Measuring and Maximizing Outcomes in Population Genomic Screening: a High-Touch Recontact and Optimization Pilot

Kelly Tangney, Deanna Erwin, Deanna Brockman, Sayyed Amin Zarkesh Esfahani, Nicole M. Johnson, Jennifer Lee, Ambreen Khan, Ashly Collins, Lily Servais, Amanda Nguyen, Ramon Garcia, Cynthia L. Neben, Alicia Y. Zhou, Scott Topper
Color Health, Burlingame, CA

Introduction

Population genomic screening programs can identify individuals at risk of adult-onset hereditary diseases, but the impact of screening lies in follow-up care. Color provides population screening and care advocacy for common hereditary conditions through employee benefits programs, research studies, and healthcare providers. As a part of these programs, Color provides genetic counseling to inform and engage participants and, more recently, care advocacy services to support participants in taking the appropriate next steps with their care.

To assess the effectiveness of these programs, we first reengaged participants who had received a positive genetic result 1-3 years ago for hereditary breast and ovarian cancer (HBOC), Lynch syndrome (LS), or familial hypercholesterolemia (FH); hereafter known as study 1. These participants had received only genetic counseling only during their original return of results session. During recontact, we evaluated how thoroughly participants followed the specific recommendations provided and recorded outcomes. We also connected participants to local resources or an in-house care advocate if further care navigation was indicated or requested.

To understand how we might drive action even more quickly, we prospectively offered additional discussion and support to participants who had genetic testing during their return of results genetic counseling session earlier this year; hereafter known as study 2. We assessed participant eligibility for cancer screenings based on age, sex, genetic risk, family history, and personal history of recent care and offered direct navigation and advocacy support, including appointment scheduling, provider referrals, and insurance review.

Methods

Participants in study 1 received clinical genetic testing through a Color program from 2020 to 2022, had a positive test result for a CDC Tier 1 genomics condition (HBOC, LS, and FH)[1], resided in the United States, and previously opted in to recontact. A total of 200 individuals were identified for recontact. The recontact protocol included two phone calls, followed by one email. Participants who were successfully recontacted were asked a series of questions to evaluate follow-up actions including sharing results with an additional provider, using the results to inform a screening or treatment protocol, and sharing the results with at-risk relatives. Participants were also asked qualitative and open-ended questions about the return of results and follow up experience.

Participants in study 2 received clinical genetic testing through a Color population genomic screening program in 2023. A total of 75 individuals, all of which resided in the United States, were included in the study. During the genetic counseling, participants were offered a discussion about their cancer screening activities in the context of their genetic results. Participants were asked a series of questions to assess adherence to risk-adjusted cancer screening guidelines from the American Cancer Society (ACS)[2] and the National Cancer Comprehensive Network (NCCN)[3]. Based on age, risk, and cancer screening status, participants were referred for colonoscopies and mammograms and to high-risk breast centers, gynecologists, primary care providers, and genetics providers. Participants were also offered assistance by care advocates at Color to make appointments with specialists in their communities for the recommended screenings.

All participants consented to have their de-identified information used in anonymized studies. All information was offered and reported by the individual; information not provided was noted as such.

Conclusions

- Accessible cancer screening combined with genetic counseling and care advocacy can be effective in identifying and motivating individuals to take appropriate next steps in their healthcare. Specifically, a high human touch, both during genetic result disclosure and recontact at a later date, can aid in completing screening uptake.
- Study 1 demonstrated that many population screening participants (57.5%; n=42) reported initiating a recommended screening, prevention, or treatment after receiving a high-risk genetic result and post-test counseling. Adherence to screening guidelines was highest in participants with LS, followed by HBOC, and then FH.
- Study 2 demonstrated that about half of participants (56.0%; n=42) of participants were either not up-to-date with one or more cancer screening or needed additional high-risk cancer-related services at the time they received their genetic testing results. Of those, almost half (38.1%; n=16) elected to receive support from a genetic counselor or care advocate to facilitate such screenings.

References

[1] US Centers for Disease Control and Prevention. Tier 1 Genomics Applications and their Importance to Public Health. https://www.cdc.gov/genomics/implementation/toolkit/tier1.htm

[2] American Cancer Society Guidelines for the Early Detection of Cancer. https://www.cancer.org/cancer/screening/american-cancer-society-guidelines-for-the-early-detection-of-cancer.html

[3] National Comprehensive Cancer Network Guidelines. Detection, Prevention, and Risk Reduction. https://www.nccn.org/guidelines/category_2

Questions? kellyt@color.com

Results: study 1

Figure 1. Participant flow diagram in study 1

We successfully recontacted 73 (36.5%) individuals in study 1. Genetic counselors discussed with participants any next steps that participants had taken in their cancer-screening process since they had received a positive genetic test result. Genetic counselors and care advocates worked together to identify and connect participants to local health care services for 10 participants.

