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Digital Segmentation of Priority Populations in Public Health

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Abstract

The rapid growth and diffusion of digital media technologies has changed the landscape of market segmentation in the last two decades, including its use in promoting prosocial and behavior change. New, population-specific and culturally appropriate prevention strategies can leverage the potential of digital media to influence health outcomes, especially for the greatest users of digital technology, including youth and young adults. Health behavior change campaigns are increasingly shifting resources to social media, creating opportunities for innovative interventions and new research methods. This article examines three case studies of digital segmentation: (1) tobacco control from the Truth Initiative, (2) community-based public health programs from the Centers for Disease Control and Prevention, and (3) substance use (including opioids) and other risk behavior prevention from Public Good Projects. These case studies of recent digital segmentation efforts in the not-for-profit, government, and academic sectors show that it increases reach and frequency of messages delivered to priority populations. The practice of digital segmentation is rapidly growing, shows early signs of effectiveness, and may enhance future public health campaigns. Additional research could optimize its use and effectiveness in promoting prosocial and behavior change campaign outcomes.

Keywords

behavior change, digital media, mobile phones, public health, segmentation, social marketing

Commercial marketers have long recognized that not all consumers are alike. Consumers differ in terms of demographic characteristics, such as age or gender, geographic location (which may affect their access to products and services, as well as social environment), behavioral and lifestyle factors, and psychographic factors (psychological characteristics, beliefs, and attitudes). Armstrong and Kotler (2005) define market segmentation as "dividing a market into distinct groups of buyers who have distinct needs, characteristics, or behavior and who might require separate products or marketing mixes" (p. 54). The purpose of segmentation is to align the marketer's offer with the right consumer for whom the product or service is most relevant.

This approach has been widely applied in social marketing (i.e., the use of marketing theory, skills, and practices to achieve social change) for public health objectives (Evans, 2016; French & Gordon, 2015). For example, the *Heart Truth* campaign was created in response to the problem of heart disease in women (Long, Taubenheim, Wayman, Temple, & Ruoff, 2008). The *Heart Truth* developed a strategy for raising awareness of heart disease risks among 40 to 60 year olds and encouraged them to take action to reduce heart disease risk factors.

Evans (2016) noted four criteria for effective segmentation: (1) tight definition based on a specific set of factors such as demographic and psychographic, (2) ability to measure the segments to estimate size and likely reach within the population to make a meaningful difference, (3) being reachable through communication in an affordable way, and (4) be substantial enough (large enough) to potentially have a meaningful public health impact.

The rapid growth and diffusion of digital media technologies has changed the landscape of segmentation in the last two decades (Evans, 2016). New, population-specific and culturally appropriate prevention strategies could leverage

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the potential of digital media to influence health outcomes, especially for the greatest users of digital technology, including youth and young adults. Health behavior change campaigns are increasingly shifting resources to social media such as YouTube, Twitter, Facebook, Instagram, and Snapchat, as these are the most widely used channels among youth and young adults (Pew Research Center, 2018). Recent studies show that social media can be an effective tool both to promote healthy behaviors and to counter unhealthy product marketing, such as tobacco industry product promotion, and may serve as effective campaign platforms (Duke et al., 2014). However, there is relatively little published data on exposure to and evaluations of large-scale health behavior change campaigns based on digital channels. Social marketing as a theoretical framework for social and behavior change suggests that digital channels will be a central strategy to maximize the reach and effectiveness of future campaigns (French & Gordon, 2015).

Health behavior change campaigns, especially those focused on high users of digital platforms, such as youth and young adult target audiences, are being encouraged to reallocate substantial resources to deliver messages online (Evans, 2016). Within digital platforms, primarily social networking services, interactivity or *engagement*—a measure of audience awareness, dialogue, or behavior—has been treated as a key performance indicator and a predictor of successful campaign outcomes (Hopp & Gallicano, 2016; Smith & Gallicano, 2015; Taylor & Kent, 2014). Recent work has operationalized engagement metrics into tiers: low (likes, awareness), medium (created or shared content), and high (subsequent offline activities; Neiger et al., 2012). Engagement is a function of both initial exposure to digital content and the process of behavioral *retargeting*—a form of online targeted advertising by which online advertising is targeted to consumers based on their previous Internet actions. Delivering traditional paid media (TV, radio, print, out of home), coupled with digital media, can increase the likelihood of audience exposure (Hornik, 2016). However, there are no standards associated with levels of paid digital media, audience exposure, and engagement over time (Hornik, 2016). As a result, additional information could help inform how and to what extent digital message exposure and engagement influences behavior over time, across platforms, and among multiple devices for the same individuals.

