AMERICAN JOURNAL OF
Preventive Medicine

BRIEF REPORT

Dissemination of Technology to Evaluate Healthy Food Incentive Programs

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Introduction: Federal policy supports increased implementation of monetary incentive interventions for chronic disease prevention among low-income populations. This study describes how a Prevention Research Center, working with a dissemination partner, developed and distributed technology to support nationwide implementation and evaluation of healthy food incentive programming focused on Supplemental Nutrition Assistance Program recipients.

Methods: FM Tracks, an iOS-based application and website, was developed to standardize evaluation methods for healthy food incentive program implementation at direct-to-consumer markets. This evaluation examined diffusion and adoption of the technology over 9 months (July 2015–March 2016). Data were analyzed in 2016.

Results: FM Tracks was disseminated to 273 markets affiliated with 37 regional networks in 18 states and Washington, DC. All markets adopted the sales transaction data collection feature, with nearly all recording at least one Supplemental Nutrition Assistance Program (99.3%) and healthy food incentive (97.1%) transaction. A total of 43,493 sales transactions were recorded. By the ninth month of technology dissemination, markets were entering individual sales transactions using the application (34.5%) and website (29.9%) and aggregated transactions via website (35.6%) at similar rates. Use of optional evaluation features like recording a customer ID with individual transactions increased successively with a low of 22.2% during the first month to a high of 69.2% in the ninth month.

Conclusions: Systematic and widely used evaluation technology creates possibilities for pragmatic research embedded within ongoing, real-world implementation of food access interventions. Technology dissemination requires supportive technical assistance and continuous refinement that can be advanced through academic–practitioner partnerships.

INTRODUCTION

Prevention Research Centers (PRCs) have a 30-year history conducting applied public health research to reduce chronic disease. PRCs are grounded in the realities of diverse contexts and populations, making them nimble to tailor prevention research with shifting methodologic landscapes and population health needs.

A current methodologic shift is the use of information technology for intervention delivery and data collection.[1,2] The ubiquity of technology access furthers the role PRCs can fulfill to develop and disseminate evaluation technology focused on chronic disease prevention.[3]

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This article is part of a supplement issue titled Prevention Research Centers Program – 30th Anniversary: Translating Applied Public Health Research into Policy and Practice.

0749-3797/$36.00

http://dx.doi.org/10.1016/j.amepre.2016.08.036

Another methodologic shift is related to intervention strategies aimed at creating healthy contexts.[4] Food access interventions are an exemplar of this approach.[5,6] Monetary incentive programs extend built environment interventions to make healthy choices more affordable.[7] In the Agriculture Act of 2014 (i.e., Farm Bill) passed by the U.S. Congress, $100 million was allocated for the Food Insecurity Nutrition Incentive program to support healthy food incentive programs for Supplement Nutrition Assistance Program (SNAP) recipients.[8]

Convergence of these trends created an opportunity for the Prevention Research Center for Healthy Neighborhoods (PRCHN) at Case Western Reserve University to develop and disseminate technology to support nationwide implementation and evaluation of incentive programs. This study examines dissemination and adoption of new technology designed to standardize and systematically evaluate incentive program implementation at direct-to-consumer markets like farmers' markets and mobile markets (henceforth "markets").

METHODS

Researchers at PRCHN developed FM Tracks, an iOS-based application (app) and website based on a decade of experience using paper-based methods for evaluating farmers' markets.[9] FM Tracks is designed for use by market staff to record customer utilization of SNAP benefits and SNAP-based healthy food incentives. Sales transactions can be recorded individually, by app or website, or in aggregate by website. Evaluation capacity includes additional features to assess repeat customer trends, customer characteristics and feedback, and market trends and context. Table 1 provides a summary of FM Tracks features. These features and data can be accessed by end users to observe real-time trends via a data dashboard.

The Knowledge to Action Framework highlights dissemination and translation as a two-way dialogue, involving partnerships with research and practice sectors.[10] In January 2015, PRCHN established an academic–practitioner partnership with Wholesome Wave (WW), a national non-profit supporting healthy food incentive programming, to integrate real-world experience into development. The partnership expanded PRCHN's reach of this new technology and improved WW's capacity to support data-driven decision making regarding healthy food incentive interventions. PRCHN led FM Tracks technology co-development including pre-testing and formative evaluation. As a dissemination partner, WW developed formal training materials (e.g., webinars, toolkits); provided technical assistance; and enrolled end users through a diffusion model that targeted regional networks supporting individual markets.

