tobacco products), price (including multi-pack or other discounts), promotion (signs, displays, shelving, ads inside, ads outside, ads by brand, and ad size, functional items, gifts with purchase), and placement (product or marketing materials near youth products or at a child's height/line of vision). For promotion, we provided additional detail on measurement strategies relating to the link of POS exposure to behaviours. Each paper was also coded for its year of data collection and study setting. A final question specifically asked for any measures or other information that did not fit into the data abstraction form.

RESULTS

The systematic search identified 2,906 de-duplicated articles, including 9 through citations (Figure 1). Of these, 88 met inclusion criteria for the systematic review, and 106 articles were coded as background articles.

The first POS audit was a study of San Francisco, California, USA, pharmacies published in 1978 by Schroeder and Showtack.[22] No other audits were published until 1989, when Braverman and colleagues published a study of smokeless tobacco marketing in California.[23] Over the past two decades, annual publications increased from approximately 1 to 10 per year (Figure 2).

Overall, 64% of audits were conducted in the USA, followed by Canada (n=8), the UK (n=7), Australia (n=5), India (n=3), Guatemala (n=2), and Mexico (n=2). Audits have also been conducted in Argentina (reported with Guatemala data), China, Greece, Ireland, New Zealand, and Thailand. The leading publisher of POS tobacco marketing audit studies is *Tobacco Control* (n=23), followed by *Nicotine & Tobacco Research* (n=8), *American Journal of Public Health* (n=6), *Preventive Medicine* (n=4), *Australian & New Zealand Journal of Public Health* (n=3), *Canadian Journal of Public Health* (n=3), *Health & Place* (n=3), and *Journal of Health Communication* (n=3).

Research Questions

The most common objectives for store audits were to describe the content and prevalence of POS tobacco marketing (75%), to investigate disparities (26%), and to assess compliance with regulations (28%). Sixteen papers examined compliance with national regulations or voluntary marketing agreements, seven with provincial regulations, and two with local regulations. Fewer studies correlated audit data with smoking behaviour among youth or adults (13%), or with illegal sales to minors (6%). Only four studies evaluated interventions to reduce tobacco marketing at the POS.

The few studies (10%) that explicitly mentioned an underlying theoretical framework referenced the Bernard framework of neighbourhood health disparities,[25] community organizing, diffusion of innovation, ecosocial theory, the social ecologic framework, structural violence, and youth empowerment. Apart from work by Shareck and colleagues[26] using the Bernard framework,[25] the literature was largely atheoretical.

Research Methods

Among the 88 studies, 64 (73%) used a single cross sectional design,[12, 22, 23, 27–87] four (5%) used a repeated cross sectional design,[88–91] and 20 (23%) used a panel design.[24, 26, 67, 92–108] Sixty-eight studies (77%) reported a sampling frame, most commonly using licensing, tax, or inspection lists (32%) or *ground truthing* (26%) (i.e., canvassing an

area to identify each retail location) to develop a list of stores. A few studies used business lists (9%) or phone books (7%). Seventy-eight studies (89%) reported how stores were selected, and among these random sampling (45%) and census (41%) were more common than convenience sampling (8%). Fourteen of these studies (18%) reported stratified sampling, generally using area demographics or store type. Nineteen of these studies (24%) sampled based on proximity to schools. One study sampled 60-meter street sections instead of stores as the population element.[26] Among the 65 studies reporting the sample size, excluding one study with a sample size of 17,476,[106] the average sample size was 569 (sd = 858, median = 206).

Audit Protocol

Store audits require careful and systematic observation of the retail environment and sometimes demand interaction with store clerks. Surprisingly, fewer than half (44%) of studies mentioned any characteristics of their data collectors and fewer (19%) specified any details about how they were trained. Of these, 47% reported the length of training provided, and 65% reported field training by visiting actual stores. Forty-one per cent of all studies reported how data collectors approached stores. Of these, 42% covertly collected data, 8% explained their presence only as needed, and 39% notified store staff as part of protocol. One intervention study reported using passive consent through mailings to store owners.[108] Nine per cent of papers reported the mode of the audit instrument, and all reported using paper. Among the 13% of papers that reported time spent per store, the estimates ranged from 5 – 30 minutes. One 2006 study estimated data collection costs at approximately \$60 USD per store within a single community.[39]

Measuring the “Marketing Mix”

Twenty-seven per cent of papers used or adapted existing tobacco audit instruments (Table 1). The most frequently cited audit instrument or protocol was from the ImpacTeen research group followed by Operation Storefront. Authors made only one comment on particular audit instruments: a report of challenges in using the Store Alert form, noting challenges in calculating the prevalence of particular items.[75]

Twice as many papers examined promotion (86%) as price (43%), placement (42%), or products (41%).

Product—Cigarettes were the most commonly examined product (Table 2). Little research examined any form of smokeless tobacco, cigars, cigarillos, or other tobacco products. For example, the only examination of e-cigarette availability we identified was conducted in Guatemalan pharmacies.[81] In an effort to document the availability and variety of culturally-specific tobacco products, Longman and colleagues audited stores in South Asian immigrant communities in England, identifying 98 different smokeless tobacco products, [59] and Schensul and colleagues identified 68 smokeless tobacco products in low-income areas of Mumbai.[72]

Price—Although 43% of studies examined the price of tobacco products, it was surprisingly difficult to confirm whether price was determined from actual purchase (e.g., store receipt), observed from advertisement, or verbally requested from the merchant. Sixty-three per cent of these studies reported measures of price collected by purchase or observation. Sixty-three per cent of these also recorded the presence of any type of price discounts, and 39% noted the presence of multi-pack discounts. Two suggestions emerged for future research: One study noted that the collection of product weight would have allowed for better comparison of prices for non-standard smokeless tobacco products.[59]

Another study noted that data from single-pack purchases could not address the impact of multi-pack discounts, which have been a popular marketing tool in the US.[79]

Promotion—Eighty-six per cent of papers collected and/or reported on promotional methods for communicating with customers such as informational signs; images indicating virility, independence, or other characteristics; cues to purchase; gifts with purchase; etc. (Table 3). Unique measures included counts of store-made tobacco signs,[55] exclusively Marlboro-branded stores,[80] the ethnicity of models in tobacco advertisements,[103] the presence of youthful models in tobacco advertisements,[83] and the per cent of product fronts visibly displayed.[37] Two papers used a four-point visual impact scale developed by Wakefield and colleagues that ranged from “no advertising” to “advertising covering most of the store/storefront”[85] or “in your face” advertising.[49]

Placement—Thirty-seven papers measured the placement of tobacco products or marketing. However, the most frequently examined placement issue was self-service sales of tobacco products, identified in 49% of these papers, that is, tobacco products that can be handled prior to purchase by the consumer. Forty-one per cent of placement papers measured proximity to youth products and 38% measured advertisements at a child’s height or line of vision. Child’s height was universally defined as 91 cm (3 ft.); however, measures of what constitutes proximity and what constitutes a youth product showed greater variability. Proximity measures used range from “adjacent to” (the first audit to use this term defines it as within 61 cm [2 ft.]),[23] to 15.25 cm (6 inches),[40, 111] to 30.5 cm (1 ft.),[34, 86] to 50 cm (20 inches),[29] and finally to 1 m (3.3 ft.).[64] Others leave “adjacent to” undefined. Youth products have been defined to include candy, toys, ice cream, and sometimes snack foods.

