Different Times Call for Different Measures: Using Retail Sales to Monitor the Tobacco Product Landscape

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In the past 15 years, the tobacco product landscape has evolved rapidly. After the introduction of E-cigarettes in the 2000s and the growth and promotion of several brands, including JUUL, the use of these products rapidly increased among U.S. youth during 2011–2019. These increases were driven by multiple factors, including advertising themes that are similar to those previously found to promote youth cigarette smoking, flavors that appeal to youth, and the introduction of newer products with characteristics that appeal to young people (e.g., smaller and easily concealable or similar in size and shape to a USB flash drive). Newer E-cigarette types also deliver nicotine in the form of nicotine salts, which allows a particularly high level of nicotine to be inhaled more easily and with less irritation than the free-base nicotine that has traditionally been used in conventional tobacco products and older E-cigarette types. However, the diversification of the tobacco product landscape has not been limited to E-cigarettes, and other products also continue to reemerge or newly emerge. More recently, updated versions of heated tobacco products, which were originally introduced in the 1990s with limited consumer interest, have returned to the marketplace in several countries. Novel smokeless tobacco products, including nicotine pouches, have also recently emerged; these pre-filled, microfiber pouches contain nicotine powder that dissolves in the mouth without requiring spitting. Given the quickly evolving tobacco product marketplace, it is critical that researchers rapidly collect data on these emerging products, particularly to document seminal increases in sales and use to inform timely public health interventions that can expeditiously mitigate the use among populations at increased risk, including young people.

Most longstanding or gold-standard surveillance systems that assess tobacco product use in the U.S. are fielded annually (e.g., National Youth Tobacco Survey, Monitoring the Future Survey), biennially (e.g., Youth Risk Behavior Survey), or even less frequently (e.g., Tobacco Use Supplement to the Current Population Study). These surveys typically use established sampling (e.g., probability-based) and survey administration (e.g., household-based, school-based) approaches. Although these established surveillance systems have strengths, including robust validity and reliability, they are not able to capture rapid, subannual changes in awareness and use, which is critical to assess emergent trends in novel products. It also takes time for items related to new and emerging tobacco products to be added to these surveillance systems. Rapid surveys can serve as an important complement to but not a replacement for these established surveillance systems mentioned earlier. These types of rapid surveys can also be useful for collecting timely data to inform efforts related to concurrent public health issues. For example, at the onset of the coronavirus disease 2019 (COVID-19) pandemic, rapidly collected data on tobacco product use were important to understanding the relationship between cigarette smoking and the risk of severe illness from COVID-19. Rapid surveillance systems that have gained momentum in recent years include web-panel surveys; however, these surveys can be time and resource intensive, including securing probability-based samples, particularly among young people.
Retail sales data are one rapidly available source to assess tobacco product consumption that does not require the resources associated with securing representative, self-reported population-level data, which is the case for gold-standard surveillance systems. Through vendors that compile universal product code (UPC)-level scanner data from a cohort of retailers, researchers can purchase retail sales data for cigarettes, E-cigarettes, cigar products, smokeless tobacco, nicotine replacement therapy, and other emerging products. These data are projected to account for nonparticipating retailers using propriety vendor calculations, yielding estimates that illustrate the total marketplace in a given geography. Data are generally available monthly or quarterly, allowing for subannual assessment. Retail sales data can be purchased from vendors (e.g., NielsenIQ, IRI) at national and subnational levels in the U.S.; for example, data are available for individual U.S. states and for scantrack market areas. Aside from measuring various aspects of overall population-level sales (e.g., dollar and unit sales), retail sales data also provide critical information on new products on the market, the price of these products, the venue in which the product was purchased (e.g., convenience stores, grocery stores, drug stores, mass merchandizer stores, club stores, dollar stores, and Military sales) and any accompanying promotions (e.g., buy one get one). In addition, to providing a cross-sectional snapshot of the product market at a given time (i.e., most sold product type and flavor), retail sales data can also provide information on weekly, monthly, quarterly, or annual trends in key measures over time. Studies analyzing retail sales data have contributed to the literature and advanced understanding of E-cigarette product availability and trends in purchasing.\(^{10-13}\) Retail sales data can be used to assess the introduction of new products to the marketplace, measure shifts in market share by flavor type, and assess the relationship between regulatory action and changes in product sales.

In the context of a rapidly emerging landscape, retail sales data have several inherent strengths. The data are timely—most vendors offer monthly data delivery, allowing for the rapid detection of trends. In addition, data are generally collated and analyzable at the weekly level, allowing for the assessment of temporally precise changes from week to week, which can be easily cross-linked with specific policies or interventions (Figure 1). Certain vendors have restrictions around publishing sales at the weekly level and require aggregation into 2- or 4-week periods. Retail sales data provide considerable detail about specific product information that is tied to the UPC, including products names, brands, and characteristics such as flavors. The UPC is constant across different retailers, which is not the case for other bar codes such as stock-keeping units (SKU); therefore, products are captured in the database as long as they are sold and scanned by participating retailers, which were estimated to cover 77% of retail stores in the U.S. (excluding online and vape shops).\(^{14}\) Finally, the availability of national, state, and some city or scantrack market-level data allows for comparisons between geographies, including those that have implemented relevant policies and those used as control jurisdictions.\(^{14,15}\)