End users for this analysis included all markets using FM Tracks for reporting requirements as a part of two Food Insecurity Nutrition Incentive grants affiliated with WW awarded in April 2015. Markets are connected to regional networks that coordinate local incentive programming. The authors examined adoption of FM Tracks during the first 9 months of technology dissemination (July 2015–March 2016). Dissemination Phase 1 represented initial rollout of technology, materials, and training, which were refined before Phase 2. Descriptive statistics were analyzed in SPSS, version 23, and spatial analysis in ArcMap, version 10.3, in 2016. Technical assistance logs recorded by WW and key informant interviews (N=10) conducted jointly by PRCHN and WW were analyzed using a team-based thematic approach. The Case Western Reserve University IRB approved the study.

RESULTS

FM Tracks was disseminated on a rolling basis to 37 regional networks in 18 states and Washington, DC. Within these networks, 273 markets (1–44 markets per state) used FM Tracks (Figure 1).

All 273 markets used at least one data entry method to record at least one sales transaction (Table 1). The highest adoption rate was for entry of aggregated sales transactions using the website (68.9%) compared with individual transactions via app (23.8%) or website (52.0%). Nearly all markets (99.3%) recorded at least one SNAP transaction, and 97.1% recorded at least one healthy food incentive transaction. Recording other payment types such as credit/debit is optional. Thus, even these low adoption rates indicate markets are extending use of FM Tracks beyond program evaluation into their business operations. Market metrics were recorded by 75.8% of the markets and 94.9% recorded post market trends at least once. The unique customer ID feature to link customer sales transactions over time was used by 72.4% of the markets recording individual sales transactions via app or website (n=156). Most markets using the app (n=65) used the optional new (83.1%) and repeat (63.1%) customer evaluation questions at least once.

In all, 43,493 sales transactions were recorded with higher numbers during dissemination Phase 1 corresponding to peak market season for many states (Table 2). During Phase 1, most transactions were recorded retrospectively using the website. The majority were recorded in aggregate format limiting opportunities to evaluate customer-level trends by linking transactions with a customer ID. Qualitative data revealed that low adoption of the app was related to inopportune timing of technology release, challenges transitioning to new data collection methods, limited availability of mobile technology, general discomfort with technology, and frustrations with software glitches. Phase 1 informed updates to the technology, training materials, and workflow strategies to maximize utilization of app evaluation capacity through retrospective data entry using customized worksheets that included additional FM Tracks evaluation features (e.g., new customer questions). During Phase 2, there was a steady decline in aggregate data entry and steady increase in data entry via the app. By the ninth

Table 1. Usage of Data Entry Method and Features of FM Tracks Evaluation Technology by Direct-to-Consumer Markets (N=273) From July 2015 to March 2016