Operationalization of the 4 P’s in Correlational Analysis—To better express the diversity of measures used for relating POS tobacco marketing and products to health behaviours, we describe measures used among studies correlating measures of tobacco use behaviours and POS marketing (n=7). Feighery *et al*[39] and Henriksen *et al*[12] summed counts of advertisements and estimated exposure per week based on reported visits to stores. In a separate study, Henriksen *et al*[48] used the total number of advertisements observed in the school neighbourhood. Lovato *et al*[60] used three separate variables: the proportion of stores with any promotions, any advertisements, and any powerwalls. Pabayo *et al*[62] similarly used the proportion of stores with a higher “smoking tolerance” score based on the presence of three indicators: sales, marketing, and allowed smoking. Slater *et al*[106] measured whether or not five types of marketing were present in stores (i.e., parking lot, exterior, interior, functional object, or low-height advertisements) and used the proportion of stores with each of these measures to create a summary score for each research site (Cronbach’s alpha = 0.70). Wakefield *et al*,[84] in a study on brand preference, used five key measures: presence of a gift with purchase, proportion of exterior brand-share, proportion of interior brand-share, total number of exterior ads, and total number of interior ads.

Reliability and Validity

Surprisingly few studies (11%) reported the reliability of audit measures. Although reliability of measures was generally acceptable to high, some items involving physical measurement (e.g., products within a certain distance from candy) show poor or reduced reliability (Appendix, online only).

Few studies (6%) explicitly reported any type of validity assessment. Cohen and colleagues reported that two experts provided feedback on the audit instrument and previous audit

instruments were consulted for additional relevant measures, signifying face and content validity.[34] Feighery and colleagues compared audit measures with school survey measures (e.g., self-reported exposure to marketing), and found both yielded similar findings, signifying convergent validity.[39] Freedman and colleagues, using self-reported surveys and store audits, found that “participants’ perceptions regarding the availability of tobacco and alcohol products do appear to differ from the reality of their local food environments,” [43](p. 834) signifying a failed test of concurrent validity relevant to survey research assessing the perceived presence of tobacco products. Quedley and colleagues used compliance officer reviews to assess the face and content validity of their audit instrument. [64] Lastly, Toomey and colleagues noted that phone surveys of cigarette prices show poor agreement with audit measures and suggested that audit measures are likely more precise. [79]

DISCUSSION

We sought to describe the objectives and methodology for audits of POS tobacco marketing in order to synthesize a growing literature and to make recommendations to improve future research. Strengths of the existing literature are numerous. Longitudinal designs have been used to track trends in marketing and to correlate change in exposure with change in behaviour. Random sampling or census approaches are frequently used, thereby improving generalizability. The reliability of key measures is generally good, albeit with some concerns about measures requiring spatial estimation or physical measurement. However, too many studies leave critical details of measurement and methodology unreported.

In addition, we noted the atheoretical nature of most audit-based work, a challenge that has also faced the food environment literature[17] and neighbourhood environment more generally.[113] Researchers frequently use the Social Ecological Framework[114] to structure thinking about multiple levels of social influence on human development and health.[e.g., 115] More recent work takes a systems-based approach that examines the relationships between individuals’ behaviour and how those behaviours in turn reproduce and change social and environmental systems.[116] Examining the influence of POS tobacco marketing on behaviour can provide feedback for refining existing theories and frameworks on neighbourhood health; indeed, such applied work testing theories is critical to scientific advancement.[117] Moreover, the measurement of retail tobacco marketing can itself be informed by work proposing domains of influence on health behaviours across physical, social, economic, regulatory, and community influence.[25] That is, theory can help inform the selection of critical constructs of exposure to marketing at the POS that are likely linked to resulting behaviour. There has been only limited work to integrate theory into the measurement of the retail environment’s influence on tobacco use behaviour,[26, 45] primarily using a framework of neighbourhood health disparities developed by Bernard and colleagues.[25]

The Bernard framework suggests the importance of both institutional (e.g., government) and community intervention for health promotion. Much of the research identified in this review is designed to be relevant for policymakers, regulators, and/or community members rather than to directly examine health behaviours. The role of theory in this research is also important, but the emphasis shifts away from testing hypotheses of behavioural outcomes to understanding the role of research in promoting healthful environments. Multiple theories and frameworks for policy change posit a role for research findings in policy change.[118] The Advocacy Coalition Framework, for example, is explicitly designed to account for the use of technical information by policymakers, advocates, and stakeholders in policy development.[119] The content, format, and products of research findings matter in diffusion theories.[120, 121] For measurement, this calls our attention to the importance of

carefully linking POS tobacco marketing measures to current and future policy developments, to questions of interest to regulators, and to provide actionable information to community members. Strategic use of measurement can provide information of use to city planners,[122] note levels of marketing near schools, identify tobacco industry evasions of regulations, and monitor compliance with regulations. Policy-making theories provide a guide to how different measures and research products regarding POS tobacco marketing are more or less relevant for different stakeholders

Strengths and weaknesses of this review

This study used a systematic approach with independent inclusion coding and data abstraction. However, the search may have missed some peer-reviewed papers, and it did not incorporate any grey literature, such as reports of retail marketing surveillance sponsored by state health departments or other government agencies.[123, 124] Such reports may contain additional measures, more detailed information about reliability, and descriptive results about changes in the quantity and nature of retail tobacco marketing over time. Such information would be particularly informative if the instruments were readily available to interested researchers.

Our coding of included articles did not address information on the availability of flavoured tobacco products, which was an oversight given their importance to the tobacco industry. Nor did the coding address the availability of single cigarettes, which are of interest because they reduce the unit price of tobacco products. Future work should synthesize the results of the studies we identified, which was beyond the scope of our aims.