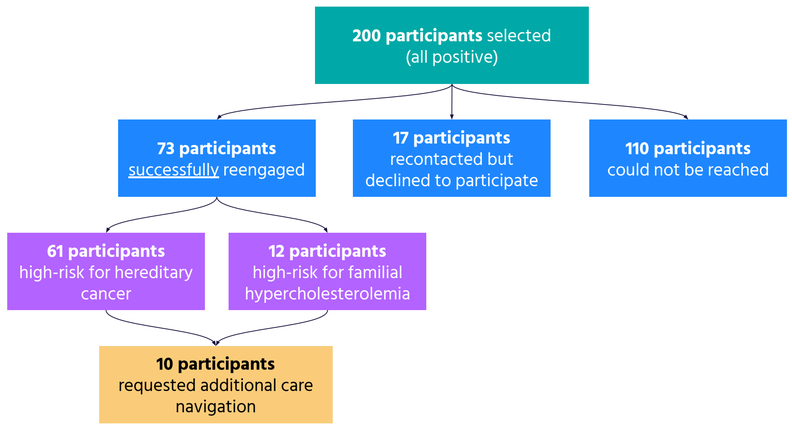


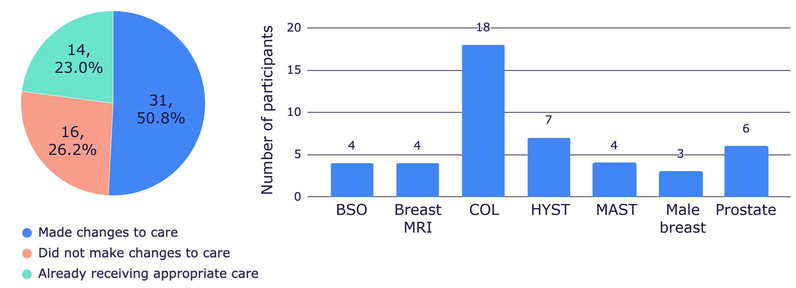
Table 1. Cohort demographics in study 1

The average age of participants was 50.8 years (range 22-84). 46.6% (n=34) self-identified as female, 74.0% (n=54) were non-Hispanic White, and all were English-speaking. All participants had a pathogenic or likely pathogenic variant in a gene associated with hereditary breast and ovarian cancer (*BRCA1* and *BRCA1*; n=34, 46.6%), Lynch syndome (*MLH1, MSH2, MSH6, PMS2,* and *EPCAM*; n=27, 37.0%), or familial hypercholesterolemia (*LDLR, APOB,* and *PCSK9*; n=12, 16.4%).

		Total (N=73)
Age at recontact (years)	Mean (SD)	50.8 (16.1)
	Median	54
	Min - Max	22 - 84
Sex assigned at birth	Female	34 (46.6%)
	Male	39 (53.4%)
Race/Ethnicity (self-reported)	Asian/Pacific Islander	12 (16.4%)
	Black or African American	2 (2.7%)
	Hispanic or Latino of any race	4 (5.5%)
	Native American or Alaskan	0 (0%)
	Other	0 (0%)
	White	54 (74.0%)
	Unknown	1 (1.4%)

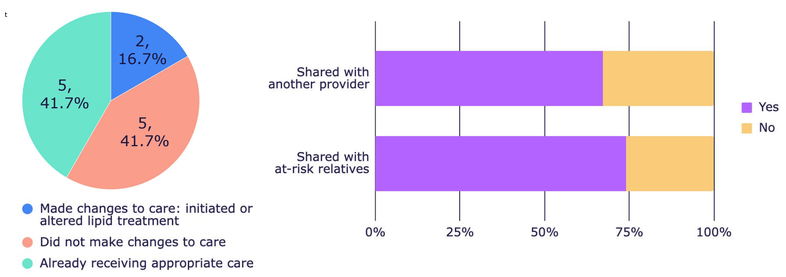
Figure 3. Participant-reported actions 1-3 years since receiving genetic test results in study 1

A total of 61 participants (29 females and 32 males) were at high-risk for hereditary cancer. 31 participants reported making a change to their cancer screening processes after receiving their genetic test results: 4 had a bilateral salpingo-oophorectomy (BSO), 4 breast MRI screening, 18 initiated a colonoscopy screening (COL), 7 had risk-reducing hysterectomy (HYST), 4 had a risk-reducing mastectomy (MAST), 3 initiated male breast cancer screening, and 6 initiated prostate cancer screening.



A total of 12 participants (5 females and 7 males) were at high-risk for familial hypercholesterolemia. 2 participants made changes to their care by initiating or altering their lipid treatment.

Within two weeks of initial receipt, many participants shared results with a provider (67.1%; n=49) and at-risk relatives (74.0%; n=54).



