Screening Beyond the Evidence: Patterns of Age and Comorbidity for Breast, Cervical, and Colorectal Cancer Screening

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ABSTRACT

BACKGROUND: Little evidence exists to guide continuation of screening beyond the recommended ages of national guidelines for breast, cervical, and colorectal cancers, although increasing age and comorbidity burden is likely to reduce the screening benefit of lower mortality.

OBJECTIVE: Characterize screening after recommended stopping ages, by age and comorbidities in a large, diverse sample.

DESIGN: Serial cross-sectional.

PARTICIPANTS: All individuals in the PROSPR-I consortium cohorts from 75 to 89 years of age for breast cancer screening, 66–89 years of age for cervical cancer screening, and 76–89 years of age for colorectal cancer screening from 2011 to 2013. The lower age thresholds were based on the guidelines for each respective cancer type.

MAIN MEASURES: Proportion of annual screening by cancer type in relation to age and Charlson comorbidity score and median years of screening past guideline age. We estimated the likelihood of screening past the guideline-based age as a function of age and comorbidity using logistic regression.

KEY RESULTS: The study cohorts included individuals screening for breast ($n=33{,}475$); cervical ($n=459{,}318$); and colorectal ($n=556{,}356$) cancers. In the year following aging out, approximately 30% of the population was screened for breast cancer, 2% of the population was screened for cervical, and almost 5% for colorectal cancer. The median number of years screened past the guideline-based recommendation was 5, 3, and 4 for breast, cervical, and colorectal cancer, respectively. Of those screening >10 years past the guideline-based age, 15%, 46%, and 25% had ≥3 comorbidities respectively. Colorectal cancer screening had the smallest decline in the likelihood of screening beyond the age-based recommendation.

CONCLUSIONS: The odds of screening past guideline-based age decreased with comorbidity burden for breast and cervical cancer screening but not for colorectal. These findings suggest the need to evaluate shared decision tools to help patients understand whether screening is appropriate and to generate more evidence in older populations.

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INTRODUCTION

Cancer screening guidelines vary across recommending organizations, with starting ages, screening modalities, screening intervals, and stopping ages varying. While all screening guidelines include a starting age, only some make specific recommendations for a stopping age, largely due to minimal evidence. This is exemplified by the recent media focus on breast cancer screening recommendations based on draft changes by the United States Preventive Services Task Force (USPSTF) to start screening at age 40 for all average-risk women.[1] While the starting age for breast, colorectal, and cervical cancer screenings has received much attention over the past two decades due to variation and periodic updates in evidence-based recommendations, guidelines for the age at which to stop screening for average-risk individuals have received relatively little focus. Guidelines for the age at which to stop screening for an average-risk individual stem largely from the upper age included in clinical trials (thus, no robust evidence for screening benefits and harms beyond these ages), as well as on population-based observational and modeling studies.[1–3] While studies continue to examine tradeoffs for screening at older ages based on life expectancy, comorbidities, and potential harms, for average-risk individuals, the USPSTF recommends stopping breast cancer screening at >74 years of age, cervical screening at >65 years of age, and recommends against screening patients 86 and older for CRC; patients 76–85 should be offered screening selectively.[1–3] These age cut-offs for screening do not apply to all average-risk people,

but are broad general guidelines that are intended to provide a basis for population-based screening. Although the USPSTF does not provide explicit evidence-based guidelines for stopping ages, understanding large-scale patterns of screening past these recommended ages has implications for patients, providers, healthcare delivery systems, and payers.

