# A Longitudinal Implementation Evaluation of a Physical Activity Program for Cancer Survivors: LIVESTRONG® at the Y.

**Jamie M Faro** ( jamie.faro@umassmed.edu )
University of Massachusetts Medical School https://orcid.org/0000-0002-6592-463X

**Hannah Arem**
George Washington University

**Ann-Hilary Heston**
YMCA of the USA

**Katherine H Hohman**
YMCA of the USA

**Heather Hodge**
YMCA of the USA

**Bo Wang**
University of Massachusetts Medical School

**Stephenie C Lemon**
University of Massachusetts Medical School

**Thomas K Houston**
Wake Forest University School of Medicine

**Rajani S Sadasivam**
University of Massachusetts Medical School

---

**Short report**

**Keywords:** Cancer, Physical Activity, Implementation, Evaluation, Community-Based

**Posted Date:** April 26th, 2020

**DOI:** https://doi.org/10.21203/rs.2.21636/v2



---

**Version of Record:** A version of this preprint was published on July 8th, 2020. See the published version at https://doi.org/10.1186/s43058-020-00051-3.

# Abstract

Purpose: Increased physical activity (PA) levels in cancer survivors are associated with decreased risk of recurrence and mortality as well as additional positive health outcomes. PA interventions have shown to be efficacious, though many lack translation to and sustainability in community settings. We used dimensions of the RE-AIM framework to evaluate LIVE STRONG® at the YMCA, a nation-wide community-based PA program for cancer survivors delivered at Ys.

Methods: LIVE STRONG at the Y national data compiled by YMCA of the USA and Y Association Program Managers between the years of 2010-2018 was examined. We assessed reach (number of participants), adoption (Associations offering the program), implementation (conducting 3 fidelity checks), setting-level maintenance (Associations recently offering program) and participant-level maintenance (membership conversion rate). We also examined relationships between organizational characteristics (years of program existence and Association area household income), and program implementation factors with member conversion.

Results: As of 2018, LIVE STRONG at the Y has reached 62,044 survivors and 245 of the 840 (29.2%) of Y Associations have adopted the program. Among the adopters, 91% were aware of fidelity checks; implementation of Observational (62.3%), Goal-setting (49.9%), and Functional (64.6%) checklists varied. Most (95.1%) adopters reported offering ≥1 LIVE STRONG session per year (setting-level maintenance) and a facility-level mean membership conversion percentage of 46.9±31.2% (participant-level maintenance). Fewer years implementing the program and higher Association area household income were significantly associated with a greater membership conversion rate vs their comparison (all t-test p's <0.05). In a multiple regression model controlling for organizational characteristics, conducting the fidelity checks (Observational, β=8.41; Goal-setting, β=9.70; and Functional, β=9.61; all p's <0.01) was positively associated with higher membership conversion rates.

Conclusions: LIVE STRONG at the Y, in its early years, has shown promise for high reach, while adoption at more Associations could be facilitated. Implementing fidelity checks along with organizational characteristics were associated with higher participant-level maintenance. Identification of Association-level strategies to increase reach, adoption, implementation and maintenance may increase the impact of this community-based PA program.


# Background

In the United States, the number of cancer survivors has increased steadily as cancer death rates have decreased [1]. There were 16.9 million survivors in 2018, a number which is expected to increase to 20.3 million by 2026 [2]. Health priorities among survivors include decreasing risk of cancer recurrence, improving quality of life and mental health outcomes and general health promotion [3]. Regular physical activity (PA) has been associated with lower secondary cancer recurrence and improvements in quality of life, fatigue, fitness, body composition, mood, self-esteem and physical function [4-6]. The American

College of Sports Medicine has determined the efficacy and safety of PA for survivors [7]. American Cancer Society (ACS) guidelines recommend engaging in 150 minutes of moderate-to-vigorous physical activity and two days of strength training per week [8]. However, less than <30% of survivors are meeting guidelines [9].

In 2007 the YMCA of the USA (Y-USA) partnered with LIVE**STRONG®** to design an evidence-based 12-week exercise intervention free of cost for cancer patients and survivors, LIVESTRONG at the Y [10]. In brief, trained Y instructors facilitate two weekly sessions over 12 weeks to improve participants aerobic fitness, muscle mass, strength flexibility and balance, and social support. The program has evidenced increases in cardiorespiratory fitness, PA levels and quality of life [11, 12]. Since the initial pilot in 2008, a national infrastructure was created to increase its dissemination and implementation [10]. Since 2010, Y-USA has collected nationwide data about the program [13]. While a prior study reported on the reach and adoption of the program as of 2015 [10], the public health field is lacking an examination of the implementation, organizational maintenance and participant-level maintenance in this evidence-based program. As survivorship numbers grow and PA program effectiveness data increases, the need for national dissemination of programs addressing survivor needs has become evident [10].

