Preventive Medicine xxx (xxxx) xxxx

Contents lists available at ScienceDirect

Preventive Medicine

journal homepage: www.elsevier.com/locate/ypmed

The Cancer Prevention and Control Research Network (CPCRN): Advancing public health and implementation science

Arica White[a], Susan A. Sabatino[a,*], Cynthia Vinson[b], David Chambers[b], Mary C. White[a]

[a] Centers for Disease Control and Prevention, United States of America
[b] National Cancer Institute, United States of America

ARTICLE INFO

Keywords:
Public health
Implementation science
Translation
Disparities

ABSTRACT

The Cancer Prevention and Control Research Network (CPCRN) is one of the thematic networks of the United States' Centers for Disease Control and Prevention's (CDC) Prevention Research Centers. Network members are academic research centers in the United States who collaborate with public health and community partners to accelerate the use of evidence-based interventions in communities to reduce the burden of cancer, especially among underserved populations. CPCRN studies include geographically dispersed populations, cross-institution partnerships, and opportunities for collaborative learning across network centers. Since its inception in 2002, CPCRN has worked to translate research on community-based intervention strategies into practice to improve cancer screening and reduce cancer risk. This commentary describes CPCRN's role in contributing to public health and the field of dissemination and implementation science. In addition, CDC and the National Cancer Institute describe how their joint support of the network contributes to each organization's goals and missions.

1. Introduction

Despite advances in tobacco control and the early detection and treatment for some types of cancer during the past few decades, disparities persist in cancer incidence and mortality across different populations in the United States. (Cronin et al., 2018) For some cancers, these disparities have widened over time. (Mokdad et al., 2017; Polite et al., 2017) Evidence-based recommendations (https://www.uspreventiveservicestaskforce.org/) and interventions (https://www.thecommunityguide.org/; https://rtips.cancer.gov/rtips/index.do) exist to prevent cancer and promote cancer screening among diverse populations. Translating this knowledge into practice could improve lives and reduce cancer disparities. (Curry et al., 2003) In 2002, the Cancer Prevention and Control Research Network (CPCRN) was established to accelerate the use of proven cancer prevention and control intervention strategies in communities within the United States, to enhance large-scale efforts to reach underserved populations and reduce disparities, and to understand the processes that drive success. (Harris et al., 2005)

CPCRN is a thematic network of U.S. academic research centers in the Prevention Research Centers (PRCs) program — CDC's flagship for studying how people and communities can prevent or control chronic diseases (https://www.cdc.gov/prc/index.htm). Across four funding cycles, the Division of Cancer Control and Population Sciences at the National Cancer Institute (NCI) and the Division of Cancer Prevention and Control (DCPC) at CDC have worked together to support and fund the CPCRN.

Since 2002, 16 university member centers with diverse academic affiliations and from different geographic regions have participated in one or more funding cycles of the CPCRN (Table 1). During the 2014–2019 cycle, there were network centers at eight universities with one serving as a coordinating center (Table 2). Cross-center workgroups investigated areas of research interest to the network that often aligned with key priorities at CDC and NCI (Fig. 1). These workgroups also supported implementation of evidence-based recommendations and interventions (EBIs) suggested by the Community Guide and the U.S. Preventive Services Task Force to prevent and control cancer.

This commentary describes CPCRN's role in contributing to public health and to the field of dissemination and implementation science. We also discuss how the network is helping to advance national cancer prevention and control.

2. CDC perspective

As the nation's leading public health agency, CDC's mission is to keep Americans safe and healthy. CPCRN's work focuses on translation,

* Corresponding author at: Division of Cancer Prevention and Control, Centers for Disease Control and Prevention, 4770 Buford Highway, MS S107-4, Atlanta, GA 30341, United States of America.
E-mail address: bzo8@cdc.gov (S.A. Sabatino).

https://doi.org/10.1016/j.ypmed.2019.105824
Received 15 July 2019; Received in revised form 22 August 2019; Accepted 28 August 2019
0091-7435/ © 2019 Published by Elsevier Inc.

ARTICLE IN PRESS

Table 1
Cancer Prevention and Control Research Network centers, 2002–2019.

	Cycle 1	Cycle 2	Cycle 3	Cycle 4
University	2002–2004	2004–2009	2009–2014	2014–2019
Case Western Reserve University				X
Emory University Rollins School of Public Health		X	X	
Harvard University School of Public Health/Boston University School of Public Health	X	X	X	
Morehouse School of Medicine		X		
Oregon Health & Science University				X
St Louis University		X		
St. Louis University/Washington University in St. Louis			X	
Texas A&M University			X	
University of California, Los Angeles		X	X	
University of Colorado, Denver			X	
University of Kentucky				X
University of Kentucky/West Virginia University	X			
University of Iowa				X
University of Pennsylvania				X
University of North Carolina at Chapel Hill		X	X	X
University of South Carolina, Columbia Arnold School of Public Health	X		X	X
University of Texas, Houston Health Science Center	X	X	X	
University of Washington	X	X	X	X

Table 2
Cancer Prevention and Control Research Network, 2014–2019.