At the patient level, there is recognition that a "one size fits all" model of screening based on age is not ideal, and individual characteristics may alter the likely harms and benefits of screening.[4] Comorbidity burden is important to consider since it competes with cancer as a cause of death, thereby affecting the likelihood of benefiting from early cancer detection. Providers are increasingly being called upon to facilitate personalized screening decisions, yet are evaluated based on metrics tied to guidelines that do not consider the full spectrum of differences among people. Similarly, healthcare systems seek to provide quality care, of which cancer screening benchmarks are a part. Yet benchmarks are based on national guidelines and related metrics, such as HEDIS[5], so accountability for population screening may only extend to the USPSTF ages, for example. Payers are additional stakeholders in screening cessation, as coverage policies are typically based on metrics tied to national guidelines. The heterogeneity of recommendations for cancer screening stopping ages for breast, cervical, and colorectal cancers, combined with the multiple levels of stakeholders, creates an uncertain environment for cancer screening at older ages.[6]

This study examined population screening patterns beyond existing stopping age recommendations for breast, cervical, and colorectal cancers within the NCI-funded consortium, PROSPR-I (Population-based Research Optimizing Screening through Personalized Regimens).[7] Screening participation among population denominators by age and comorbidity burden were measured and the likelihood for screening past recommended age was estimated in relation to age and comorbidities. Our study aims were to (1) estimate the magnitude of the screening population who continued to screen beyond guideline-based ages and (2) determine if advancing age and increasing comorbidities are related to discontinuation of screening after individuals age out of guideline age recommendations. The overarching objective was to help inform national screening practices as evidence builds to address the tension between optimizing population-level screening benefits and tailoring to individuals by quantifying the size of these populations screening beyond the recommended age and by examining whether older age and more comorbidities are likely to be related to stopping, given the likelihood of diminishing benefits from screening.

METHODS

Study Population and Data

This study was conducted as part of the NCI-funded consortium Population-based Research Optimizing Screening through Personalized Regimens (PROSPR).[7] The overall aim of PROSPR is to conduct multi-site, coordinated, transdisciplinary research to evaluate and improve cancer screening processes. The ten PROSPR-1 Research Centers reflect the diversity of US delivery system organizations. Breast cancer screening data were derived from four sites: the University of Vermont, capturing data from all women receiving breast imaging at radiology facilities in the state of Vermont; the University of Pennsylvania, collecting data from an integrated healthcare delivery system; and Dartmouth-Hitchcock Health System in New Hampshire and Brigham and Women's Hospital in Massachusetts, capturing data within their primary care practice networks. Cervical cancer screening data were obtained from five sites: Kaiser Permanente Washington (formerly Group Health), a mixed-model healthcare system in Washington state; Kaiser Permanente Northern California and Kaiser Permanente Southern California, integrated healthcare systems in California; Parkland-University of Texas Southwestern, which is the sole safety-net provider for underinsured and uninsured Dallas County residents; and the New Mexico HPV Pap Registry located at the University of New Mexico, gathering data from all women in New Mexico undergoing cervical cancer screening, diagnosis, and treatment. All cervical sites except New Mexico also collected colorectal cancer screening data; specifically, Kaiser Permanente Washington, Kaiser Permanente Northern California, Kaiser Permanente Southern California, and Parkland-University of Texas Southwestern. Additional site details have been published previously.[8–11] All activities for the study were approved by the institutional review boards of participating PROSPR-I Research Centers and the Statistical Coordinating Center.

We included all individuals undergoing screening tests within the PROSPR-I Research Centers' clinical networks[7] between 2011 and 2013 who were ≥ 75 for breast, ≥ 66 for cervical, and ≥ 76 for colorectal.

Key Variables

Baseline sociodemographic and screening-related characteristics of the population were computed using the first available calendar year in which an individual was older than the ages above. The likelihood of getting screened was assessed independently for each year of age beyond guidelines. The main variables of interest were age at the time of the screening exam and comorbidity burden in the year prior to the exam year. Breast cancer screening was defined as breast imaging with an indication of screening and no other breast imaging within 3 months prior. Cervical cancer screening was defined as receipt of a Pap test with no other Pap test within 300 days prior. Colorectal cancer screening was receipt of FOBT/FIT that is not in-office, flexible sigmoidoscopy, or colonoscopy with an indication of screening.[8]

Comorbidity was measured with the Charlson index[12] using the enhanced ICD-9 coding scheme of Quan et al.[13] to ascertain comorbidities based on both inpatient and outpatient care in the calendar year preceding the screening event. We categorized the

Charlson scores into four categories based on the number and severity of comorbidities: 0, 1, 2, 3+. Covariates included in the analysis were race/ethnicity, median household income for the ZIP code of residence, and number of primary care visits in the calendar year prior to the screening exam. Race/ethnicity was defined as Non-Hispanic White, Non-Hispanic Black, Hispanic, Asian/Pacific Islander, or Multiple/Other/Unknown. ZIP code-level income was measured in tertiles using Census 2010 data. The number of visits to a primary care provider (PCP) in the 12 months prior to the screening event was captured based on care provided within the clinical networks participating in PROSPR-1 and was categorized as none, one, or two or more.