The objective of this longitudinal study was to assess implementation outcomes of LIVE**STRONG** at the Y using nationwide data collected by the Y-USA between 2010 through 2018 [13]. To conduct this analysis, we used the RE-AIM (Reach, Effectiveness, Adoption, Implementation and Maintenance) framework. RE-AIM is concerned with issues related to impact in real-world settings, incorporates both individual and organizational setting level variables and describes the population-based impact of an intervention [14]. Participant-level maintenance ensures the long-term benefits the program provides to survivors; thus, a secondary aim was to determine associations between organizational characteristics and implementation measures with this RE-AIM metric. LIVE**STRONG** at the Y is the only nationwide community-based physical activity program for survivors and has been in existence for over a decade. Thus, gaining a better understanding of this large public health program that has been adopted, implemented and maintained in real-world settings is critical to advance the field of PA and cancer survivorship. As data in this study are provided by community workers and not researchers, we are limited in some metrics and unable to examine all RE-AIM aspects. For example, effectiveness data of participant-level outcomes was not provided in this dataset but has been shown elsewhere [12, 15].

# Methods

### Study Design and Participants:

This was a longitudinal study design using data collected by Y-USA about the LIVE**STRONG** at the Y program between 2010-2018. The Y serves 22 million people in over 800 Associations and 2,700 individual branches across all 50 states. Y Associations may consist of a single or multiple branches (up to 40) within their Association and operate independently of other Associations. The process of becoming a LIVESTRONG at the Y provider has been described elsewhere [10]. In brief, YMCAs interested

in becoming providers apply to the Y-USA and complete a simple readiness assessment scored by two reviewers. If the YMCA receives a score indicating they have the capacity to become a provider, they will move on to complete a 6-month on-boarding and learning process. The Y-USA is the national resource office for all Ys and exists to serve Ys. Y-USA offers technical and administrative support throughout, though Association Program Directors are responsible for marketing, administration, oversight and funding within their Association This study was approved by the Institutional Review Board of the University of Massachusetts Medical School.

### Data Sources

Data for this study included 1) Routine evaluation data collected between January 2010 to June 2018 from Association Program Directors and 2) 2010 US Census data. Y data included organizational characteristics, overall number of participants completing the program (as well as broken down by priori membership or decision to join after the program), awareness and implementation of three fidelity check tools separately. Reporting of all data by Program Directors is encouraged, but not required. Program data is sent to Y-USA quarterly: January 1$^{st}$ – March 31$^{st}$, April 1$^{st}$ – June 30$^{th}$, July 1$^{st}$ - September 30$^{th}$ and October 1$^{st}$ - December 31$^{st}$. 2010 U.S. Census data were used to assess household income of each Association.

# Measures

## Reach and Adoption

Reach has been identified as the absolute number, proportion and representativeness of individuals who are willing to participate in an intervention{Glasgow, 1999 #79}. While prior studies have examined representativeness on a small scale [12, 15], we did not have access to these data. To participate in LIVESTRONG at the Y, participants must 1) Be aged 18 years of older, 2) Have a previous cancer diagnosis, 3) Receive medical clearance, and 4) Be able to attend most sessions. Due to these criteria, we were unable to determine a denominator (number of eligible participants) to determine the proportion of individuals participating. For these reasons and due to data limitations, reach was defined as the of the absolute number of participants completing the program. Adoption was conceptualized as the percentage of Associations (out of all possible eligible Associations) becoming approved LIVE**STRONG** at the Y providers and offering at least 1 session/year. We calculated this rate as the number of approved LIVE**STRONG** at the Y Association providers divided by the total number of Y Associations.

*Implementation*

Implementation refers to the extent to which a program is delivered as intended [13]. Fidelity checklists were designed specifically for LIVESTRONG at the Y by the program developers and implemented from January 2017- June 2018. Program Directors were encouraged to use three fidelity tools conducted at

least annually to ensure the program was being delivered as intended: 1) Observation Assessment Tool - Used by the Program Director to observe each Instructor conducting a session, 2) Instructor Goal Setting – Following feedback from the observation, the Instructor and Program Director worked collaboratively to identify the Instructor's areas of strength and opportunities for improvement and document these goals, and 3) Functional Assessments Checklist – Program Directors observed a minimum of two Functional Assessments (baseline or 12-weeks) implemented by program Instructors. Implementation was conceptualized as the percentage of Associations implementing fidelity checks during each reporting quarter. Program Directors reported on whether they were aware of the fidelity checklists (yes/no) and whether they completed each of the three fidelity checks (yes/no).