Center	Research	Populations
Case Western Reserve University	This center focuses on urban and metropolitan areas, community health clinics, tobacco cessation programs, and community-clinical linkage intervention using an e-referral.	Urban and metropolitan areas
Oregon Health & Science University	This center focuses their cancer prevention efforts in collaboration with American Indian/Alaska Native and rural populations. Investigators' expertise is related to diet and physical activity and their roles in cancer prevention.	American Indian/Alaska Native and rural populations
University of Iowa	This center focuses on rural and micropolitan areas, Latinos and African American populations, and projects to enhance dissemination of HPV vaccinations.	Rural and micropolitan areas Latinos and African American populations
University of Kentucky	This center focuses on the rural Appalachian region, systematic approaches to offering cancer screening services at every office encounter, and multilevel interventions to increase cancer screening.	Rural Appalachia
University of North Carolina at Chapel Hill	This center focuses on testing and comparing the effects of 2 capacity-building interventions on practitioners' a) capacity to plan and implement EBIs, b) quality of EBI, and c) EBI impact on targeted outcomes; and comparing cervical cancer and obesity interventions.	
University of Pennsylvania	This center focuses on implementation of EBIs to increase CRC screening in primary settings for disadvantaged and minority adults in federally qualified health centers (FQHCs), community-engaged scholars programs, evidence academies (one-day single theme meetings on local epidemiologic assessments of cancer incidence and mortality risk factors and health disparities).	Disadvantaged and minority adults in FQHCs
University of South Carolina at Columbia Arnold School of Public Health	This center focuses on continuing the work of CPCRN with FQHCs, continuing minigrants - grantees partner with FQHCs to implement an EBI directed at multiple levels, mapping cancer rates in geographic space, and neighborhood-level social factors.	FQHCs
University of Washington	This center focuses on increasing EBIs to improve cancer screening to community health centers, state and local health departments and workplaces, in addition to the limited English-proficient population.	Community health centers State and local health departments Workplaces Limited English-proficient populations

evaluation, and partnership, which are key elements of the applied research supported by DCPC. Since its inception, CPCRN has supported CDC's priorities for cancer prevention and control. For example, to reduce the incidence of vaccine-preventable cancers, CPCRN has conducted research to increase human papillomavirus (HPV) vaccination initiation and completion among different populations in various community settings, including a narrative review of HPV vaccination interventions in rural communities in this supplement. (Brandt et al., 2020) In addition, CPCRN has conducted research to understand the barriers and facilitators faced by community health centers related to implementing tobacco assessment and cessation assistance or referrals. (Trapl et al., 2020).

Much of CPCRN's work has helped to advance national screening goals. (Office of Disease Prevention and Health Promotion, 2017) CPCRN has collaborated with CDC's Colorectal Cancer Control Program and the National Breast and Cervical Cancer Early Detection Program to support and evaluate the use of EBIs by awardees to promote cancer screening. (Hannon et al., 2010; Hannon et al., 2013; Maxwell et al., 2014) To promote adherence to current cervical cancer screening recommendations with lengthened screening intervals, CPCRN worked to identify and evaluate methods to increase implementation of new and emerging recommendations. (Alber et al., 2018) CPCRN also



Fig. 1. Cancer Prevention and Control Research Network workgroups, 2014–2019.

collaborated with community health centers and primary care associations representing federally qualified health centers (FQHCs) to increase colorectal cancer (CRC) screening uptake among low-income and underserved populations by strengthening and evaluating existing CRC screening initiatives at the patient, clinic, and community levels. Similar work has been done in FQHCs to increase lung cancer screening. (Zeliadt et al., 2018)

CDC has emphasized the importance of improving health outcomes for the estimated 15.5 million Americans living with a cancer diagnosis (cancer survivors). In a previous funding cycle, CPCRN examined the most effective ways to translate new recommendations about cancer survivorship care planning into action and disseminate findings. More recent work explored the financial hardships faced by rural cancer survivors. (Odahowski et al., 2020)