Statistical Analyses

Our analyses quantified the proportion of individuals in a screening population who continued to screen after "aging out," that is, screening beyond the guideline-based age. We estimated the association of screening with both age and comorbidities. Separate analyses were stratified by cancer type of the screening exam (breast, cervical, colorectal). Characteristics of individuals in the cohort when they first aged out of recommended screening guidelines were summarized as median and interquartile range for continuous variables, and as frequencies for categorical variables. We computed the proportion of the enrolled cohort at each age who received screening at that age. Among those who screened outside of the usual age range, we examined the distribution of comorbidity burden according to years since the guideline-based usual stopping age.

Unadjusted logistic regression models were fit using any screening beyond guideline-based age as the outcome and the predictors were years after guideline age and comorbidity. Adjusted analyses were conducted to account for calendar year, PROSPR-1 site, race/ethnicity, ZIP code-level income, and number of primary care visits. Adjusted estimated percentages for screening receipt in each age and/or comorbidity group were obtained via predictive margins.[14] The predictive margin for a specific group represents the average predicted response (e.g., probability of screening receipt) if everyone in the study population had been in that group and had the same covariate distribution.[14] For each cancer type and 1-year age group, a logistic regression model of screening receipt (yes/no) was fit to Charlson score plus the adjustment covariates. The resulting probability estimates represent predictive margins, with a separate estimate for each cancer type and comorbidity level. These comorbidity-specific estimates were then standardized to the overall distribution of comorbidity in each cancer group.

RESULTS

The study population included the following numbers of individuals who were older than organ-specific screening ages: breast ($n=33{,}475$); cervical ($n=459{,}318$); colorectal ($n=556{,}356$) (Table 1). Individuals in the breast and colorectal cohorts were older than in the cervical cohort. The distribution of Charlson scores for each cohort showed substantial numbers of healthy individuals in each population (Table 1).

Adjusted estimated percentages for those in the 1-year age group undergoing screening beyond the guideline-based age are shown in Fig. 1 and Appendix Table 4. For example, among those aged 85 years, 24.0% were screened for breast cancer at that age, 3.8% for colorectal, and 0.5% for cervical. The proportion screening for breast cancer at older ages was consistently higher than for colorectal and cervical cancers (median % screened across 1-year age groups: breast, 29.8%; cervical, 1.7%; colorectal, 4.6%) (Appendix Table 4). Although there was a lower proportion screened past the guideline-based age for colorectal and cervical (~10%), the rate of decrease was low, part of which may be explained by clinical characteristics.

The median age of those screening at any time beyond the guideline-based age was 5 years higher than recommended for breast, 4 years for colorectal, and 3 years for cervical (Table 2). Overall, the highest comorbidity burden for those receiving screening beyond the guideline-based age was for colorectal (33.9% with a score of 3+). Over half of individuals screening beyond the guideline-based age for breast and cervical cancers had no comorbidities, with about a quarter having a score of two or more (Table 2). As the number of years past guideline-based age increased, the proportion with 3+ comorbidities increased for colorectal (46.2% at >10 years, v. 27.3% at 1–2 years) and cervical (25.0% at >10 years v. 10.9% at 1–2 years) (Table 2). The proportion of individuals with the highest comorbidity burden among colorectal cancer screeners was twice that compared to cervical cancer screeners, and more than triple that of breast cancer screeners.