Method or feature	Description	Markets using feature ≥1 times, *n* (%)
Data entry method for sales transactions		
Overall (use of at least one method)	Sales transactions recorded via app or website, individually or in aggregate	273 (100)
Website (aggregate)	Aggregation of sales by payment type recorded retrospectively via website based on manual logs to batch transactions that are not tracked by customer ID; this can be for all payment types or for select payments such as credit/debit that are not tracked for evaluation purposes	188 (68.9)
Website (individual)	Single sale retrospectively recorded via website based on manual logs allowing for customer ID to link transactions	142 (52.0)
App (individual)	Single sale recorded either in real time or retrospectively on the same day allowing for maximum evaluation capacity to record new and repeat customer questions linked by customer ID	65 (23.8)
Record of sales transactions by payment type		
Overall (all payment types)	Payment type and amount per sale transacted at central point of purchase at market	273 (100)
Supplemental Nutrition Assistance Program (SNAP)	Payment by beneficiary via electronic benefit transfer to purchase any SNAP-eligible food and transacted at central point of purchase	271 (99.3)
Credit/Debit	Credit/debit payments at direct-to-consumer markets are transacted either directly with vendors or at a central point of purchase	46 (16.8)
Cash	Most cash payments at direct-to-consumer markets are transacted directly to vendors unless purchasing goods available at central point of purchase (e.g., market T-shirt)	30 (11.0)
Produce prescription	Coupons given to patients by a healthcare professional to reduce costs of purchasing fresh fruits and vegetables for health promotion and disease prevention available at select markets and transacted at central point of purchase	16 (5.9)
Senior Farmers' Market Nutrition Program	Coupons available in select states and counties for low-income seniors to access farmer-grown fruits and vegetables at no cost and are typically transacted directly with vendors unless the direct-to-consumer market distributes additional incentives for these coupons at central point of purchase	10 (3.7)
WIC Farmers' Market Nutrition Program	Coupons available in select states and counties for participants in the Women, Infants, and Children (WIC) program to access farmer-grown fruits and vegetables at no cost and are typically transacted directly with vendors unless the direct-to-consumer market distributes additional incentives for these coupons at central point of purchase	8 (2.9)
WIC cash value voucher	Monthly vouchers available nationwide to participants in the Women, Infants, and Children (WIC) program to purchase fresh, frozen, canned, or dried fruits and vegetables and are typically transacted directly with vendors unless the direct-to-consumer market distributes additional incentives for these coupons at central point of purchase	7 (2.6)
Check	Most check payments at direct-to-consumer markets are transacted directly to vendors unless purchasing goods available at central point of purchase (e.g., market T-shirt)	3 (1.1)
Healthy food incentive program		
Distribution of incentive funds	Healthy food incentive type and amount per transaction distributed at central point of purchase at market	265 (97.1)
Market operations		
Post market trends	Five questions recorded after each market day to track trends related to (1) amount of SNAP and incentive redemption by vendors and (2) number of vendors overall, able to accept SNAP, and selling fruits and vegetables	259 (94.9)

(continued on next page)

Table 1. Usage of Data Entry Method and Features of FM Tracks Evaluation Technology by Direct-to-Consumer Markets (N=273) From July 2015 to March 2016 *(continued)*

Method or feature	Description	Markets using feature ≥1 times, *n* (%)
	Optional post-market questions may be selected by markets for individualized tracking (e.g., events on market day, weather)	
Market metrics	Recorded annually to document market management structure, community context, vendor information, and outreach strategies	207 (75.8)
Optional unique customer ID (among markets recording individual transactions via app or website, *n*=156)[a]		
Overall (use of either ID option)	Unique ID used to link customer sales transactions over time; only available with individual sales transaction recorded via app or website	113 (72.4)
Standard format	Six-digit format based on name and birth year	98 (62.8)
Alternative format	Other IDs recorded based on local methods or engagement in research or other programs	45 (28.9)
Optional customer evaluation questions (among markets recording transactions via app, *n*=65)[a]		
New customer	Four optional close-ended questions answered by customers at the time of their transaction: (1) How did you hear about this market? (2) Have you ever shopped at this market before today? (3) Is this your first time ever shopping at any farmers' market? and (4) What is your ZIP code?	54 (83.1)
Repeat customer	Three optional close-ended questions selected by market, network, or national staff to evaluate customer satisfaction or impact of market on health, economic, and social development; Evaluation questions drawn from national data sources (e.g., Census, Behavioral Risk Factor Surveillance System) to support comparative analysis	41 (63.1)

[a]Optional features allow end-users flexibility to tailor evaluation capacity within a consistent framework.