Why is this work significant? As more and more private and public sector marketing relies on digital platforms, the need to understand behavior in segments that predict consumer and program engagement and outcomes based on online behavioral characteristics increases. The traditional segmentation variables discussed earlier, while still relevant, will increasingly be just one part of a larger mosaic of predictive factors. Segmentation based on digital behavior will become more and more important in predicting engagement with online advertising and behavior change campaigns, and thus will be increasingly predictive of achieving campaign outcomes.

Digital segmentation—the ability to sort and reach audiences in a targeted manner using digital technologies—is still in its infancy as a public health practice but is growing rapidly. This article explores three case studies from the public, philanthropic, and not-for-profit sectors focused on the use of digital segmentation for behavioral and social change. We present examples of digital segmentation and message targeting from the truth campaign to prevent smoking among youth and young adults; communities funded by the Centers for Disease Control and Prevention (CDC) to address chronic disease; and the Public Good Projects' (PGP) digital segmentation efforts across multiple subject areas, including opioid misuse. These case studies were chosen because they illustrate public health digital segmentation efforts, suggest future directions in the field, and point to the opportunity for research and digital campaign evaluations. While the cases are diverse, they share the common factor of illustrating the methods by which digital segmentation may be used for social and behavior change. Each was presented by an author of the current article at the 2018 Digital Health Promotion Summit held in Washington, D.C.

Case Studies

Case Study 1: Truth

Truth, the national mass media antitobacco campaign aimed at preventing tobacco use among youth ages 12 to 17 years, was launched in 2000 by Truth Initiative (formerly American Legacy Foundation; Vallone et al., 2017). Since its launch, truth primarily used television and radio advertisements to reach its intended audience. By 2014, the media landscape shifted dramatically with the rise of internet advertising, the growth of mobile devices, and increasing engagement with social media, prompting truth to seek new pathways to deliver its message (Verhoef, Kannan, & Inman, 2015).

To ensure that the target audience had multiple opportunities to take part in the movement, Truth Initiative employed an omni-channel marketing approach to the campaign. Unlike single-channel approaches such as television advertisements, omni-channel marketing uses the latest technology to deliver messages on multiple fronts, including mobile devices, through social media, and dedicated campaign websites (Verhoef et al., 2015). To best meet the needs of the target generation and evolving media landscape, the latest iteration of the truth campaign has gone beyond television advertisements to deliver digital messages through multiple platforms, including banner ads, online video ads, paid promotions on social media, truth-branded social media pages, and a campaign website (Vallone et al., 2018). Drawing from formative and psychological research showing that the target generation valued autonomy, identity formation, and connections with others, the campaign called on youth to join a social movement to end smoking (Hair et al., 2018). An evaluation of the