Implications for measurement and reporting

Our findings suggest potential improvements in the reporting of audit-based papers (Table 4), and we propose that editors and authors strongly consider presenting key information about the audit protocol that was frequently not reported in the papers we reviewed.

In comparison to the field of nutrition environment measurement, where researchers have identified problematic measurement and reporting issues, less attention appears to have been paid to assessments of the retail tobacco environment. Tobacco marketing instruments may be lagging behind the science of nutrition environment measurement, as Ohri-Vachaspati and Leviton found 39% of 48 nutrition environment instruments had been assessed for reliability and validity (albeit including weaker face and content validity).[16] In a different assessment of papers measuring the nutrition environment, however, the reporting of measurement quality is much lower as noted by McKinnon and colleagues who found that only 13% of 137 nutrition environment papers reported measures of reliability and/or validity of any type.[15] Concurrent development of audit methodologies raises the question of future efforts exploring most practical ways of linking food, alcohol, physical activity, and tobacco audits.

Future work might examine lessons from store audits for other health-relevant products and consider the merging of key constructs into modular standardized instruments. We note that substantial work on the consumer nutrition environment has coalesced around the Nutrition Environment Measures Survey (NEMS),[19] providing standardized protocols that are used widely, albeit not universally. Such standardization allows for easier comparisons of findings between studies and streamlines measurement. The development of these instrument modules will require on-going research to determine the most salient measures and their validity. Some guidance is available from the field of nutrition environment assessment: Lytle has published an excellent discussion of both validity and reliability in

environmental measures and notes additional areas of measurement concern including variance and utility for generalizing across populations and health behaviours.[14]

Unanswered questions and future research

In spite of its importance to tobacco control, the unit price of tobacco products has not received as much attention as the availability of promotions and other advertising. Price is relevant to the study of target marketing patterns,[50] to assess compliance within minimum price laws[42] and to indicate the presence of illicitly-traded tobacco products. Research is needed to examine the concordance of price measured from multiple sources, including advertised price, reports of store clerks (by phone or in-person), purchase receipts, and scanner data, especially given the dramatic difference in cost and effort that these sources represent.

The growing presence of anti-smoking cues at the point of sale also suggests a new focus for retail audits. Only one of the studies we examined reported on the visibility of graphic warnings on products, advertisements, or elsewhere at POS.[53] Future efforts may need to consider how product shelving or displays may be used to obscure warning labels from a customer's view.

In addition, the utility of audit methods to evaluate compliance with regulations on advertising, labelling, and product sales may require additional research: What, for example, is the best way to measure the availability of single cigarettes for sale? Various measurement approaches evident in the literature: advertised or visible sales of single cigarettes,[44] attempted purchase by youth and adults,[56] observations of youth,[51] inspection of the counter area,[107] and clerk interviews.[107] In a 1990–1991 study, Wildey and colleagues noted that observed availability of single cigarettes among a sample of stores was much lower (24.8%) than clerk-reported availability (40.6%).[107] Given heightened penalties for single cigarette sales in some countries, audits that do not evaluate inaccessible areas behind the counter could underestimate the availability of single cigarettes for sale.

More consistent measurement and repeated surveillance of retail tobacco marketing could provide valuable information for policymakers and regulators.[1, 125] However, as audits are conducted more frequently, retailers may be more reluctant to participate, yielding higher refusal rates. This will require new innovations in observing the retail tobacco environment. Although we excluded from this review two studies that coded photographs rather than conducting real-time audits,[126, 127] we recognize that photographs may provide a valuable data source for more reliable measurement. Unfortunately, retailers are reluctant to permit photographs (e.g., a UK study obtained permission from only 56% of tobacco retailers, none of which were chain or franchises with a corporate headquarters). [127] Satellite and digitized storefronts collected for other purposes (e.g., Google StreetView) offer opportunities to develop new measures for studying exterior marketing materials and raise the option of outsourced image coding. Lastly, there may be opportunities for combining work on the role of tobacco retailer density and proximity[128] with audit-based information on tobacco marketing.

Conclusion

The POS tobacco marketing audits that we examined highlight long overdue – and increasingly global – attention to the regulation of tobacco products and their POS marketing.[129] The global tobacco epidemic has vectors that transmit the use of addictive products, a transnational tobacco industry and its lawyers,[130, 131] and this paper shows the growing emphasis on measurement of an important component of the epidemic, the

retail environment. Marketing at the POS is used by the tobacco industry in carefully calibrated ways, and addressing the tobacco epidemic will require continued and improved surveillance of marketing strategies to promote this addictive agent.

Supplementary Material

Refer to Web version on PubMed Central for supplementary material.

Acknowledgments

Thanks to our amazing data abstraction team: Amber Anderson, Catherine Jo, Yuna Kim, Ashley Leighton, and Sarah Moreland-Russell. Thanks also to the UNC Health Sciences Library's consultation services on database searching.

Funding

This research was partially funded by the National Institutes of Health/National Cancer Institute (U01 CA154281).

This paper was partially supported by doctoral training support from the University of North Carolina Lineberger Comprehensive Cancer Center's University Cancer Research Fund to JGL Lee.

Note: Opinions are those of the authors and do not represent those of the funders or institutions.