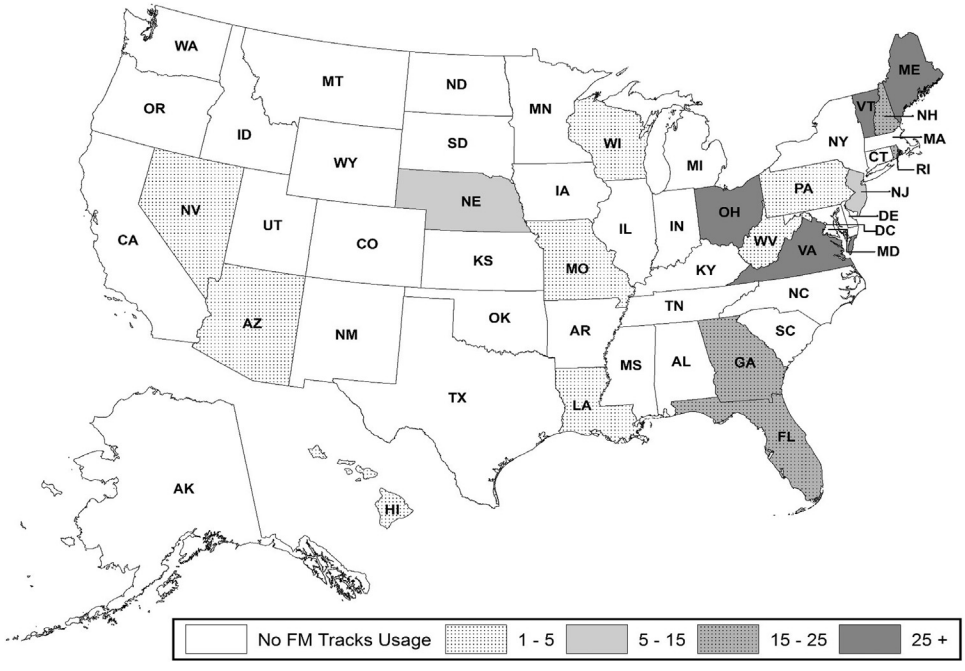

Figure 1. Number of direct-to-consumer markets per state using FM Tracks technology, July 2015–March 2016.
Note: The geographic distribution of 273 direct-to-consumer markets using at least one feature of FM Tracks during the first 9 months of technology dissemination (July 2015–March 2016).

Table 2. Percentage of Sales Transactions (N=43,493) Recorded in FM Tracks Evaluation Technology by Data Entry Method and Use of Optional Customer ID, July 13, 2016–March 15, 2016

	Dissemination Phase 1				Dissemination Phase 2				
	2015						2016		
Variable	July	August	September	October	November	December	January	February	March
Total transactions, *n*	4,472	10,297	9,667	7,605	3,460	2,345	2,308	2,173	1,166
Data entry method for sales transactions, %									
App (individual)	0.51	5.5	7.8	6.8	16.2	25.6	31.2	35.6	34.5
Website (individual)	31.5	33.9	27.8	26.7	22.2	25.2	29.4	32.0	29.9
Website (aggregate)	68.0	60.6	64.4	66.5	61.6	49.2	39.3	32.4	35.6
Use of optional customer ID with individual transactions recorded via app or website, %									
Standard ID format	22.2	35.8	45.6	48.4	63.3	69.0	67.4	69.2	69.2
Alternative ID format	4.1	7.8	8.0	2.1	2.4	2.4	3.1	5.5	5.2

month of technology dissemination, markets were using the app (34.5%); website for individual entry (29.9%); and website for aggregate entry (35.6%) at similar rates.

A customer ID can only be recorded with individual transactions. A standard customer ID format was initially proposed for use across all markets. Among the 156 markets recording individual sales transactions, use of the standard customer ID increased successively during nearly every month with a low of 22.2% during the first month and a high of 69.2% in the ninth month. Phase 1 feedback revealed some market managers were uncomfortable asking customers to create the standard customer ID. Accordingly, 45 markets adopted an alternative customer ID format that was recorded with 2.1%–7.8% of the transactions over the 9 months.

DISCUSSION

The case of FM Tracks shows that PRCs can contribute to implementation and evaluation of food access interventions through the development and dissemination of evaluation technology and establishment of practitioner partnerships. Adoption of the primary features of FM Tracks related to sales transactions occurred across all markets, and there was a positive adoption trend for use of additional evaluation features. Findings highlight the importance of enhancing website capacity and the benefits of developing additional features to align the software with a market's business goals beyond program evaluation. Technology refinement and dissemination requires bidirectional systems to transfer feedback between researchers and end users that can be advanced through academic–practitioner partnerships.[10]

CONCLUSIONS

With increasing support for community-level health interventions,[4,11,12] there is a need for technology to collect the same outcomes using the same format to evaluate widescale impacts.[13] Technology like FM Tracks will expedite data aggregation for rapid evaluation to inform practice and policy.[14]

ACKNOWLEDGMENTS

This publication is a product of the Prevention Research Centers Program at the Centers for Disease Control and Prevention. The findings and conclusions in this publication are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the U.S. Department of Agriculture.