Adjusted logistic regression models for likelihood of screening past the guideline-based age showed similar results to unadjusted rates; therefore, we presented unadjusted results (Table 3). The odds of screening past the guideline-based age decreased steadily as the number of years past the guideline-based age increased. Cervical cancer screening showed the greatest decrease in likelihood with years past guideline recommendations (OR 0.10, 95% CI 0.10–0.10 at >10 years v. 1–2 years). Colorectal cancer screening had the smallest decline in likelihood of screening at >10 years past the guideline (colorectal: OR 0.39, 95% CI 0.38–0.40; breast: OR 0.30, 95% CI 0.28–0.32; cervical: OR 0.10, 95% CI 0.10–0.10) (Table 3). For breast and cervical cancers, increasing comorbidity burden was associated with decreased likelihood of screening past the guideline-based age (Table 3). Comorbidity burden was not associated with screening past guideline-based age for colorectal cancer.

DISCUSSION

In this large, population-based study characterizing screening beyond the recommended ages for breast, cervical, and colorectal cancers, we found that the overall proportion of

Table 1 Characteristics Of Subjects Older Than Usual Screening Ages in the PROSPR-1* Consortium for Breast, Cervical, and Colorectal L Cancer Screening

	Breast	Cervical	Colorectal
N	33,475	459,318	556,356
Age (years): median (IQR)	78 (75–82)	71 (66–78)	79 (76–83)
Sex	*n* (%)	*n* (%)	*n* (%)
Female	33,475 (100%)	556,356 (100%)	260,293 (56.67%)
Charlson Score			
0	8889 (26.55%)	230,731 (41.47%)	141,988 (30.91%)
1	3903 (11.66%)	92,309 (16.59%)	75,603 (16.46%)
2	2390 (7.14%)	62,140 (11.17%)	67,923 (14.79%)
3+	2474 (7.39%)	88,478 (15.9%)	126,082 (27.45%)
Missing	15,819 (47.26%)	82,698 (14.86%)	47,722 (10.39%)
Race/ethnicity			
NH White	26,582 (79.41%)	333,849 (60.01%)	298,952 (65.09%)
NH Black	4495 (13.43%)	41,116 (7.39%)	34,448 (7.5%)
Hispanic	852 (2.55%)	83,869 (15.07%)	66,224 (14.42%)
Asian/PI	452 (1.35%)	59,698 (10.73%)	42,903 (9.34%)
Mult/Other/Unk	1094 (3.27%)	37,824 (6.8%)	16,791 (3.66%)
Median ZIP income			
1st tertile	44,268	53,044	53,027
2nd tertile	56,102	69,488	69,703
3rd tertile	72,871	81,613	81,037
Number of PCP visits†			
None	5,930 (29.38%)	85,684 (16.02%)	66,980 (14.58%)
One	3766 (18.66%)	91,774 (17.16%)	71,416 (15.55%)
Two or more	10,485 (51.95%)	357,298 (66.82%)	320,922 (69.87%)