References

1. Henriksen L. Comprehensive tobacco marketing restrictions: promotion, packaging, price and place. *Tob Control*. 2012; 21(2):147–153. [PubMed: 22345238]
2. World Health Organization. Tobacco, Fact Sheet Number 339. Geneva: Author; 2011.
3. Franco M, Nandi A, Glass T, et al. Smoke before food: A tale of Baltimore City. *American Journal of Public Health*. 2007; 97(7)
4. Lavack AM, Toth G. Tobacco point-of-purchase promotion: examining tobacco industry documents. *Tobacco Control*. 2006; 15(5):377–384. [PubMed: 16998172]
5. Pollay RW. Targeting youth and concerned smokers: evidence from Canadian tobacco industry documents. *Tob Control*. 2000; 9(2):136–147. [PubMed: 10841849]
6. Cruz TB, Wright LT, Crawford G. The menthol marketing mix: targeted promotions for focus communities in the United States. *Nicotine Tob Res*. 2010; 12 (Suppl 2):S147–153. [PubMed: 21177371]
7. Federal Trade Commission. Federal Trade Commission Cigarette Report for 2009 and 2010. Washington, DC: 2012.
8. Federal Trade Commission. Federal Trade Commission Smokeless Tobacco Report for 2009 and 2010. Washington, DC: 2012.
9. Paynter J, Edwards R. The impact of tobacco promotion at the point of sale: A systematic review. *Nicotine & Tobacco Research*. 2009; 11(1):25–35. [PubMed: 19246438]
10. U.S. Department of Health and Human Services. Preventing Tobacco Use Among Youth and Young Adults: A Report of the Surgeon General. Atlanta, GA: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion, Office on Smoking and Health; 2012.
11. Lovato C, Watts A, Stead LF. Impact of tobacco advertising and promotion on increasing adolescent smoking behaviours. *Cochrane Database Syst Rev*. 2011; (10):CD003439. [PubMed: 21975739]
12. Henriksen L, Schleicher NC, Feighery EC, et al. A longitudinal study of exposure to retail cigarette advertising and smoking initiation. *Pediatrics*. 2010; 126(2):232–238. [PubMed: 20643725]
13. Germain D, McCarthy M, Wakefield M. Smoker sensitivity to retail tobacco displays and quitting: a cohort study. *Addiction*. 2010; 105(1):159–163. [PubMed: 19804457]
14. Lytle LA. Measuring the food environment: state of the science. *Am J Prev Med*. 2009; 36(4 Suppl):S134–144. [PubMed: 19285204]

15. McKinnon RA, Reedy J, Morrisette MA, et al. Measures of the food environment: a compilation of the literature, 1990–2007. *Am J Prev Med.* 2009; 36(4 Suppl):S124–133. [PubMed: 19285203]
16. Ohri-Vachaspati P, Leviton LC. Measuring food environments: a guide to available instruments. *Am J Health Promot.* 2010; 24(6):410–426. [PubMed: 20594098]
17. Saelens BE, Glanz K. Work group I: Measures of the food and physical activity environment: instruments. *Am J Prev Med.* 2009; 36(4 Suppl):S166–170. [PubMed: 19285209]
18. Richter KP, Harris KJ, Paine-Andrews A, et al. Measuring the health environment for physical activity and nutrition among youth: A review of the literature and applications for community initiatives. *Prev Med.* 2000; 31:S98–S111.
19. Kelly B, Flood VM, Yeatman H. Measuring local food environments: an overview of available methods and measures. *Health Place.* 2011; 17(6):1284–1293. [PubMed: 21908229]
20. Yudelson J. Adapting McCarthy’s four P’s for the Twenty-First Century. *Journal of Marketing Education.* 1999; 21:60–67.
21. Davis, RM.; Gilpin, EA.; Loken, EA., et al. National Cancer Institute. NCI Tobacco Control Monographs. Bethesda, MD: U.S. Department of Health and Human Services, National Institutes of Health, National Cancer Institute; 2008. The role of media in promoting and reducing tobacco use.
22. Schroeder SA, Showstack JA. Merchandising cigarettes in pharmacies: a San Francisco survey. *Am J Public Health.* 1978; 68(5):494–495. [PubMed: 646000]
23. Braverman MT, D’Onofrio CN, Moskowitz JM. Marketing smokeless tobacco in California communities: implications for health education. *NCI Monogr.* 1989; (8):79–85. [PubMed: 2785655]
24. Mindell JS. The UK Voluntary Agreement on Tobacco Advertising: A comatose policy? *Tob Control.* 1993; 2(3):209–214.
25. Bernard P, Charafeddine R, Frohlich KL, et al. Health inequalities and place: a theoretical conception of neighbourhood. *Soc Sci Med.* 2007; 65(9):1839–1852. [PubMed: 17614174]
26. Shareck M, Dassa C, Frohlich KL. Improving the measurement of neighbourhood characteristics through systematic observation: inequalities in smoking as a case study. *Health Place.* 2012; 18(3): 671–682. [PubMed: 22297153]
27. Point-of-purchase tobacco environments and variation by store type--United States, 1999. *MMWR Morb Mortal Wkly Rep.* 2002; 51(9):184–187. [PubMed: 11900352]
28. Bansal R, John S, Ling PM. Cigarette advertising in Mumbai, India: targeting different socioeconomic groups, women, and youth. *Tob Control.* 2005; 14(3):201–206. [PubMed: 15923471]
29. Barnoya J, Mejia R, Szeinman D, et al. Tobacco point-of-sale advertising in Guatemala City, Guatemala and Buenos Aires, Argentina. *Tob Control.* 2010; 19(4):338–341. [PubMed: 20530136]
30. Barovich M, Sussman S, Dent CW, et al. Availability of tobacco products at stores located near public schools. *International Journal of the Addictions.* 1991; 26(8):837–850. [PubMed: 1960002]
31. Bernstein SL, Cabral L, Maantay J, et al. Disparities in access to over-the-counter nicotine replacement products in New York City pharmacies. *Am J Public Health.* 2009; 99(9):1699–1704. [PubMed: 19638596]
32. Brown LJ, DiFranza JR. Pharmacy promotion of tobacco use among children in Massachusetts. *Am Pharm.* 1992; NS32(5):45–48. [PubMed: 1590207]
33. Chaudhry S, Chaudhry K. Point of sale tobacco advertisements in India. *Indian J Cancer.* 2007; 44(4):131–136. [PubMed: 18322354]
34. Cohen JE, Planinac LC, Griffin K, et al. Tobacco promotions at point-of-sale: the last hurrah. *Can J Public Health.* 2008; 99(3):166–171. [PubMed: 18615934]
35. Corelli RL, Aschebrook-Kilfoy B, Kim G, et al. Availability of tobacco and alcohol products in Los Angeles community pharmacies. *J Community Health.* 2012; 37(1):113–118. [PubMed: 21644021]
36. Cummings KM. Tobacco advertising in retail stores. *Public Health Reports.* 1991; 106(0033-3549, 0033-3549):570–575. [PubMed: 1910192]