Quotes from participants in study 1 and study 2

"Oh wow! This is so awesome. Anything helps. What a gift to be able to talk to you today." – A participant who was offered help scheduling a colonoscopy

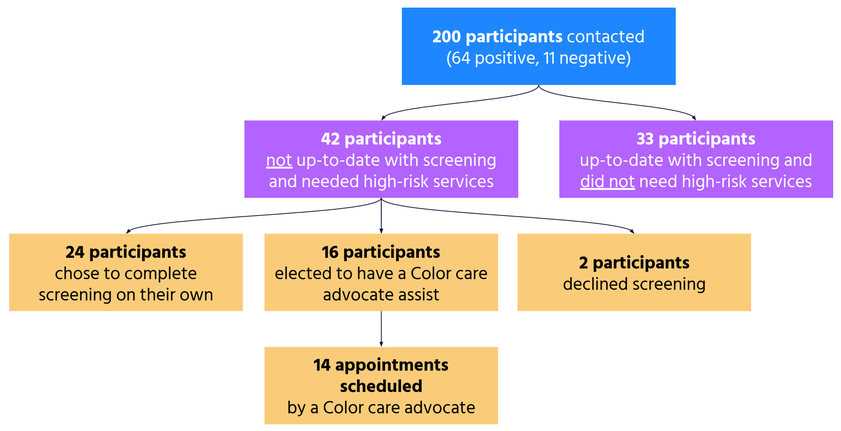
"Thank you so much for all of your help! … I appreciate all of your efforts." – A participant who had breast specialist and colonoscopy appointments scheduled by a Color care advocate

"You folks did an outstanding job! I can't thank you enough for that." – A participant who was offered help scheduling a colonoscopy

Results: study 2

Figure 3. Participant flow diagram in study 2

We engaged with 75 individuals in study 2. Genetic counselors contacted participants by phone to review their Color genetic test results and discuss next steps in their cancer screening process. Genetic counselors and care advocates worked together to identify local health care services, gather relevant insurance and medical information, and schedule cancer screening and/or specialist provider appointments on behalf of participants.



Of the participants needing cancer screening or additional high-risk cancer-related services, 38.1% (n=16) of participants elected to receive real-time support from a genetic counselor or care advocate to facilitate their screenings. In total, 14 appointments were scheduled: 5 for colonoscopies, 1 for mammogram, 4 with high-risk breast specialists, and 4 with local genetics providers.

Table 2. Cohort demographics in study 2

The average age of participants was 51.9 years (range 24-76 years). 73.3% (n=55) self-identified as female, 84.0% (n=63) were non-Hispanic White, and all but one participant were English-speaking; the one non-English speaking participant was Spanish-speaking. All participants had clinical genetic testing through a Color program. 69.3% (n=52) of participants had a pathogenic or likely pathogenic variant associated with a hereditary cancer or cardiovascular condition; the majority of pathogenic variants were identified in a cancer-related gene. 26.7% (n=20) of participants had a negative genetic test result. All participants had a genetic counseling appointment.

		Total (N=75)
Age (years)	Mean (SD)	51.9 (13.1)
	Median	50
	Min - Max	24 - 76
Sex assigned at birth	Female	55 (73.3%)
	Male	20 (26.7%)
Race/Ethnicity (self-reported)	Asian	3 (4.0%)
	Hispanic or Latino of any race	6 (8.0%)
	Middle Eastern	1 (1.3%)
	Non-Hispanic Black or African	1 (1.3%)
	Non-Hispanic White	63 (84.0%)
	No response	1 (1.3%)
Genetic test result	Negative	20 (26.7%)
	Positive, cancer-related gene	52 (69.3%)
	Positive, cardiovascular condition-related gene	3 (4.0%)

Figure 4. Pathogenic variants identified in study 2

Participants received clinical genetic testing for genes related to hereditary cancer, hereditary cardiovascular conditions, medication processing, and/or other actionable conditions recognized by the American College of Medical Genetics and Genomics (ACMG) Secondary Findings List 2.0.

52 (69.3%) participants had a pathogenic or likely pathogenic variant in a gene associated with hereditary cancer. The most common were *BRCA1, BRCA2, CHEK2, ATM,* and *APC*. One participant had two pathogenic variants (*BRCA1* and *APC* c.3920T>A). 3 (4.0%) participants had a pathogenic or likely pathogenic variant in a gene associated with hereditary cardiovascular condition: *MYBPC3,* which is associated with hypertrophic cardiomyopathy, or *PCSK9,* which is associated with FH.

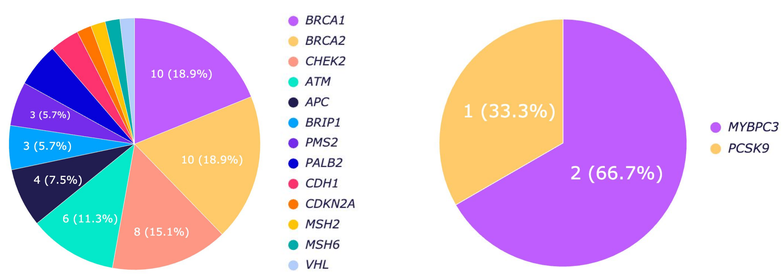


Figure 5. Screening and in-person services offered in study 2

56.0% (n=42) of participants were either not up-to-date with one or more cancer screening or needed additional high-risk cancer-related services at the time of genetic result disclosure. The most common services recommended were referrals to a genetics provider, referrals to a breast specialist for breast MRI, and colonoscopies (COL), followed by referral to gynecologist for a pap test, mammogram (MAM), and referral to primary care provider for PSA test. On average, participants who were not up-to-date were eligible for 1.6 screenings at the time of contact (range: 0-4 services).