*Maintenance*

We defined organizational-level maintenance as the percentage of Associations offering at least one 12-week session since the last full reporting year, 2017 divided by the total number of on-boarded Associations. At the participant-level, we conceptualized maintenance as the percentage of non-members purchasing a membership following the programs cessation. Membership conversion rate (rate of non-members purchasing membership) may serve as a proxy to the lack of national-level PA data following program cessation and has been shown to predict future PA [16]. Program Directors reported the number of members and non-members who completed the program and the number of non-members who became members following the program. We divided the total number completing the program who became members by the total number of non-members completing program to obtain this rate.

## Organizational Characteristics

Y-USA maintains the number of years the Association has implemented the program along with the city and zip code of the corporate branch. We categorized the duration of program implementation into low and high, by splitting Associations on the median number of years (n=7) offering the program. Using U.S. Census Bureau [17], median household income data was collected for each Association. The sample's area household income was divided at the median ($47,300) to classify into high and low household income.

# Statistical Analyses

Descriptive statistics were calculated. Independent *t* tests were used to compare membership conversion rates between organizational characteristics and implementation of fidelity checklists. Due to the variability of implementing 1, 2, and all 3 checklists, we ran all checklist models independently and cumulatively. We followed bivariate analyses with multiple linear regression analyses adjusted for organizational characteristics. These were used to determine the independent relationships between implementation of fidelity checks and membership conversion rate. Separate models were run for all 3 fidelity variables, in addition to a 4$^{th}$ model run using all 3 fidelity variables. Missing data were removed

from the analyses. Analyses were conducted using STATA. All statistical tests were two-tailed and considered significant at $p<0.05$.

# Results

Descriptive statistics for organizational characteristics are shown in Table 1.

INSERT TABLE 1

*Reach and Adoption*

Figure 1 shows the number of participants completing the program per year. In 2010, 4,019 participants had completed the program, with that number increasing to 62,044 by 2018. The number of participants completing the program has steadily increased, with more rapid increases in recent reporting years. Figure 2 shows the number of Associations offering the program per year. The adoption rate steadily increased apart from 2014-2015 and was 29.2% as of June 2018.

Figure 1. Cumulative number of participants completing the program between the years of 2010 and 2018.

Figure 2. Adoption rate and number of Associations trained to deliver LIVE**STRONG** at the Y between the years of 2010 and 2018.

*Implementation*

During 2017-2018, an estimated 91% (n=233) of Y Associations offering LIVE**STRONG** at the Y were aware of the fidelity checklists. Of those aware of checklists, 62.6% implemented the observational assessment checklist, 50.2% the goal-setting checklist and 65.1% the functional assessment checklist. Of those Associations aware of all checklists, 62.3% implemented the observational assessment checklist, 49.9% the goal-setting checklist and 64.6% the functional assessment checklists, while only 40% (implemented all three checklists. Thus, of the Associations aware of the checklists (n=223), 144 did not implement all three checklists.

*Maintenance*

At the organizational level, sessions were offered during 68.2% of possible reporting quarters, while 95.1% of all on-boarded Associations offered at least one session since the reporting year 2017. At the participant-level, the mean membership conversion rate was 46.4% ± 30.9, with a range from 0 to 100%.

*Factors associated with participant-level maintenance*

Membership conversion rates were significantly greater in Associations that implemented observational, goal-setting and functional checklists independently (See Table 2). We found similar results for those

Associations implementing all three checklists. In a linear regression model adjusting for organizational characteristics, implementing observational (β=8.40, 95% CI 3.33–14.67), goal-setting (β=9.7, 95% CI 4.85–16.63) and functional (β=9.61, 95% CI 3.98-15.6) checklists independently and collectively (β=10.82; 95% CI 5.90-16.80) were significantly associated with greater membership conversion rates. Associations implementing the program for < 7 years had a significantly greater membership conversion rate than those implementing for ≥ 7 years. Membership conversion rate was significantly greater in higher household income areas as compared to lower household income areas (48.5 vs. 44.29; See table 2).