37. DiFranza JR, Coleman M, St Cyr D. A comparison of the advertising and accessibility of cigars, cigarettes, chewing tobacco, and loose tobacco. *Prev Med.* 1999; 29(5):321–326. [PubMed: 10564622]
38. Eule B, Sullivan MK, Schroeder SA, et al. Merchandising of cigarettes in San Francisco pharmacies: 27 years later. *Tob Control.* 2004; 13(4):429–432. [PubMed: 15564630]
39. Feighery EC, Henriksen L, Wang Y, et al. An evaluation of four measures of adolescents' exposure to cigarette marketing in stores. *Nicotine Tob Res.* 2006; 8(6):751–759. [PubMed: 17132522]
40. Feighery EC, Ribisl KM, Schleicher N, et al. Cigarette advertising and promotional strategies in retail outlets: results of a statewide survey in California. *Tob Control.* 2001; 10(2):184–188. [PubMed: 11387542]
41. Feighery EC, Ribisl KM, Schleicher NC, et al. Retailer participation in cigarette company incentive programs is related to increased levels of cigarette advertising and cheaper cigarette prices in stores. *Prev Med.* 2004; 38(6):876–884. [PubMed: 15193911]
42. Feighery EC, Ribisl KM, Schleicher NC, et al. How do minimum cigarette price laws affect cigarette prices at the retail level? *Tob Control.* 2005; 14(2):80–85. [PubMed: 15791016]
43. Freedman DA, Bell BA. Access to Healthful Foods among an Urban Food Insecure Population: Perceptions versus Reality. *Journal of Urban Health-Bulletin of the New York Academy of Medicine.* 2009; 86(6):825–838. [PubMed: 19898939]
44. Frick RG, Klein EG, Ferketich AK, et al. Tobacco advertising and sales practices in licensed retail outlets after the Food and Drug Administration regulations. *J Community Health.* 2012; 37(5): 963–967. [PubMed: 22197961]
45. Frohlich KL, Potvin L, Gauvin L, et al. Youth smoking initiation: disentangling context from composition. *Health Place.* 2002; 8(3):155–166. [PubMed: 12135639]
46. Glanz K, Sutton NM, Jacob Arriola KR. Operation storefront Hawaii: tobacco advertising and promotion in Hawaii stores. *J Health Commun.* 2006; 11(7):699–707. [PubMed: 17074736]
47. Gong T, Lv J, Liu Q, et al. Audit of tobacco retail outlets in Hangzhou, China. *Tob Control.* 2011
48. Henriksen L, Feighery EC, Schleicher NC, et al. Is adolescent smoking related to the density and proximity of tobacco outlets and retail cigarette advertising near schools? *Prev Med.* 2008; 47(2): 210–214. [PubMed: 18544462]
49. Henriksen L, Feighery EC, Schleicher NC, et al. Reaching youth at the point of sale: cigarette marketing is more prevalent in stores where adolescents shop frequently. *Tob Control.* 2004; 13(3):315–318. [PubMed: 15333890]
50. Henriksen L, Schleicher NC, Dauphinee AL, et al. Targeted advertising, promotion, and price for menthol cigarettes in California high school neighborhoods. *Nicotine Tob Res.* 2012; 14(1):116–121. [PubMed: 21705460]
51. Hernandez-Avila JE, Tirado-Ramirez E, Santos-Luna R, et al. Use of Geographical Information Systems for billboards and points-of-sale surveillance in two Mexico cities. *Salud Publica de Mexico.* 2007; 49:S241–S246.
52. Hosler AS, Kammer JR. Point-of-purchase tobacco access and advertisement in food stores. *Tob Control.* 2012; 21(4):451–452. [PubMed: 22411730]
53. Jalleh G, Donovan RJ, O'Flaherty C, et al. Tobacco advertising and promotion at point-of-sale. *Aust N Z J Public Health.* 2006; 30(6):579–580. [PubMed: 17209278]
54. Jirojwong S. Cigarette sales to women and children in urban Thailand. *Southeast Asian J Trop Med Public Health.* 2003; 34(1):220–226. [PubMed: 12971539]
55. John R, Cheney MK, Azad MR. Point-of-sale marketing of tobacco products: taking advantage of the socially disadvantaged? *J Health Care Poor Underserved.* 2009; 20(2):489–506. [PubMed: 19395844]
56. Klonoff EA, Fritz JM, Landrine H, et al. The problem and sociocultural context of single-cigarette sales. *JAMA.* 1994; 271(8):618–620. [PubMed: 8301795]
57. Lane SD, Keefe RH, Rubinstein R, et al. Structural violence, urban retail food markets, and low birth weight. *Health Place.* 2008; 14(3):415–423. [PubMed: 17928255]