However, despite these strengths, there are also several notable limitations. Retail sales data are reported in aggregate at the UPC level; therefore, there is no demographic information about those who purchased the products or actually used the products. For example, retail sales data can document changes in dollar or unit sales of a specific product in a given area, which are presumably being used; however, it is not possible to ascertain whether those purchases have been made by adults or youth. Nonetheless, the sales reflect products purchased and available in society, which could be obtained directly or indirectly by youth. For E-cigarettes, retail sales trends have been historically consistent with those from self-reported surveys of youth; for example, in the U.S., E-cigarette use increased by 78% (from 11.7% to 20.8%)\(^{16}\) between 2017 and 2018, with a similar increase occurring in national E-cigarettes sales during the same period (115% increase from 87.7 million standardized units sold in 2017 to 188.6 million standardized units sold in 2018).\(^ {17}\) Another limitation of retail sales data is that they reflect sales for brick-and-mortar retailers (e.g., convenience stores, gas stations); data are not obtained for some retailers for which a sizable portion of certain products might be sold, including tobacco specialty/vape stores and online. Although this is not problematic for products largely sold through brick-and-mortar retailers (e.g., cigarettes), it can introduce bias for some products that might be available in excluded store types. For example, in the U.S., the exclusion of Internet purchases is of particular importance for E-cigarettes, which are available for online purchase; in contrast, conventional tobacco products such as cigarettes and smokeless tobacco are illegal to sell through the Internet. Finally, retail sales data can be relatively costly to purchase, and the data require technical expertise to analyze.

When considering the potential for the bias associated with retail sales data, it is important to understand the proportion of tobacco products sold through channels excluded from the data source, particularly related to Internet sales of emerging products such as E-cigarettes. Estimates of the proportions of sales in noncovered brick-and-mortar stores such as tobacco specialty stores and vape shops are unknown. To date, some general estimates of the potential proportion of overall sales.
attributed to the Internet have been proposed. For example, Wells Fargo analysts estimated that in 2019, 28.3% of U.S. E-cigarette sales were online. In this same year, ECigIntelligence estimated that 15% of U.S. E-cigarette sales were online, which increased to 20% by 2020. Euromonitor International estimated that 25.6% of U.S. E-cigarette sales were online in 2019, which increased to 32.6% in 2020. In the most detailed assessment to date, CDC Foundation recently commissioned an analysis from DigitalCommerce360, a leading research and media organization specializing in electronic commerce reporting and analysis, to assess the size of the online E-cigarette market in the U.S. Through analysis of available market data (e.g., U.S. Department of Commerce, Gales reports) assessing information from annual 10-K and investor day filings from publicly held tobacco product manufacturers and interviews with web merchants and industry analysts, DigitalCommerce360 estimated that 18.3% of U.S. E-cigarette sales were online in 2020 (increasing from 17.7% in 2019) and projected that this proportion would grow to approximately 19% in 2021. Taken together, although there is some variation in estimates across sources, they suggest that online sales comprise approximately one third or less of the marketplace. Retail sales likely include the majority of the U.S. E-cigarette market and provide a reasonable gauge of the patterns of a majority of the E-cigarette sales occurring in the U.S.

In summary, the tobacco product landscape is constantly changing; tobacco control practitioners and researchers can benefit from access to rapidly available data to be able to understand emerging products and trends as they are occurring. This is particularly important in the context of rapid onset public health threats that might impact product access and use, such as EVALI (E-cigarette or vaping product use associated lung injury) or COVID-19, as well as the proliferation of tobacco control policies being implemented at varying geographies, such as flavor prohibitions, and the need to evaluate the impact of these policies in a timely manner. Importantly, rapid response surveillance, including retail sales data, is an important complement to but not a replacement for gold-standard surveillance systems such as annual and biennial nationally representative surveys. Although retail sales data have certain limitations, preliminary evidence suggests that retail sales data cover a sizable portion of tobacco product sales. Moreover, in the absence of an alternative approach for obtaining similarly timely data, retail sales data afford the most scientifically robust option for quickly collecting emerging tobacco product sales at subannual levels of periodicity. These data also have utility for both public health and clinical practice; retail sales data can identify emerging products, which can help clinicians to screen for use of these products among their patients. Retail sales data can also be used to assess

Figure 1. National E-cigarette unit sales by flavor and 4-week estimates, January 2017—January 2022.

Sales data do not reflect sales from vape shops or online retailers; dates represent the end of 4-week periods; All Other Flavors category includes fruit, clove/spice, chocolate, alcoholic drink (such as wine, cognac, or other cocktails), candy/desserts/other sweets, and some other flavor; E-cigarette accessories and devices sold without electronic liquids were excluded (4.0% of total sales). Unknown flavors were excluded from this figure (<0.1%).

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the trends in purchasing of products across a variety of health behaviors and risk factors (e.g., sugar-sweetened beverages, alcohol) in a similar way to how they are used to assess the tobacco product landscape. The benefits of retail sales data are further reinforced by its broad domestic availability, the diversity of scientific opportunities to which it can be applied (e.g., surveillance, evaluation, and research), and its utility for quickly informing public health policy, planning, and practice.

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