A guiding principle of CDC's cancer division is to improve the integration and use of data and evidence to support decisions by health systems and state health departments. CPCRN has promoted using evidence to inform intervention planning focused on cancer screening, practice-level change, improvement at the health system level, and policy at state and national levels. This work has integrated the best available evidence into decision support models and applied these models to conduct virtual comparative effectiveness research. This supplement includes examples of such comparative effectiveness research in the Medicaid population (Davis et al., 2020) and at the state level. (Hassmiller Lich et al., 2020) In addition, several projects focused on the use of CDC's Colorectal Cancer Control Program clinical data and the evaluation of their efforts. (Barrington et al., 2020; Hannon et al., 2013; Maxwell et al., 2014)

Reducing health disparities is a cross-cutting theme of many DCPC programs. Many CPCRN projects have focused on underserved and at-risk populations disproportionately affected by cancer. Several articles in this supplement highlight work that focused on patients receiving care at FQHCs. (Trapl et al., 2020; Zeliadt et al., 2018) Populations without health insurance served by such clinics have low cancer screening uptake. (White et al., 2017) Other research focused on understanding and addressing the challenges faced by rural populations. (Barrington et al., 2020; Odahowski et al., 2020)

Finally, CPCRN has worked to develop, test, and refine training and technical assistance strategies with the goal of building the capacity of community planners to select, adapt, and implement EBIs.(Mainor et al., 2018; Cancer Prevention and Control Research Network, 2017) This includes supporting the efforts of the Comprehensive Cancer Control National Partnership. (Moreland-Russell et al., 2018) In this issue, Ko and colleagues highlight how CPCRN knowledge has been used to help create tools and resources for dissemination and implementation. (Ko et al., 2020)

3. NCI perspective

The National Cancer Institute (NCI) is the federal government's principal agency for cancer research. Since the formation of the Division of Cancer Control and Population Sciences, NCI has recognized the continual challenge of ensuring the adoption, implementation and sustainment of cancer control interventions. A broad range of initiatives has been developed to research the delivery of EBIs across the cancer control continuum. The Division's Implementation Science (IS) Team,

which has led dissemination and implementation science efforts over the past eighteen 18 years, has 3 major goals that have benefited from CPCRN collaboration.

First, the IS Team aims to foster advances in implementation science for population-based cancer control, through funding announcements, training programs, and special projects. CPCRN investigators have been involved in numerous NCI-funded implementation studies, participated as faculty in our training opportunities (both domestically and internationally), and lend expertise to internally led research studies. Second, the team focuses on how implementation science integrates with the broader cancer control and population sciences agenda. CPCRN members work to understand how cancer control interventions can be "designed for implementation" from the beginning, and how understanding of factors affecting screening and prevention programs can lead to novel approaches to disseminate evidence. Third, the team fosters collaborations among researchers, practitioners, and decision makers in the service of dissemination and implementation of EBIs. CPCRN investigators have led multiple efforts to improve practitioner understanding of evidence and support local implementation of EBIs.

CPCRN has been a key initiative of NCI's implementation science agenda. Over the years, CPCRN investigators have demonstrated expertise in implementation practice, leading them to contribute to the developing field. CPCRN's connection to cancer control and prevention services in state and community settings has given the network a unique opportunity to understand how evidence-based cancer control interventions are being implemented, as well as the barriers to implementation and the limitations of our armamentarium of evidence-based strategies and interventions. For example, CPCRN investigators have participated in many projects focused on reducing health disparities by expanding the reach of cancer control interventions in underserved communities. Early CPCRN studies focused on ways to leverage the national 2-1-1 Social Services Information and Referral System (similar to 9-1-1 for emergencies or 4-1-1 for directory assistance) to link callers to local services within their communities. (Kreuter, 2012) When CPCRN investigators began partnering with 2-1-1 helplines, they were able to study how this service could be used to increase referrals for cancer screenings, promote smoke-free homes among underserved populations, and navigate individuals to needed health care providers and services.

CPCRN has developed important resources for cancer control practitioners to support efforts to improve cancer screening uptake, HPV vaccination, and other interventions, while also supporting the need to tailor dissemination efforts to community needs and preferences. Working with the Comprehensive Cancer Control National Partnership, CPCRN investigators explored the impact of technical assistance used by the partnership on increasing state cancer control coalition efforts to increase both colorectal cancer screening and HPV vaccination efforts. (Moreland-Russell et al., 2018)

As expectations for public health practitioners to use evidence-based approaches and programs have increased, CPCRN has stepped in to build the capacity of cancer control planners and public health professionals to locate, select, adopt, adapt, implement, and evaluate evidence-based cancer prevention programs, policies, and practices. Building off "Using What Works" developed by National Cancer Institute's Using What Works, n.d, CPCRN developed and tested the "Putting Public Health Evidence in Action" training curriculum. (Cancer Prevention and Control Research Network, 2017; Mainor et al., 2018) The curriculum was updated in 2017 and continues to be used to train planners and public health practitioners in many venues across the country.