58. Lee RE, Feighery EC, Schleicher NC, et al. The relation between community bans of self-service tobacco displays and store environment and between tobacco accessibility and merchant incentives. *Am J Public Health*. 2001; 91(12):2019–2021. [PubMed: 11726387]
59. Longman JM, Pritchard C, McNeill A, et al. Accessibility of chewing tobacco products in England. *J Public Health (Oxf)*. 2010; 32(3):372–378. [PubMed: 20484160]
60. Lovato CY, Hsu HCH, Sabiston CM, et al. Tobacco point-of-purchase marketing in school neighbourhoods and school smoking prevalence: A descriptive study. *Canadian Journal of Public Health-Revue Canadienne De Sante Publique*. 2007; 98(4):265–270. [PubMed: 17896733]
61. McCarthy M, Scully M, Wakefield M. Price discounting of cigarettes in milk bars near secondary schools occurs more frequently in areas with greater socioeconomic disadvantage. *Aust N Z J Public Health*. 2011; 35(1):71–74. [PubMed: 21299704]
62. Pabayo R, O'Loughlin J, Barnett TA, et al. Does intolerance of smoking at school or in restaurants or corner stores decrease cigarette use initiation in adolescents? *Nicotine Tob Res*. 2012; 14(10): 1154–1160. [PubMed: 22355076]
63. Pucci LG, Joseph HM Jr, Siegel M. Outdoor tobacco advertising in six Boston neighborhoods. Evaluating youth exposure. *Am J Prev Med*. 1998; 15(2):155–159. [PubMed: 9713672]
64. Quedley M, Ng B, Sapre N, et al. In sight, in mind: retailer compliance with legislation on limiting retail tobacco displays. *Nicotine Tob Res*. 2008; 10(8):1347–1354. [PubMed: 18686182]
65. Robertson W, Archer P, Jeffreys W, et al. Survey of tobacco advertising and display of the “under-16” sign: influencing compliance with the voluntary agreement. *Health Education Journal*. 1996; 55(4):382–388.
66. Robertson W, Field NJ, Bird C, et al. Voluntary agreement on tobacco advertising. *BMJ*. 1995; 310(6972):124. [PubMed: 7833704]
67. Rodriguez-Bolanos R, Reynales-Shigematsu LM, Ibanez-Hernandez NA, et al. Monitoring strategy for control of tobacco in Mexico: advertising, promotion and sponsorship, packaging and labeling. *Salud Publica de Mexico*. 2010; 52:S254–S266. [PubMed: 21243196]
68. Rogers JD, Biener L, Clark PI. Test marketing of new smokeless tobacco products in four U.S. cities. *Nicotine Tob Res*. 2010; 12(1):69–72. [PubMed: 19917598]
69. Romito LM, Saxton MK, Coan LL, et al. Retail promotions and perceptions of R.J. Reynolds' novel dissolvable tobacco in a US test market. *Harm Reduct J*. 2011; 8(1):10. [PubMed: 21569637]
70. Rooke C, Cheeseman H, Dockrell M, et al. Tobacco point-of-sale displays in England: a snapshot survey of current practices. *Tob Control*. 2010; 19(4):279–284. [PubMed: 20472576]
71. Ross L. Sustaining Youth Participation in a Long-term Tobacco Control Initiative: Consideration of a Social Justice Perspective. *Youth & Society*. 2011; 43(2):681–704.
72. Schensul JJ, Nair S, Bilgi S, et al. Availability, accessibility and promotion of smokeless tobacco in a low-income area of Mumbai. *Tob Control*. 2012
73. Scollo M, Younie S, Wakefield M, et al. Impact of tobacco tax reforms on tobacco prices and tobacco use in Australia. *Tobacco Control*. 2003; 12:59–66.
74. Seidenberg AB, Caughey RW, Rees VW, et al. Storefront cigarette advertising differs by community demographic profile. *Am J Health Promot*. 2010; 24(6):e26–31. [PubMed: 20594091]
75. Siahpush M, Jones PR, Singh GK, et al. The association of tobacco marketing with median income and racial/ethnic characteristics of neighbourhoods in Omaha, Nebraska. *Tob Control*. 2010; 19(3):256–258. [PubMed: 20395407]
76. Slater S, Chaloupka FJ, Wakefield M. State variation in retail promotions and advertising for Marlboro cigarettes. *Tob Control*. 2001; 10(4):337–339. [PubMed: 11740024]
77. Slater S, Giovino G, Chaloupka F. Surveillance of tobacco industry retail marketing activities of reduced harm products. *Nicotine Tob Res*. 2008; 10(1):187–193. [PubMed: 18188759]
78. Snell C, Bailey L. Operation storefront: Observations of Tobacco Retailer Advertising and Compliance With Tobacco Laws. *Youth Violence and Juvenile Justice*. 2005; 3(1):78–90.
79. Toomey TL, Chen V, Forster JL, et al. Do cigarette prices vary by brand, neighborhood, and store characteristics? *Public Health Rep*. 2009; 124(4):535–540. [PubMed: 19618790]

80. Vardavas CI, Connolly GN, Kafatos AG. Geographical information systems as a tool for monitoring tobacco industry advertising. *Tob Control*. 2009; 18(3):190–196. [PubMed: 19188209]
81. Viteri E, Barnoya J, Hudmon KS, et al. Smoking cessation medications and cigarettes in Guatemala pharmacies. *Tob Control*. 2011
82. Voorhees CC, Swank RT, Stillman FA, et al. Cigarette sales to African-American and white minors in low-income areas of Baltimore. *Am J Public Health*. 1997; 87(4):652–654. [PubMed: 9146447]
83. Voorhees CC, Yanek LR, Stillman FA, et al. Reducing cigarette sales to minors in an urban setting: issues and opportunities for merchant intervention. *Am J Prev Med*. 1998; 14(2):138–142. [PubMed: 9631166]
84. Wakefield MA, Ruel EE, Chaloupka FJ, et al. Association of point-of-purchase tobacco advertising and promotions with choice of usual brand among teenage smokers. *J Health Commun*. 2002; 7(2):113–121. [PubMed: 12049420]
85. Wakefield MA, Terry-McElrath YM, Chaloupka FJ, et al. Tobacco industry marketing at point of purchase after the 1998 MSA billboard advertising ban. *Am J Public Health*. 2002; 92(6):937–940. [PubMed: 12036782]
86. Widome R, Brock B, Klein EG, et al. Smokeless tobacco advertising at the point of sale: prevalence, placement, and demographic correlates. *Nicotine Tob Res*. 2012; 14(2):217–223. [PubMed: 22080586]
87. Wildey MB, Young RL, Elder JP, et al. Cigarette point-of-sale advertising in ethnic neighborhoods in San Diego, California. *Health Values: The Journal of Health Behavior, Education & Promotion*. 1992; 16(1):23–28.
88. Dubray J, Schwartz R. Association between tobacco vendor non-compliance with youth access and point of sale restrictions. *Tob Control*. 2010; 19(2):171. [PubMed: 20008153]
89. Dubray JM, Schwartz RM, Garcia JM, et al. Vendor compliance with Ontario's tobacco point of sale legislation. *Can J Public Health*. 2009; 100(2):109–112. [PubMed: 19839285]
90. McNeill A, Lewis S, Quinn C, et al. Evaluation of the removal of point-of-sale tobacco displays in Ireland. *Tob Control*. 2011; 20(2):137–143. [PubMed: 21088060]
91. Ruel E, Mani N, Sandoval A, et al. After the Master Settlement Agreement: Trends in the American Tobacco Retail Environment from 1999 to 2002. *Health Promotion Practice*. 2004; 5(3):99S–110S. [PubMed: 15231103]
92. Barbeau EM, Wolin KY, Naumova EN, et al. Tobacco advertising in communities: associations with race and class. *Prev Med*. 2005; 40(1):16–22. [PubMed: 15530576]
93. Celebucki CC, Diskin K. A longitudinal study of externally visible cigarette advertising on retail storefronts in Massachusetts before and after the Master Settlement Agreement. *Tob Control*. 2002; 11(Suppl 2):ii47–53. [PubMed: 12034982]
94. Cohen JE, Planinac L, Lavack A, et al. Changes in retail tobacco promotions in a cohort of stores before, during, and after a tobacco product display ban. *Am J Public Health*. 2011; 101(10):1879–1881. [PubMed: 21852644]
95. Devlin E, Anderson S, Borland R, et al. Development of a Research Tool to Monitor Point of Sale Promotions. *Social Marketing Quarterly*. 2006; 12(1):29–39.
96. Feighery EC, Schleicher NC, Cruz TB, et al. An examination of trends in amount and type of cigarette advertising and sales promotions in California stores, 2002–2005. *Tobacco Control*. 2008; 17(2):93–98. [PubMed: 18303088]
97. Feighery EC, Schleicher NC, Ribisl KM, et al. An examination of the effect on cigarette prices and promotions of Philip Morris USA penalties to stores that sell cigarettes to minors. *Tob Control*. 2009; 18(6):502–504. [PubMed: 19648133]
98. Hatzis S, McAnulty J, Cannata S. Intervention to limit advertising of tobacco products. *Aust N Z J Public Health*. 1996; 20(3):324–325. [PubMed: 8768429]
99. Hosler AS, Dharssi A. Reliability of a survey tool for measuring consumer nutrition environment in urban food stores. *J Public Health Manag Pract*. 2011; 17(5):E1–8. [PubMed: 21788772]
100. Ivers RG, Castro A, Parfitt D, et al. The role of remote community stores in reducing the harm resulting from tobacco to Aboriginal people. *Drug Alcohol Rev*. 2006; 25(3):195–199. [PubMed: 16753641]