INSERT TABLE 2

# Discussion

Our results suggest that while LIVES**TRONG** at the Y has linearly increased its participant reach and organizational adoption rates, it has room to continue to grow. Implementing community-based programs with high fidelity is challenging, and our findings suggest implementation measures of fidelity checks can be improved, While the data only shows whether checks were implemented and not actual fidelity to the program, we did find implementing checks were associated with participant-level maintenance. Further, we found that area household income was associated with participant-level maintenance. This supports the notion that inequities exist in survivor PA, and potentially access to community-based programs, in low socioeconomic status areas [18].

The estimated 60,000 survivors that the program has reached is only a small fraction of the roughly 16.9 million survivors in 2018 [2]. Increasing the number of participants is an important research priority. A prior examination of a subset of program participants (7%) showed the highest reported method of referral to LIVE**STRONG** at the Y was from a doctor or other healthcare professional [10]. Providers may serve on the front line to screen and refer patients to appropriate programs that fit their medical, geographic, social and economic preferences [19]. Recent health reforms have placed an emphasis on using electronic medical health records for surveillance [20]. Thus, integrating PA surveillance into standard of care may provide better insight into patient characteristics, medical clearances and referral to appropriate PA programs, such as LIVE**STRONG** at the Y.

Reach may also be increased if additional Ys adopt the program, though strategies are still needed. A previous study examining a health program in Y-affiliated sites found that adoption facilitators included organizational support, on-going financial support, matching the Ys mission and target population, novelty of the program, invitations from established partners and program champions [21]. Barriers included limited resources and expertise, competing programs and space and costs of offering the program. A prior examination of the Diabetes Prevention Program delivered in YMCAs found that outreach and recruitment required 2 to 20 hours of staff time per week [22]. As LIVE**STRONG** at the Y is free of cost, YMCA staff must use some of their time to employ fundraising efforts to fund the program. Alleviating staff time and the financial burden of program costs may increase adoption of the program

and staff time to devote to outreach. The American Society of Clinical Oncology has encouraged a third-party payer system to provide coverage of services for cancer prevention and control, including those for PA [23]. Payer financial assistance may alleviate fundraising burden from Ys and provide opportunities for more Ys to adopt the program, run additional sessions, perform outreach efforts and reach more individuals.

Program fidelity may potentially moderate the relationship between an intervention and its outcomes [24]. Less than 40% of Associations were implementing all three checks which was associated with greater membership conversion rates. Fidelity is associated with an intervention's outcomes [25] and incorporating checklists are one way to measure adherence to delivering the intervention as intended. However, fidelity monitoring delivered in non-research-based settings presents several logistical concerns of self-report measures, time and resources to complete checks while concurrently implementing the program, as well adaption to the local setting and drift from the intervention [26]. Implementation strategies may be needed to promote fidelity. We also found that fewer years implementing the program was associated with a higher membership conversion rate. Examining setting-specific variables affecting programs implemented over a longer time, such as funding, community saturation, change in organizational structure, adaptability of the intervention and support from leadership [27], are warranted.

Consistent with prior data that the purchase of a fitness membership is limited to those of higher socioeconomic status [28, 29], we found that household area income was associated with membership conversion rate despite that the Y offers financial assistance to those in need. Strategies to motivate and support participants facing financial stress are needed to reduce the disparities in participation. Survivors have reported financial constraints as a barrier to exercise [12]. They also report spending 1/3 of their household income on cancer care [30]. Third-party payer systems covering survivor PA services may provide a re-allocation of funds to overcome financial barriers to program attendance, including childcare, transportation and athletic gear. Additionally, there are considerable disparities in the population being served in PA programs for survivors [16], thus there is a need to determine how to make even free-of-cost programs more accessible to minority survivors and those with low socioeconomic status. Providers may be able to assist in these efforts, as ACS guidelines and the Institute of Medicine recommend PA prescriptions and/or referrals be provided to survivors. However, specific recommendations on how to prescribe or where to refer patients are not included [10]. Provider education coupled with assessing barriers to PA may aid in the PA referral process.

Several limitations should be noted. First, data is optionally self-reported from Program Directors; thus, it is unclear if an Association with no report conducted sessions and our results may under-estimate the outcomes of interest. Second, data is reported from Y Associations rather than individual branches; therefore, it is unclear as to how individual branches perform within each Association as well as a lack of branch-specific contextual factors (such as staffing, financial resources, facilities, equipment and leadership) which may influence the capacity and performance of programs. Third, the RE-AIM metrics identified in this study are limited to the data provided. This is a strength, as measures are collected by all Associations similarly, though a weakness as these measures do not fully capture all indicators of

each RE-AIM aspect (such as the unknown characteristics of those not participating in the program). In lieu of PA maintenance measures, participant-level maintenance was limited to membership conversion rates upon program cessation. This does not account for those who purchase a membership later nor assess membership use or PA behaviors in alternative settings. Fourth, our metric of household income based on census data is limited to the corporate branch within the Association. Not having data at the level of the implementing branches limited our ability to understand the implementation context. Lastly, the metric of Associations offering at least one session per full reporting year provides only preliminary insight into an Association's organizational maintenance.