The authors acknowledge the contributions of Julia Pon, Nicole Vaudrin, David Hurt, and Oleg Fridman for their support of technology development and to the network and market managers using FM Tracks. This research is a product of the Health Promotion and Disease Prevention Research Center supported by Cooperative Agreement 1U48DP005030 from the Centers for Disease Control and Prevention, Grant 2B01OT009042-14 from the Centers for Disease Control and Prevention, and by Grants 2015-70018-23350 and 2015-70018-23353 from the U.S. Department of Agriculture. This study was approved as an exempt protocol by the Case Western Reserve University IRB (protocol no. IRB-2014-903). D. Freedman conceptualized the study and coordinated all writing; A.

Hunt and K. Merritt contributed to data acquisition and manuscript development; E. Shon and S. Pike contributed to data analysis and manuscript development. All authors reviewed and approved the final version of the manuscript. D. Freedman invented intellectual property being evaluated for commercialization by an outside entity. Case Western Reserve University is the owner of the invention being commercialized with this outside entity, and as such, could have financial benefit, such as royalties or other income. A. Hunt is a consultant to Wholesome Wave. K. Merritt, E. Shon, and S. Pike have no financial disclosures. FM Tracks is available at https://access.fmtracks.org/#/registration/market.

REFERENCES

1. Oldenburg B, Taylor CB, O'Neil A, Cocker F, Cameron LD. Using new technologies to improve the pevention and Mmanagement of chronic conditions in populations. *Annu Rev Public Health*. 2015;36(1):483–505. http://dx.doi.org/10.1146/annurev-publhealth-031914-122848.
2. Chen H, Hailey D, Wang N, Yu P. A review of data quality assessment methods for public health information systems. *Int J Environ Res Public Health*. 2014;11(5):5170–5207. http://dx.doi.org/10.3390/ijerph110505170.
3. Friede A, Blum HL, McDonald M. Public health informatics: How information-age technology can strengthen public health. *Annu Rev Public Health*. 1995;16(1):239–252. http://dx.doi.org/10.1146/annurev.pu.16.050195.001323.
4. Frieden TR. A framework for public health action: the health impact pyramid. *Am J Public Health*. 2010;100(4):590–595. http://dx.doi.org/10.2105/AJPH.2009.185652.
5. U.S. Department of Agriculture. *Access to Affordable and Nutritious Food: Measuring and Understanding Food Deserts and Their Consequences*. Washington, DC: Economic Research Service, U.S. Department of Agriculture; 2009.
6. Satia JA. Diet-related disparities: understanding the problem and accelerating solutions. *J Am Diet Assoc*. 2009;109(4):610–615. http://dx.doi.org/10.1016/j.jada.2008.12.019.
7. CDC. *State Indicator Report on Fruits and Vegetables, 2009: National Action Guide*. Atlanta, GA: CDC, 2009.
8. 113th Congress of the USA. Agricultural Act of 2014, H.R.2642. www.fns.usda.gov/sites/default/files/Agriculture%20Act%20of%202014.pdf. Published 2014.
9. Freedman DA, Mattison Faye A, Alia K, Guest MA, Hebert JR. Comparing farmers' market revenue trends before and after the implementation of a food assistance monetary incentive intervention. *Prev Chronic Dis*. 2014;11:130347. http://dx.doi.org/10.5888/pcd11.130347.
10. Wilson KM, Brady TJ, Lesesne C, on behalf of the NCCDPHP Work Group on Translation. An organizing framework for translation in public health: The knowledge to action framework. *Prev Chronic Dis*. 2011;8(2).
11. IOM. *Accelerating Progress in Obesity Prevention: Solving the Weight of the Nation*. Washington, DC: National Academies of Science; 2012.
12. CDC. *Strategies to Prevent Obesity and Other Chronic Diseases: The CDC Guide to Strategies to Increase the Consumption of Fruits and Vegetables*. Atlanta, GA: U.S. DHHS; 2011.
13. Blanck HM, Kim SA. Creating supportive nutrition environments for population health impact and health equity: an overview of the nutrition and obesity policy research and evaluation network's efforts. *Am J Prev Med*. 2012;43(3 suppl 2):S85–S90. http://dx.doi.org/10.1016/j.amepre.2012.06.005.
14. Patsopoulos NA. A pragmatic view on pragmatic trials. *Dialogues Clin Neurosci*. 2011;13(2):217–224.