4. Conclusions

The partnership between two U.S. federal agencies, CDC and NCI, and their active engagement in CPCRN facilitated the application of research methods to improve the use of evidence-based intervention strategies for cancer control programs. The unique collaborative relationship between funding agencies enabled CPCRN to work outside their local communities to contribute to national goals for cancer prevention and control and advance the science of dissemination and implementation. The network impact as measured by traditional metrics, such as publications (over 2000) and successful grant applications (over $600 million in research dollars), has been impressive. (Cancer Prevention and Control Research Network, 2018) Multicenter collaboration has enhanced the strength of grant applications and peer-reviewed publications and expanded scientific impact to catalyze action and effect change in centers' local communities and nationally.

Cancer disparities across populations share characteristics of other "wicked problems;" factors that drive disparities are complex and beyond the reach of any single strategy or entity. In addition, barriers and facilitators to implementing EBIs for cancer prevention and control are numerous and complex, each with its own set of determinants. The qualifier "multi" is omnipresent in this field to characterize problems and intervention strategies: multidisciplinary, multifactorial, multisector, multilevel, and multicomponent. Wicked problems call for network approaches to find solutions. (Weber, 2008)

As CPCRN has demonstrated, a network of academic partners working collectively can accomplish far more than any one institution working alone, a potential example for other networks in the United States and in other countries. Each center contributed unique and valuable expertise to tackle persistent disparities by implementing EBIs to reduce cancer incidence, increase use of recommended cancer screening tests, and improve quality of life and survival after cancer diagnosis. Going forward, CPCRN can serve as a model for the application of implementation science for similarly complex public health problems.

Disclaimer

The findings and conclusions in this report are those of the authors and do not necessarily represent the official position of the Centers for Disease Control and Prevention or the National Cancer Institute.

Declaration of competing interest

None.

References

Alber, J.M., Brewer, N.T., Melvin, C., Yackle, A., Smith, J.S., Ko, L.K., Crawford, A., Glanz, K., 2018. Reducing overuse of cervical cancer screening: a systematic review. Prev. Med. 116, 51–59.

Barrington, W.E., DeGroff, A., Melillo, S., Vu, T., Cole, A., Escoffrey, C., Askelson, N., Seegmiller, L., Koopman, S., et al., 2020. Navigators' perceptions of patient navigation within two federally-funded cancer screening programs. Prev. Med (Submitted for this issue).

Brandt, H.M., Pilar, M.R., Zubizarretawe, M., Stradtman, L.R., Vanderpool, R.C., 2020. A narrative review of HPV vaccination interventions in rural U.S. communities. Prev. Med (Submitted for this issue).

Cancer Prevention and Control Research Network, 2017. Putting Public Health Evidence in Action Training Curriculum. Available from. http://cpcrn.org/pub/evidence-in-action/.

Cancer Prevention and Control Research Network, 2018. Impact of the Cancer Prevention and Control Research Network. Available from. http://cpcrn.org/wp-content/uploads/2018/05/Executive-Summary-Report.pdf.

Cronin, K.A., Lake, A.J., Scott, S., Sherman, R.L., Noone, A.M., Howlader, N., Henley, S.J., Anderson, R.N., Firth, A.U., et al., 2018. Annual report to the nation on the status of cancer, part I: national cancer statistics. Cancer 124, 2785–2800.

Curry, S.J., Byers, T., Hewitt, M., 2003. Fulfilling the Potential of Cancer Prevention and Early Detection. The National Academies Press, Washington (DC).

Davis, M.M., Nambiar, S., Mayorga, M., Sullivan, E., Hicklin, K., O'Leary, M., Dillon, K., Hassmiller Lich, K., Gu, Y., et al., 2020. A comparative study of the impact and costs of five evidence-based interventions on colorectal cancer screening in Medicaid members – a microsimulation experiment to inform intervention selection. Prev. Med (Submitted for this issue).

Hannon, P.A., Fernandez, M.E., Williams, R.S., Mullen, P.D., Escoffery, C., Kreuter, M.W., Pfeiffer, D., Kegler, M.C., Reese, L., et al., 2010. Cancer control planners' perceptions and use of evidence-based programs. J. Public Health Manag. Pract. 16, E1–E8.

ARTICLE IN PRESS

Hannon, P.A., Maxwell, A.E., Escoffery, C., Vu, T., Kohn, M., Leeman, J., Carvalho, M.L., Pfeiffer, D.J., Dwyer, A., et al., 2013. Colorectal cancer control program grantees' use of evidence-based interventions. Am. J. Prev. Med. 45, 644–648.