# Conclusions

Applying RE-AIM to evaluate a community based health program presents a number of complexities that are not present in traditional research-based programs [31]. We provided an examination into implementation of this program, which will become more needed as the number of cancer survivors increases and opportunities for structured, evidence-based PA programs become critical. LIVE**STRONG** at the Y has the potential to reach many communities, successfully implement, sustain and expand the program over the course of a decade. However, disparities in the programs reach remain, and processes need to be integrated into standard of care to screen and refer survivors. Future efforts should address setting-specific contextual factors to allow for the identification of strategies and tools to enhance program implementation and maintenance. These efforts will be strengthened by studies that assess all RE-AIM measures.

# Abbreviations

**ACS:** American Cancer Society

**PA:** Physical activity

**RE-AIM:** Reach Effectiveness Adoption Implementation Maintenance

**YMCA:** Young Men's Christian Association

# Declarations

### Ethics approval and consent to participate

This study was approved by the Institutional Review Board of the University of Massachusetts Medical School

### Consent for publication

Not applicable

### Availability of data and materials

The data that support the findings of this study are available from Y-USA but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of Y-USA.

### Competing interests

The authors declare that they have no competing interests.

### Funding

The study was funded by a research grant from by the National Cancer Institute (Grant # T32 CA172009). The funder had no role in the design, collection, analysis, and interpretation of data; in the writing of the manuscript; and in the decision to submit this manuscript for publication.

### Authors' contributions

JF led the conception and design of the study, was closely involved in the data cleaning, analysis and interpretation, and wrote the manuscript. AHH, KH and HH aided in data interpretation and contributed to intellectual content. BW was closely involved in data cleaning, analysis and interpretation and revised the manuscript for intellectual content. HA, SL and TK were involved in the design of the study, data interpretation and revised the manuscript for intellectual content. RS was closely involved in the study design, data analysis, interpretation and intellectual content of the manuscript. All authors read and approved the final manuscript.

### Acknowledgements

Not Applicable

## References

1. National Cancer Institute. Cancer Statistics 2018 [updated April 27, 2018. Available from: https://www.cancer.gov/about-cancer/understanding/statistics.
2. Bluethmann SM, Mariotto AB, Rowland JH. Anticipating the "Silver Tsunami": Prevalence Trajectories and Comorbidity Burden among Older Cancer Survivors in the United States. Cancer epidemiology, biomarkers & prevention : a publication of the American Association for Cancer Research, cosponsored by the American Society of Preventive Oncology. 2016;25(7):1029-36.
3. Jarrett N, Scott I, Addington-Hall J, Amir Z, Brearley S, Hodges L, et al. Informing future research priorities into the psychological and social problems faced by cancer survivors: A rapid review and synthesis of the literature. European Journal of Oncology Nursing. 2013;17(5):510-20.