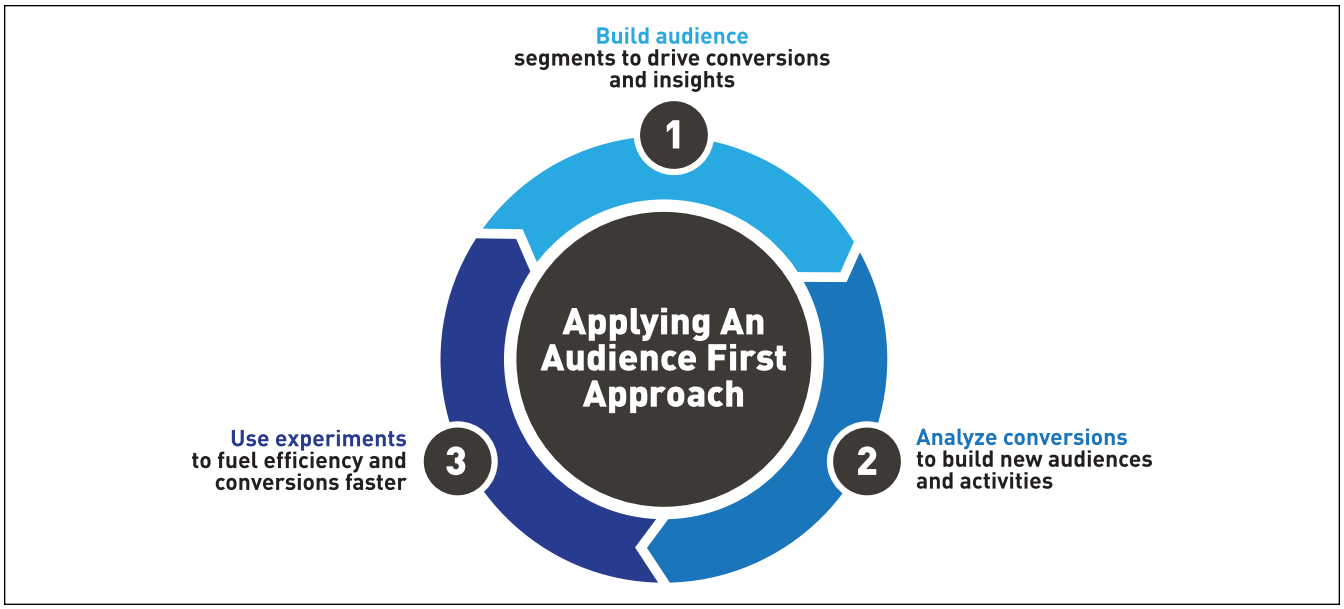

Figure 1. Audience-first model.

campaign demonstrated a dose–response relationship between awareness of truth messages and changes in antitobacco attitudes, support for a social movement to end smoking, and intentions not to smoke (Vallone et al., 2018). Thus, it was imperative that youth not only see these ads but that they have the chance to frequently engage with the content.

Crucially, an omni-channel approach can integrate users' online behavior in order to provide multiple opportunities, or touchpoints, for the target audience to take in the message (Verhoef et al., 2015). These touchpoints allow a marketer's message to meet the customer where they are, so that whether the audience likes to discuss a social movement online through their social media accounts, prefers to watch YouTube videos, or seeks out content that asks them to join a larger cause, the message has the chance to get through to the audience (Vallone et al., 2016).

Audience Segmentation. Using an audience-first approach, which first builds audience segments for the message, analyzes which messages connect most successfully to the target audience, and adjusts messaging based on analysis to make meaningful connections more quickly, the truth campaign sought to iteratively adjust messages for maximum impact, as shown in Figure 1 (Favatas, 2018).

In order to establish a baseline for message efficacy, Truth Initiative identified baseline segments, which included 25%, 50%, 75%, and 100% video completion, as well as media engagers (i.e., those who click on display or video units), and people who join the movement on signup forms on thetruth.com. Participants opted-in and the campaign anonymously monitored their level of engagement with truth content (Favatas, 2018). Since previous research established that changes in attitudes, knowledge, and beliefs translate into changes in behavior (Hair et al., 2018), it was important to measure the number of people who either complete watching the entire message or take a message-directed action, such as joining the campaign or posting about it to social media (Vallone et al., 2016).

Testing Completion. Truth Initiative then designed a test to determine which video length and message would generate the highest number of video completions. Over a 2-week period, four million impressions, or unique video views, were observed and the percentage of video viewed (25%, 50%, 75%, 100%) was measured. Video messages were produced in both 15-second and 30-second versions and in two different creative themes for a total of four videos. Each audience member was exclusively sent only one video message and video length in order to test the efficacy of both message and length (Favatas, 2018).