Harris, J.R., Brown, P.K., Coughlin, S., Fernandez, M.E., Hebert, J.R., Kerner, J., Prout, M., Schwartz, R., Simoes, E.J., et al., 2005. The cancer prevention and control research network. Prev. Chronic Dis. 2, A21.

Hassmiller Lich, K.M., O'Leary, M.C., Nambiar, S., Townsley, R.M., Mayorga, M.E., Hicklin, K., Frerichs, L., Davis, M., Shafer, P.R., et al., 2020. The anticipated impact of insurance expansion on colorectal cancer and related costs in North Carolina: a population-level simulation analysis. Prev. Med (Submitted for this issue).

Ko, L.K., Jang, S.H., Friedman, D.B., Glanz, K., Leeman, J., Hannon, P.A., Shannon, J., Cole, A., 2020. Translating CPCRN learning into resources for dissemination and implementation: what we have, how to use them, and where we need to go. Prev. Med (Submitted for this issue).

Kreuter, M.W., 2012. Reach, effectiveness, and connections: the case for partnering with 2-1-1 to eliminate health disparities. Am. J. Prev. Med. 43, S420–S421.

Mainor, A., DeCosimo, K., Escoffery, C., Farris, P., Shannon, J., Winters-Stone, K., Williams, B., Leeman, J., 2018. Scaling-up and tailoring the “Putting Public Health Evidence in Action” training curriculum. Health Promot. Pract. 19, 664–672.

Maxwell, A.E., Hannon, P.A., Escoffery, C., Vu, T., Kohn, M., Vernon, S.W., DeGroff, A., 2014. Promotion and provision of colorectal cancer screening: a comparison of colorectal cancer control program grantees and nongrantees, 2011–2012. Prev. Chronic Dis. 11, E170.

Mokdad, A.H., Dwyer-Lindgren, L., Fitzmaurice, C., Stubbs, R.W., Bertozzi-Villa, A., Morozoff, C., Charara, R., Allen, C., Naghavi, M., et al., 2017. Trends and patterns of disparities in cancer mortality among US counties, 1980–2014. JAMA 317, 388–406.

Moreland-Russell, S., Adsul, P., Nasir, S., Fernandez, M.E., Walker, T.J., Brandt, H.M., Vanderpool, R.C., Pilar, M., Cuccaro, P., et al., 2018. Evaluating centralized technical assistance as an implementation strategy to improve cancer prevention and control. Cancer Causes Control 29, 1221–1230.

National Cancer Institute's Using What Works. National Cancer Institute. Available from http://cancercontrol.cancer.gov/use_what_works/start.htm

Odahowski, C., Rotter, J., Hill, L., Zahnd, W., Edward, J., Davis, M., Perry, C., Shannon, J., Farris, P., et al., 2020. Financial hardship among rural cancer survivors in the U.S. Prev. Med (Submitted for this issue).

Office of Disease Prevention and Health Promotion, 2017. Healthy People 2020. US Department of Health and Human Services, Office of Disease Prevention and Health Promotion, Washington, DC.

Polite, B.N., Adams-Campbell, L.L., Brawley, O.W., Bickell, N., Carethers, J.M., Flowers, C.R., Foti, M., Gomez, S.L., Griggs, J.J., et al., 2017. Charting the future of cancer health disparities research: a position statement from the American Association for Cancer Research, the American Cancer Society, the American Society of Clinical Oncology, and the National Cancer Institute. Cancer Res. 77, 4548–4555.

Erika Trapl, B.V.E., Stephanie Land, Christine Kava, Vinh Trinh, Rebecca Williams, Frost, Elizabeth, 2020. Smoking and cessation behaviors in patients at federally qualified health centers. Prev. Med (Submitted for this issue).

Weber, E.P.a.K., A.M., 2008. Wicked problems, knowledge challenges, and collaborative capacity builders in network settings. Public Adm. Rev. 68:334–49.

White, A., Thompson, T.D., White, M.C., Sabatino, S.A., de Moor, J., Doria-Rose, V.P., Geiger, A.M., Richardson, L.C., 2017. Cancer screening test use - United States, 2015. MMWR Morb. Mortal. Wkly Rep. 66, 201–206.

Zeliadt, S.B., Hoffman, R.M., Birkby, G., Eberth, J.M., Brenner, A.T., Reuland, D.S., Flocke, S.A., 2018. Challenges implementing lung cancer screening in federally qualified health centers. Am. J. Prev. Med. 54, 568–575.