4. Runowicz CD, Leach CR, Henry NL, Henry KS, Mackey HT, Cowens-Alvarado RL, et al. American Cancer Society/American Society of Clinical Oncology Breast Cancer Survivorship Care Guideline. CA Cancer J Clin. 2016;66(1):43-73.
5. Courneya KS. Exercise in cancer survivors: an overview of research. Medicine and science in sports and exercise. 2003;35(11):1846-52.
6. Schmitz KH, Campbell AM, Stuiver MM, Pinto BM, Schwartz AL, Morris GS, et al. Exercise is medicine in oncology: engaging clinicians to help patients move through cancer. CA: a cancer journal for clinicians. 2019.
7. Campbell KL, Winters-Stone KM, Wiskemann J, May AM, Schwartz AL, Courneya KS, et al. Exercise guidelines for cancer survivors: consensus statement from International Multidisciplinary Roundtable. Medicine & Science in Sports & Exercise. 2019;51(11):2375-90.
8. Rock CL, Doyle C, Demark-Wahnefried W, Meyerhardt J, Courneya KS, Schwartz AL, et al. Nutrition and physical activity guidelines for cancer survivors. CA: A Cancer Journal for Clinicians. 2012;62(4):242-74.
9. Ballard-Barbash R, Friedenreich CM, Courneya KS, Siddiqi SM, McTiernan A, Alfano CM. Physical activity, biomarkers, and disease outcomes in cancer survivors: a systematic review. J Natl Cancer Inst. 2012;104(11):815-40.
10. Heston AH, Schwartz AL, Justice-Gardiner H, Hohman KH. Addressing physical activity needs of survivors by developing a community-based exercise program: LIVESTRONG(R) at the YMCA. Clin J Oncol Nurs. 2015;19(2):213-7.
11. Tran H, Lin C, Yu F, Frederick A, Mieras M, Baccaglini L. A multicenter study on the relative effectiveness of a 12-week physical training program for adults with an oncologic diagnosis. Supportive Care in Cancer. 2016;24(9):3705-13.
12. Irwin ML, Cartmel B, Harrigan M, Li F, Sanft T, Shockro L, et al. Effect of the LIVESTRONG at the YMCA exercise program on physical activity, fitness, quality of life, and fatigue in cancer survivors. Cancer. 2017;123(7):1249-58.
13. Glasgow RE, Vogt TM, Boles SM. Evaluating the public health impact of health promotion interventions: the RE-AIM framework. American Journal of Public Health. 1999;89(9):1322-7.
14. Glasgow RE, McKay HG, Piette JD, Reynolds KD. The RE-AIM framework for evaluating interventions: what can it tell us about approaches to chronic illness management? Patient Education and Counseling. 2001;44(2):119-27.
15. Schumacher MM, McNiel P. The Impact of Livestrong(R) at the YMCA for Cancer Survivors. Oncol Nurs Forum. 2018;45(6):717-25.
16. Ready AE, Naimark BJ, Tate R, Boreskie SL. Fitness centre membership is related to healthy behaviours. J Sports Med Phys Fitness. 2005;45(2):199-207.
17. U.S. Census Bureau; 2015 [Available from: http://factfinder.census.gov.
18. Kushi LH, Doyle C, McCullough M, Rock CL, Demark-Wahnefried W, Bandera EV, et al. American Cancer Society guidelines on nutrition and physical activity for cancer prevention. CA: A Cancer

Journal for Clinicians. 2012;62(1):30-67.

19. Mina DS, Sabiston CM, Au D, Fong AJ, Capozzi LC, Langelier D, et al. Connecting people with cancer to physical activity and exercise programs: a pathway to create accessibility and engagement. Current oncology (Toronto, Ont). 2018;25(2):149-62.
20. Glasgow RE, Kaplan RM, Ockene JK, Fisher EB, Emmons KM. Patient-Reported Measures Of Psychosocial Issues And Health Behavior Should Be Added To Electronic Health Records. Health Affairs. 2012;31(3):497-504.
21. Belza B, Petrescu-Prahova M, Kohn M, Miyawaki CE, Farren L, Kline G, et al. Adoption of Evidence-Based Health Promotion Programs: Perspectives of Early Adopters of Enhance®Fitness in YMCA-Affiliated Sites. Frontiers in Public Health. 2015;2(164).
22. Bozack A, Millstein S, Garcel JM, Kelly K, Ruberto R, Weiss L. Implementation and outcomes of the New York State YMCA diabetes prevention program: a multisite community-based translation, 2010-2012. Preventing chronic disease. 2014;11:E115-E.
23. Bennett GG, Glasgow RE. The Delivery of Public Health Interventions via the Internet: Actualizing Their Potential. The Annual Review of Public Health. 2009;30(Journal Article):273-92.
24. Carroll C, Patterson M, Wood S, Booth A, Rick J, Balain S. A conceptual framework for implementation fidelity. Implementation Science. 2007;2(1):40.
25. Gearing RE, El-Bassel N, Ghesquiere A, Baldwin S, Gillies J, Ngeow E. Major ingredients of fidelity: A review and scientific guide to improving quality of intervention research implementation. Clinical Psychology Review. 2011;31(1):79-88.
26. Heerman WJ, Schludnt D, Harris D, Teeters L, Apple R, Barkin SL. Scale-out of a community-based behavioral intervention for childhood obesity: pilot implementation evaluation. BMC Public Health. 2018;18(1):498.
27. Durlak JA, DuPre EP. Implementation Matters: A Review of Research on the Influence of Implementation on Program Outcomes and the Factors Affecting Implementation. American Journal of Community Psychology. 2008;41(3):327.
28. Powell LM, Slater S, Chaloupka FJ, Harper D. Availability of Physical Activity–Related Facilities and Neighborhood Demographic and Socioeconomic Characteristics: A National Study. American Journal of Public Health. 2006;96(9):1676-80.
29. Hillsdon M, Panter J, Foster C, Jones A. Equitable Access to Exercise Facilities. American Journal of Preventive Medicine. 2007;32(6):506-8.
30. Chino F, Peppercorn JM, Rushing C, Kamal AH, Altomare I, Samsa G, et al. Out-of-Pocket Costs, Financial Distress, and Underinsurance in Cancer CareOut-of-Pocket Costs, Financial Distress, and Underinsurance in Cancer CareLetters. JAMA Oncology. 2017;3(11):1582-4.
31. Shaw RB, Sweet SN, McBride CB, Adair WK, Martin Ginis KA. Operationalizing the reach, effectiveness, adoption, implementation, maintenance (RE-AIM) framework to evaluate the collective impact of autonomous community programs that promote health and well-being. BMC Public Health. 2019;19(1):803.