Testing revealed that audiences reached higher completion rates with the shorter 15-second videos—a crucial finding in designing subsequent messages. Content creators were then able to front-load messages with the most important information so that even longer advertisements could ensure that key messages were more likely to be seen. Another key observation was that, for those exposed to the longer format videos (30 seconds), on average people completed at least 75% of the video before dropping off. This suggested during the test that subjects were willing to consume up to 22.5 seconds of a video, which opened up new opportunities to test longer format videos where a forced completed exposure is required (e.g., user cannot skip a video after 5 seconds).

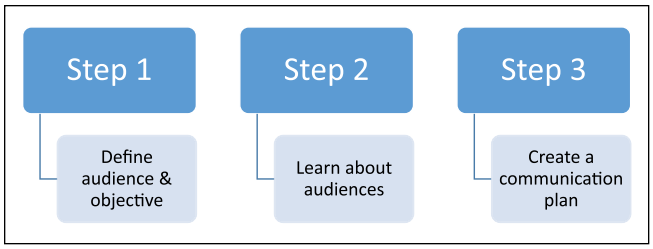

Figure 2. Approach to using communication to support community health work.

Testing Conversion. Truth Initiative also sought to understand the message content and call-to-action most likely to deliver the highest number of conversions, or follow-throughs on an intended action, such as visiting the truth campaign website or posting to social media. Researchers segmented audiences based on their percentage of video completion so that that those who watched 100% of a video and those that only completed 25% of a video were separated into their own groups and were then shown a video to determine which would be most effective for conversion. Eight advertisements used one of four key facts about the tobacco industry's targeting of people with mental health issues or those in the military and tobacco use rates of those populations. Results showed that only two facts and two content messages comprised fully half of the study's conversions. Messages focused on (1) the impact of smoking on a smoker's lifespan, (2) the amount of money Big Tobacco earned, and (3) the high prevalence of smoking among populations living with mental health conditions were the most successful at driving conversions. Overall, messages highlighting the effects of smoking on individuals as well as detailing industry tactics were more impactful than messages which focused more narrowly on a subpopulation. Knowing which fact and message theme were mostly likely to spur a subsequent action was critical in designing future messages to ensure that engagement leads to changes in attitude.

Case Study 1 Conclusions. Digital segmentation allowed Truth Initiative to capitalize on the type, content, and length of video most likely to attract a young audience, enlist them in the fight against tobacco, and, ultimately, encourage a shift in attitude and behavior that either prevents or discourages tobacco use. The next step is to examine how type, content, and video length are related to changing these attitudes and beliefs.

Case Study 2: Using Communication to Support Local Public Health Programs

From September 2014 through September 2017, the CDC funded 88 communities through two cooperative agreements, Racial and Ethnic Approaches to Community Health (REACH) and Partnerships to Improve Community Health (PICH). Communities focused on chronic disease prevention topics such as nutrition, physical activity, tobacco, and clinical and community linkages at the local level (CDC, 2014a, 2014b). Recognizing the importance of communication to public health programs (Frieden, 2014; National Association of County and City Health Officials, 2015), CDC asked communities to use communication to share messages, activities, and success about programs with public, partner, and stakeholder audiences (CDC, 2014a, 2014b). To help communities successfully use communication, CDC provided guidance, resources, and technical assistance following a three-step approach (see Figure 2).

First, CDC asked communities to define their audiences and objectives. The intent was to identify and segment audiences by age, ethnicity, or other factors early in communication planning (Woolf et al., 2015). Communities also linked their communication activities to a larger program objective (e.g., Increase the number of SNAP recipients in Riverside who will have access to redeem SNAP benefits at farmers markets from 0 to 29,000 by September 2015). This ensured communication activities supported program efforts.

Second, CDC encouraged communities to learn about their audiences through focus groups, interviews, needs assessments, surveys, market research data, or other available data. Learning about audiences and their values, needs, or preferences informed communication activities and the overall program. Communities with limited resources and experience were also encouraged to work with partners to learn about their audiences. This was important since partners came from different sectors (e.g., academia, business, health care, local media outlets, transportation) and had different data or knowledge about audiences.

Third, CDC asked communities to create a communication plan. CDC provided a template or communication planning tool to help communities identify the program objective, communication objective, audience, activities, person or group responsible, financial and in-kind resources, and evaluation metrics (CDC, 2018). Communities created and used an annual communication plan to guide their communication activities. CDC also provided feedback on the plans and encouraged communities to review and update the plan throughout the year.