101. Jason LA, Pokorny SB, Mikulski K, et al. Assessing storefront tobacco advertising after the billboard ban. *Eval Health Prof.* 2004; 27(1):22–33. [PubMed: 14994557]
102. Klein EG, Ferketich AK, Abdel-Rasoul M, et al. Smokeless tobacco marketing and sales practices in Appalachian Ohio following federal regulations. *Nicotine Tob Res.* 2012; 14(7):880–884. [PubMed: 22318692]
103. Laws MB, Whitman J, Bowser DM, et al. Tobacco availability and point of sale marketing in demographically contrasting districts of Massachusetts. *Tobacco Control.* 2002; 11:II71–II73. [PubMed: 12034986]
104. Robertson W, Rooney SE, Field NJG, et al. Voluntary agreement for tobacco advertising at retail premises not being adhered to. *British Medical Journal.* 1998; 316(7124):69. [PubMed: 9451281]
105. Rogers T, Feighery EC, Tencati EM, et al. Community mobilization to reduce point-of-purchase advertising of tobacco products. *Health Education Quarterly.* 1995; 22(4):427–442. [PubMed: 8550368]
106. Slater SJ, Chaloupka FJ, Wakefield M, et al. The impact of retail cigarette marketing practices on youth smoking uptake. *Arch Pediatr Adolesc Med.* 2007; 161(5):440–445. [PubMed: 17485618]
107. Wildey MB, Clapp EJ, Woodruff SI, et al. Retailer education to reduce the availability of single cigarettes. *Journal of Health Education.* 1995; 26(5):297–302.
108. Woodruff SI, Agro AD, Wildey MB, et al. Point-of-purchase tobacco advertising: Prevalence, correlates, and brief intervention. *Health Values: The Journal of Health Behavior, Education & Promotion.* 1995; 19(5):56–62.
109. Robert Wood Johnson Foundation, University of Illinois at Chicago. *impacTEEN*. Chicago, IL: <http://www.impacteen.org/> Undated web site [Accessed 23, Jul., 2012]
110. Campaign for Tobacco-Free Kids. *StoreALERT*. Washington, DC: http://www.storealert.org/default_flash.asp [Internet site] Undated site [Accessed 23, Jul., 2012]
111. Roeseler A, Feighery EC, Cruz TB. Tobacco marketing in California and implications for the future. *Tobacco Control.* 2010; 19:121–129. [PubMed: 20382646]
112. Institute for Global Tobacco Control. Surveillance & Evaluation. Baltimore, MD: http://www.jhsph.edu/research/centers-and-institutes/institute-for-global-tobacco-control/surveillance_evaluation/ Undated web page [Accessed 23, Jul., 2012]
113. Nicotera N. Measuring neighborhood: a conundrum for human services researchers and practitioners. *Am J Community Psychol.* 2007; 40(1–2):26–51. [PubMed: 17577660]
114. Bronfenbrenner, U. *The ecology of human development: experiments by nature and design*. Cambridge, MA: Harvard University Press; 1979.
115. Flay BR. Understanding environmental, situational and intrapersonal risk and protective factors for youth tobacco use: the Theory of Triadic Influence. *Nicotine Tob Res.* 1999; 1 (Suppl 2):S111–114. [PubMed: 11768166]
116. Giddens, A. *The constitution of society: Outline of the Theory of Structuration*. Berkeley, CA: University of California; 1984.
117. Rothman AJ. “Is there nothing more practical than a good theory?”: Why innovations and advances in health behavior change will arise if interventions are used to test and refine theory. *Int J Behav Nutr Phys Act.* 2004; 1(1):11. [PubMed: 15279674]
118. Smith KE, Katikireddi SV. A glossary of theories for understanding policymaking. *J Epidemiol Community Health.* 2012
119. McQueen K, Sabatier PA, Weible CM. Themes and variations: taking stock of the advocacy coalition framework. *Policy Studies Journal.* 2009; 37(1):121–140.
120. Brownson RC, Chiqui JF, Stamatakis KA. Understanding evidence-based public health policy. *Am J Public Health.* 2009; 99(9):1576–1583. [PubMed: 19608941]
121. Rogers, E. *Diffusion of innovations*. New York: Free Press; 2003. The innovation-decision process; p. 168-218.
122. Ashe M, Jernigan D, Kline R, et al. Government, politics, and law. Land use planning and the control of alcohol, tobacco, firearms, and fast food restaurants. *American Journal of Public Health.* 2003; 93(9):1404–1408. [PubMed: 12948952]

123. Feighery, E.; Schleicher, N.; Haladjian, H. Tobacco Marketing in California Retail Outlets, 2000–2005: How the Retail Environment has Changed Over Time and How Community Characteristics Shape it. Oakland, CA: Public Health Institute; 2009.
124. Girlando, M.; Loomis, B.; Watson, K., et al. Retail advertising and promotions for cigarettes in New York. Research Triangle Park, NC: RTI International; 2007.
125. Cruz TB. Monitoring the tobacco use epidemic IV. The vector: tobacco industry data sources and recommendations for research and evaluation. *Preventive Medicine*. 2009; 48(1):S24–34. [PubMed: 18976685]
126. Amos A, Robertson G, Hillhouse A. Tobacco advertising and children: widespread breaches in the voluntary agreement. *Health Educ Res*. 1987; 2(3):207–214.
127. Spanopoulos D, Ratschen E, McNeill A, et al. Retail price and point of sale display of tobacco in the UK: a descriptive study of small retailers. *PLoS One*. 2012; 7(1):e29871. [PubMed: 22242183]
128. Reitzel LR, Cromley EK, Li Y, et al. The effect of tobacco outlet density and proximity on smoking cessation. *Am J Public Health*. 2011; 101(2):315–320. [PubMed: 21164089]
129. Chapman S, Freeman B. Regulating the tobacco retail environment: beyond reducing sales to minors. *Tobacco Control*. 2009; 18(6):496–501. [PubMed: 19748884]
130. Guardino SD, Daynard RA. Tobacco industry lawyers as “disease vectors”. *Tobacco Control*. 2007; 16(4):224–228. [PubMed: 17652236]
131. WHO. Tobacco company strategies to undermine tobacco control activities at the World Health Organization. Geneva: WHO; 2000.