# Tables

Table 1. Descriptive statistics for Associations offering LIVE**STRONG** at the Y.

| RE-AIM Element | Variable | Total N, Frequency (%) or M±SD |
|---|---|---|
| Reach | Number of survivors completing program | 62,044 |
| Adoption | Number and percentage of Y Associations delivering program, N (%) | 245 (29.2%) |
| Implementation | Percent aware of fidelity checklists | 89.51% |
| | Percent implemented Observational checklist | 62.24% |
| | Percent implemented Goal-setting checklist | 50.19% |
| | Percent implemented Functional checklist | 65.10% |
| Maintenance (Organizational-level) | Percentage of Associations reporting ≥ 1 sessions within last full calendar year | 95.1% |
| Maintenance (Participant-level) | Mean membership conversion rate per Association (M±SD) | 46.44 ± 30.9 |
| | *Organizational Characteristics* | |
| N/A | Number of years Association implementing program | 6.3 ± 2.1 |
| N/A | Mean Association area household income (M±SD) | 53,582.42 ± 24,522.83 |

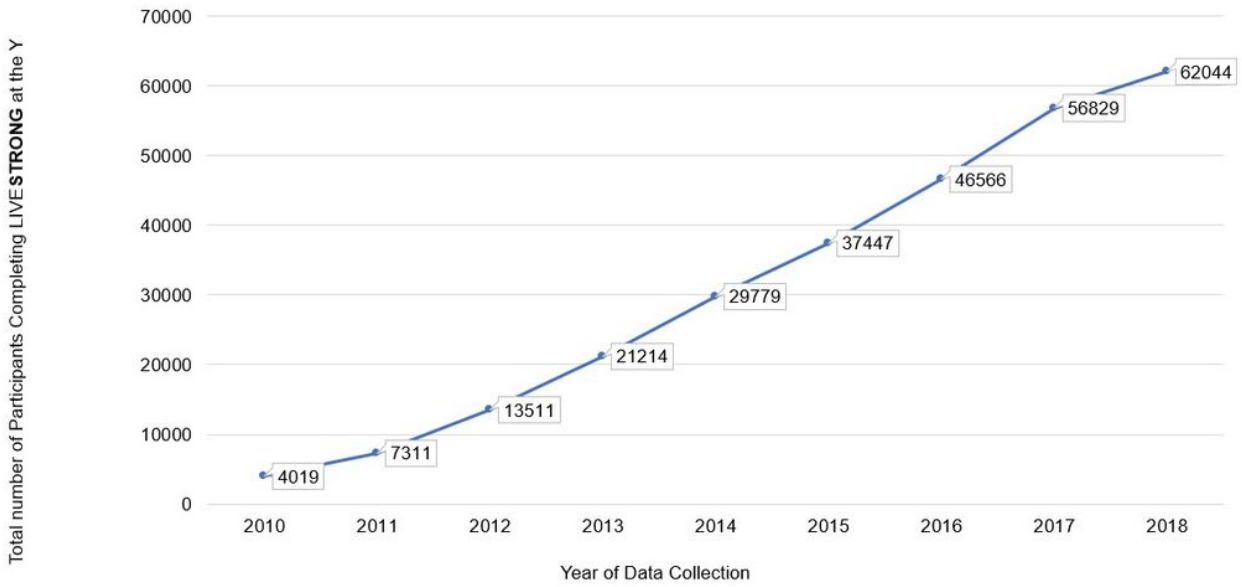
Partial data year
Fidelity checklists represent data collected in 2017-2018.