Here are a few REACH and PICH community examples of segmenting audiences for digital and social media efforts based on individual conversations and performance monitoring information. The Schenectady County Public Health Services (Schenectady County, NY) and Heart of Florida Health Center (Marion County, FL) both launched mobile phone applications to support healthy food efforts intended for low income and community residents. Marimn Health and the Coeur d'Alene Tribe in Idaho used Facebook to share videos using basic movements and cultural aspects of Pow Wow dancing to promote physical activity among Tribal members. The Cook County Department of Public Health (Cook County, IL) used geo-targeted advertisements to reach

residents in specific areas of the county and provide information on healthy foods and physical activity. The Kent County Health Department (Kent County, MI) used digital and social media advertisements to increase Facebook page interactions and promote physical activity with community members. Solano County Public Health (Solano County, CA) used digital advertisements to reach moviegoers and promote healthy food and tobacco-free places in their community.

Communities also worked with partners on communication efforts. The Cabarrus Health Alliance (Cabarrus County, NC) worked with a local minor league baseball team to promote new healthy concessions. The baseball team posted information on their Facebook page to reach the audience, and this helped increase visits and followers to the health department's Facebook page. The Cuyahoga County Board of Health (Cuyahoga County, OH) worked with radio stations to promote their work on shared-used facilities and healthy food. Radio stations used Facebook Live and Instagram to talk about the work; this helped reach the intended audience.

Case Study 2 Conclusions. Using the three-step approach, PICH and REACH communities identified and segmented their audience(s) for digital and social media efforts. Communication plans helped connect communication efforts to program objectives. Working with partners offered another way to reach audiences through a different channel and trusted messenger. Using this approach, other communities can successfully plan and implement audience-specific digital and social media efforts to support program efforts.

Case Study 3: The Public Good Projects

Media sources (television, radio, print news and magazines, online news, online video, blogs, and social media) now produce quintillion bytes of data a day (DOMO, 2018; IBM, 2019). Cisco Systems estimates that monthly Internet traffic in North America will reach 44.7 EB (EB is short for Exabytes. One billion Gigabytes [GB] equals one Exabyte) by 2021 (Cisco Systems, 2017). This increase is the result of a 20% compound annual growth rate in Internet traffic, which is remarkable given that 90% of the world's data was created in the last 2 years (IBM, 2019).

Public health and health care have used "big data" from media sources (Akay, Dragomir, & Erlandsson, 2015). However, the majority of existing public health and health care research has focused on social media data, used by university-based health researchers to assess public opinion, organization's social media use, evaluation of information accuracy, and disease surveillance (Fung, Tse, & Fu, 2015; Paul & Dredze, 2017; Tang, Bie, Park, & Zhi, 2018). The topic is of interest with approximately 2,100 peer-reviewed articles referencing "Twitter" or "Facebook" and "health" published since 2008 (National Center for Biotechnology Information, 2018). Many schools and programs of public health offer degree programs in Informatics, which may include social media data mining (Association of Schools & Programs of Public Health, 2018). PGP's experience is that industries (e.g., retailers, hospitality, travel) routinely perform media monitoring and explore hypotheses (Betancourt, 2010).

Within academia, researchers commonly use Twitter data when looking for population-level insights (Sinnenberg et al., 2017), routinely employing between 1% and 10% of Twitter's available data. Twitter allows third parties to download 1% of its data free of charge and makes these data easy for individuals to download without technical training. These two factors appear to have driven the field of media monitoring more than the need to show true representativeness, such as by triangulating data sources or using larger more robust datasets. Important research, such as the health information needs of the 2014 to 2016 Ebola outbreak (Odlum & Yoon, 2017), sentiment regarding diet and physical activity (Nguyen et al., 2017), real-time disaster response (Charles-Smith et al., 2015; Imran, Castillo, Lucas, Meier, & Vieweg, 2014), and illegal sales of opioids (Mackey, Kalyanam, Katsuki, & Lanckriet, 2017), have drawn conclusions from small percentages of one social media site's data (Twitter). Broadcast television, radio, print news and magazines, online news, and social media sites beyond Twitter and Facebook are rarely studied.