What This Paper Adds

- Audit-based measurement of retail tobacco marketing is increasingly used to monitor tobacco industry strategies and their influence on tobacco use by multiple population subgroups.
- The reliability of audit measures is generally good, albeit with some concerns when measuring spatial distances or heights.
- Given a variety of unstandardized measures reported in the literature, we make recommendations to improve the conduct and reporting of retail marketing audits.

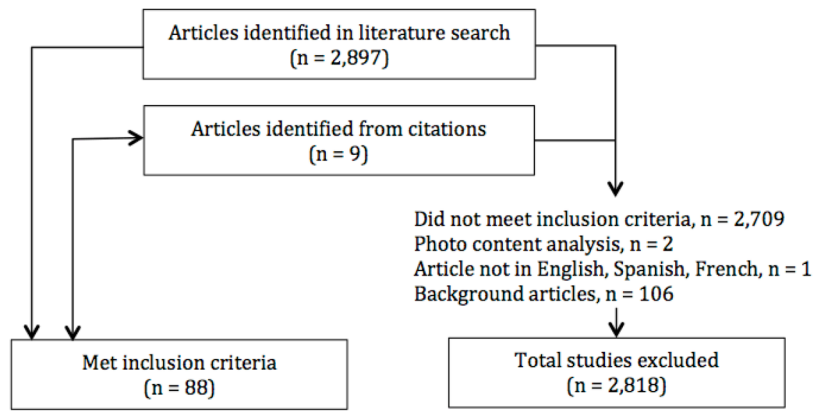
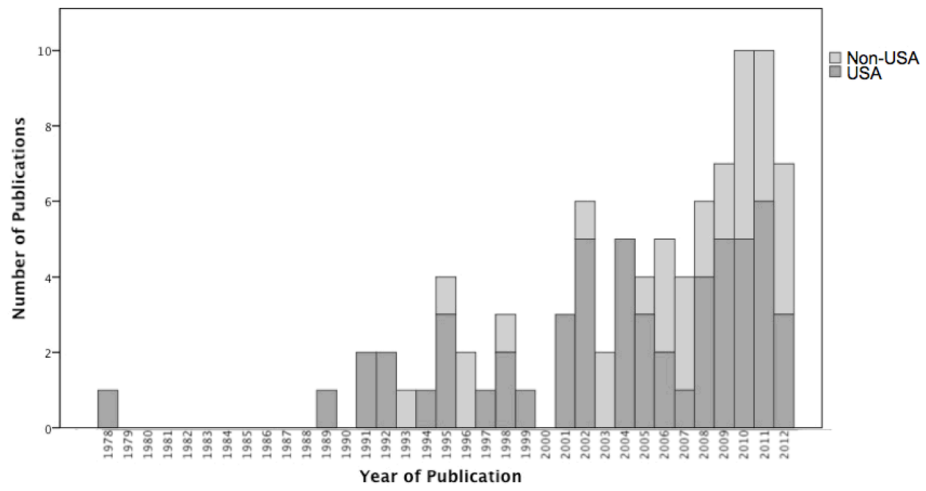


Figure 1.
Inclusion of studies, March 14, 2012



Note: data for 2012 include only through March 14th.

Figure 2.
US and non-US publications by year, March 14, 2012, N=88

Table 1

Use of existing tobacco audit instruments, March 14, 2012, n=24

Protocol or audit instrument	Number reporting used or adapted
ImpacTeen[109]	6 (25%)[27, 60, 62, 77, 85, 91]
Operation Storefront	5 (21%)[46, 55, 74, 78, 93]
Cohen and colleagues[34]	3 (13%)[29, 44, 102]
Eule and colleagues[38]	3 (13%)[31, 35, 81]
Battelle Store Alert[110]	1 (4%)[75]
Braverman and colleagues[23]	1 (4%)[30]
California Tobacco Assessment Study[96]	1 (4%)[111]
Feighery and colleagues[40]	1 (4%)[49]
Frohlich and colleagues[45]	1 (4%)[62]
Johns Hopkins Tobacco Control Tracking Tools[112]	1 (4%)[67]

Table 2

Measures of product availability, March 14, 2012, n=36

Cigarettes	23 (64%)
Aggregated, undefined tobacco products	11 (31%)
Smokeless tobacco (including snus)	7 (19%)
Cigars	4 (11%)
Emerging products	3 (8%)
Pipes/pipe tobacco	1 (3%)
E-cigarettes	1 (3%)

Note: *this table is constructed based upon measures either noted in the methods section or reported as a result.*

Table 3

Presence, count, or scaled measure of promotion, March 14, 2012, n=76

Advertisements of any type inside	57 (75%)
Advertisements of any type outside	56 (74%)
Signs (e.g., posters, ceiling hangers)	46 (61%)
Advertisements by product type	44 (58%)
Displays (moveable, branded)	27(36%)
Advertisements by brand	25 (33%)
Branded functional items (e.g., change bowls, clocks)	19 (25%)
Shelving (fixed, branded, including spatial measures)	16 (21%)
Gift(s) with purchase	15 (20%)
Measure of advertisement size	7 (9%)

Note: *this table is constructed based upon measures either noted in the methods section or reported as a result.*

Table 4

Recommendations for reporting

Key information to report in audit-based papers	
1	The sampling frame
2	The covert or disclosed nature of data collection, as this can substantially change what data can be collected around counters and clerks
3	Who is collecting the data, e.g., students, community members, or professional auditors
4	The reliability of measures, particularly novel survey items and items involving spatial estimation or physical measurement
5	If data collectors are blinded to tests of reliability or are aware they are participating in a reliability test
6	The wording and/or definition of items used as key variables in analyses, as elegantly done by Cohen <i>et al</i> , Feighery <i>et al</i> , and Lovato <i>et al</i> ; ^[34, 40, 60] these can be operationalized in multiple ways (e.g., is snus measured as an emerging product or a smokeless product?)
7	The mode of the survey, as iPads™, iPhones™, or other electronic data collection devices can influence interactions with retailers and may have instrumentation effects