Table 2. Independent sample t-tests comparing membership conversion rates between between organizational characteristics and fidelity checklists awareness and implementation.

| Variable | *Membership conversion rate (M±SD)* | *95% CI* | *p-value* |
|---|---|---|---|
| *Organizational Characteristics* | | | |
| ime implementing program (years) | | | <0.001 |
| <7 years | 49.3 ± 31.6 | 47.6 to 51.0 | |
| >7 or more years | 42.8 ± 29.7 | 41.0 to 44.6 | |
| ssociation area household income median)* | | | 0.001 |
| ≤47,300 | 44.3 ± 30.3 | 42.5 to 46.1 | |
| >$47, 300 | 48.5 ± 31.4 | 46.7 to 50.2 | |
| *Fidelity Checklists*** | | | |
| ware of fidelity checklists | | | 0.832 |
| Yes | 46.6 ± 37.5 | 37.3 to 56.0 | |
| No | 47.5 ± 32.1 | 44.8 to 50.3 | |
| nplemented Observational checklist | | | 0.002 |
| Yes | 50.6 ± 1.7 | 47.2 to 54.0 | |
| No | 41.6 ± 30.3 | 37.2 to 46.0 | |
| nplemented Goal setting checklist | | | <0.001 |
| Yes | 52.5 ± 1.9 | 48.7 to 56.3 | |
| No | 42.2 ± 30.7 | 38.4 to 46.0 | |
| nplemented Functional checklist | | | 0.001 |
| Yes | 50.6 ± 32.4 | 47.2 to 54.0 | |
| No | 40.8 ± 30.4 | 36.2 to 45.4 | |
| nplemented all 3 checklists | | | <0.001 |
| Yes | 54.2 ± 32.3 | 49.9 to 58.4 | |
| No | 42.8 ± 31.2 | 39.3 to 46.3 | |

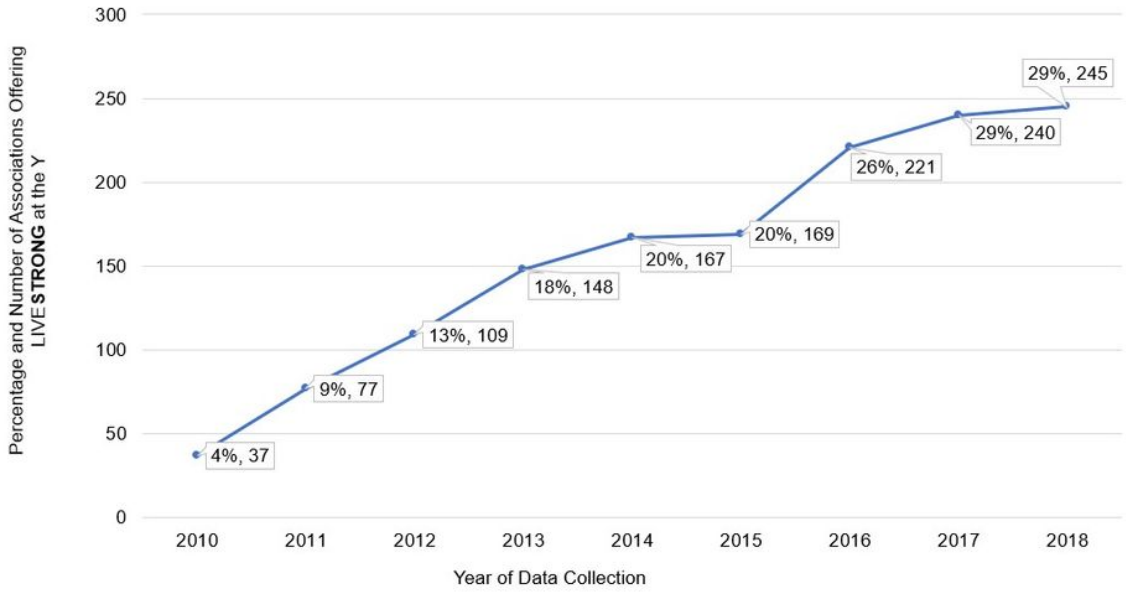
P-value significant at <0.05.
*Association area median household income was acquired using data from the US Census Bureau.
**Fidelity checks only apply to data collected in 2017-2018.

## Figures




## Figure 1

Cumulative number of participants completing the program between the years of 2010 and 2018.




## Figure 2

Adoption rate and number of Associations trained to deliver LIVESTRONG at the Y between the years of 2010 and 2018.

## Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- STROBEchecklist.docx