Public Health Monitoring. PGP collaborated with a variety of organizations, such as Kaiser Permanente; the West Orange Healthcare District; the National Academies of Sciences, Engineering, and Medicine; multiple state and local health departments; as well as the corporations Google, Facebook, and Zignal Labs, to advance public health monitoring techniques (The Public Good Projects, 2019a). PGP uses a combination of technologies to collect public data from websites, online video, social media (including 100% of Twitter), and other sources, to provide previously unavailable retrospective and real-time data for monitoring of issues important to public health. These data allow analysts to determine the public's knowledge, attitudes, and behaviors related to a specific health topic, the source and spread of facts and misinformation, differences in discourse by location, and uncover shifts in conversation following major events. Analysts can report trends over time to examine and predict how issues evolve. Additionally, PGP is able to identify and monitor bots (automated computer programs) and botnets (multiple bots controlled by one or many outside sources; United States Computer Emergency Readiness Team, 2011), which may be used to spread misinformation.

PGP's Opioid Monitoring. From September 2017 to October 2018, PGP analyzed more than 14 million individual mentions of keywords related to the opioid crisis. These mentions were collected across all previously described media types. Keywords include brand and generic names of opioids, as

well as "street names" of opioids, or slang terms referring to illicit opioids. Analyses were conducted using a combination of machine learning, natural language processing, and human coding using content analysis methodologies (i.e., interpreting and coding text material). PGP determined the United States public is predominately exposed to messaging that frames the opioid crisis in six distinct ways (The Public Good Projects, 2019b):

1. A policy debate occurring primarily among policy makers
2. The toll on families due to loss or addiction of a loved one
3. A criminal justice issue, focusing on punitive measures
4. The culpability of the health care system, and in particular, physicians
5. The culpability of the pharmaceutical industry
6. Frustration by those experiencing chronic pain, who believe they are reliant on opioids

Given that two of the six themes in the national dialogue relate to the culpability of the health care system and pharmaceutical industry, PGP concluded that erosion of trust in authorities and institutions may be of serious concern to those entrusted with the public's welfare (The Public Good Projects, 2019b). In addition to these six frames, PGP stated that little information was tailored for rural populations. Analyses also showed 18 to 25 year olds were not exposed to or shared messages, but older populations saw and shared messages regarding chronic pain (The Public Good Projects, 2019b). PGP analyses also indicated opioids may be sold illegally across many social media and websites, with different strategies employed on different sites and channels. Finally, PGP concluded the public receives very little information providing tangible calls-to-action (The Public Good Projects, 2019b). This extends beyond calls to learn more and educate oneself on the dangers of opioids. The scale of the opioid crisis necessitates local solutions and local calls-to-action (e.g., reducing exposure to opioids, overdose response). If the majority of Americans are viewing the opioid crisis as a distant policy debate, which the data seem to support, efforts to localize and personalize may help slow the drug overdose epidemic.

Case Study 3 Conclusions. Public media data can provide valuable information to researchers and health authorities regarding how public health topics are framed, who frames such topics, who receives messages related to those topics, and how those messages impact the conversation of the public and particular audience segments. Considering that such data are available, schools of public health and public health organizations may need to adapt course curriculums and professional training programs to bridge the skills gap between the public and private sectors. A limitation of the PGP example is that information is only on their website and a peer reviewed study or white paper is not available at this time. PGP states on their website that they are the only organization to continuously monitor multiple topics of public health concern across all publicly available media types. This monitoring is resource intensive and requires advanced public health and data science expertise.

Discussion

The three case studies show that digital segmentation for health promotion is becoming a widespread practice across the not-for-profit, government, and academic sectors. Community-based, regional, and national organizations in the United States are employing digital segmentation to customize, increase reach and frequency of exposure, and maximize impact of health promotion and disease prevention messages. These efforts are reaching priority populations ranging from low-income individuals, to multicultural audiences, to numerous groups facing health disparities. Digital segmentation is growing and becoming standard practice for public health.

Some additional themes about digital segmentation practice emerge from the case studies. First, digital segmentation enables public health organizations to increase reach and frequency of exposure to messages over time, making them highly relevant for emerging and acute health crises. The Truth Initiative case showed that large number of digital impressions can be generated in a matter of weeks to combat threats such as smoking. Maximizing impressions can spread awareness of health threats and potentially create diffusion effects that can assist public health in combating emergent crises (Neiger et al., 2012).

Second, digital segmentation, and tracking of exposure among segmented populations, enables public health organizations to gain valuable audience insights. Media consumption, propensity to view online content, time spent viewing videos, and engagement metrics (digital media behavior and subsequent online and offline outcomes) can all be monitored. The PGP case demonstrated other ways to gain insights from real-time public data, thus potentially leading to improved programming and content. This information can help public health organizations improve public health knowledge, increase prevention and health promoting behaviors, and combat the effects of competing messages delivered from industry through digital channels (Stephen, 2016). Such industry efforts may reduce public trust in digital marketing, and countermarketing using digital segmentation may have the added benefit of counteracting this erosion of trust. Audience insight is a cornerstone of social marketing, and digital segmentation shows significant promise to advance the state of science in how to effectively reach and influence multiple audiences for pro-social and behavior change (Google Developers, 2018).

Third, digital segmentation creates opportunities for synergies between public health organizations and the digital technology industry. Each of the case studies highlights different ways in which the implementing organizations leveraged technology platforms such as Google, Facebook, Twitter, as well as partners in health care (e.g., Kaiser Permanente), and in local communities using digital segmentation to achieve programmatic objectives. Collaborations between public health and digital technology companies offer future opportunities to increase the reach and effectiveness of health interventions, and to expand and deepen the potential impact of corporate social responsibility and philanthropic efforts (Wang, Tong, Takeuchi, & George, 2016).

There are important ethical considerations for public health organizations using digital segmentation. The same audience insights that can improve digital programming and content also have potential to compromise individuals' privacy, including the most vulnerable among us. As seen in recent efforts by foreign and domestic U.S. actors to influence public opinion, attitudes, and behaviors ranging from health to civic engagement, digital audience insights cut both ways (Director of National Intelligence, 2018). Public Health has a significant opportunity to lead future efforts to ensure that digital segmentation is used for prosocial objectives, which will promote public trust in their use and serve a constructive purpose in improving social change programs and promoting constructive online dialogue. The CDC community-engagement examples highlight important strategies and approaches to building community buy-in and co-creation of digital segmentation and sharing of insights for mutual benefit.

One approach to building support for, and effective use of, digital segmentation strategies is to promote their inclusion in professional health-related conference programs and online forums. Content presented on digital segmentation should include discussion of its ethical use. These efforts may serve to enhance message source credibility of public health digital marketing (Kumkale, Albarracín, & Seignourel, 2010).

Finally, more rigorous digital media research and campaign evaluations could aid understanding and refinement. There is a dearth of longitudinal, experimental, and quasi-experimental studies that (1) effectively measure the dosage and exposure of segmented audiences to digital media and (2) evaluate health and behavioral outcomes in relation to digital segmentation efforts. A recent meta-analysis demonstrated there was a positive relationship between social media use and civic participation cross-sectionally (Boulianne, 2015). Yet this effect was not found in a longitudinal study design. Others have pointed to a need to focus efforts beyond "likes" and toward individual and/or network characteristics as predictors of engagement (Jobs & Gilfoil, 2014; John, Emrich, Gupta, & Norton, 2017; Liang & Fu, 2015). Overall, additional information can inform how and to what extent digital message exposure and engagement influences behavior over time, across platforms, and among multiple devices for the same individuals.

Conclusions

Digital segmentation, widely practiced in commercial marketing and near omnipresent online, is now rapidly growing as a standard public health practice. The use of digital segmentation may enhance health behavior change campaigns. Recent digital segmentation efforts in the not-for-profit, government, and academic sectors show that it increases reach and frequency of messages delivered to priority populations. There is an opportunity to enhance optimization its use and effectiveness in promoting health behavior change campaign outcomes.

Authors' Note

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