*_PROSPR-1_ Population-based Research to Optimize the Screening Process

†Primary care provider (PCP) visits in the year prior to the screening event

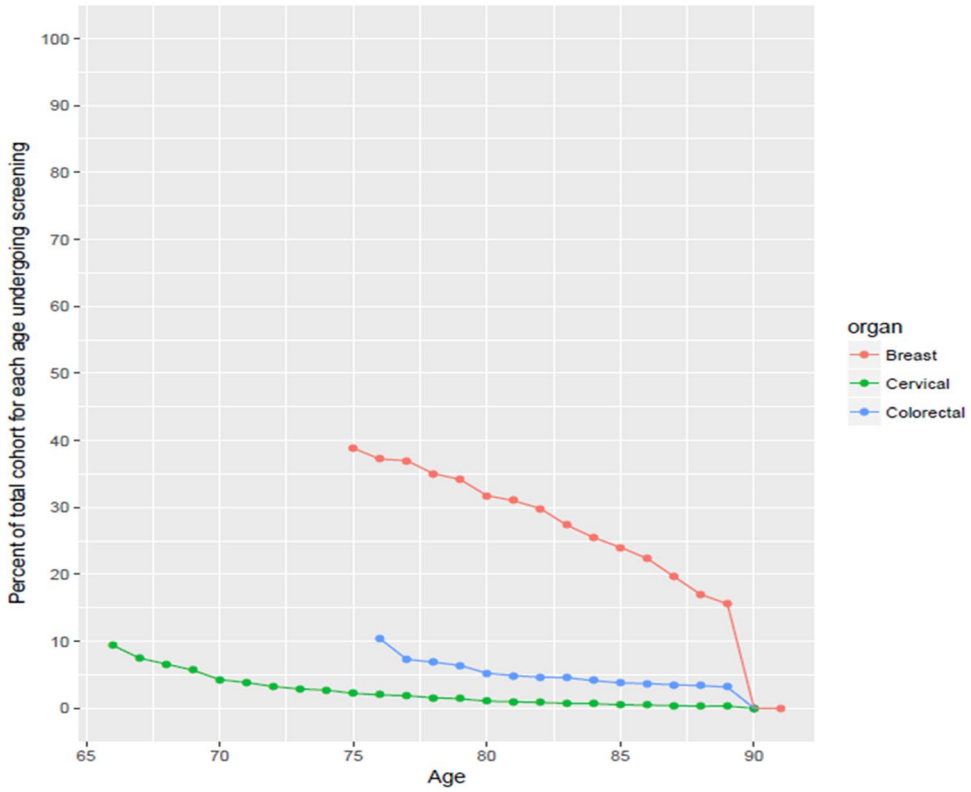

Figure 1 Proportion of older individuals screened among their same-age cohort.

Table 2 Distribution of Age and Charlson Score Among (a) Any Screening Past Guideline-Based Age*, and (b) Distribution of Charlson Comorbidity Score Among Screeners by Years Since Guideline-Based Stopping Age

		Screened past guideline-based age[a]	% screened by number of years past guideline-based age					
			1–2	3–4	5–6	7–8	9–10	> 10
Breast								
Age	Median (IQR)	79 (76, 82)	–	–	–	–	–	–
Charlson (%)	0	51.1	53.8	51.2	50.1	49.8	50.6	47.8
	1	22.1	22.2	22.3	22.7	22.2	21.4	20.8
	2	14.0	12.4	14.1	14.5	14.3	13.9	16.1
	3+	12.9	11.6	12.4	12.8	13.7	14.1	15.3
Colorectal								
Age	Median (IQR)	79 (77, 82)	–	–	–	–	–	–
Charlson (%)	0	31.1	36.9	34.0	30.1	25.8	24.2	20.4
	1	18.0	19.3	18.4	18.1	16.5	16.4	15.6
	2	17.0	16.5	17.2	16.8	17.0	16.7	17.8
	3+	33.9	27.3	30.5	35.0	40.6	42.7	46.2
Cervical								
Age	Median (IQR)	68 (67, 72)	–	–	–	–	–	–
Charlson (%)	0	52.7	58.4	54.1	51.2	47.5	44.9	38.0
	1	20.3	20.2	20.9	20.4	20.0	20.8	19.9
	2	12.7	10.5	12.3	13.6	15.6	16.1	17.0
	3+	14.3	10.9	12.8	14.9	17.0	18.2	25.0

*Guideline-based ages to stop screening according to the United States Preventive Services Task Force (USPSTF) 2017 recommendations are as follows (years): breast = 74; colorectal = 75 (with shared decision-making from 76 to 85 years); cervical = 65

Table 3 Unadjusted Logistic Regression Results for Screening Receipt on Years Past Guideline Age and Charlson Comorbidity Score

	Years	Breast	Cervical	Colorectal
Years past guideline	1–2	Ref	Ref	Ref
	3–4	0.88 (0.82–0.94)	0.66 (0.64–0.67)	0.74 (0.73–0.76)
	5–6	0.71 (0.66–0.76)	0.38 (0.37–0.39)	0.56 (0.54–0.57)
	7–8	0.56 (0.52–0.60)	0.28 (0.27–0.29)	0.50 (0.49–0.52)
	9–10	0.49 (0.44–0.55)	0.25 (0.24–0.27)	0.45 (0.44–0.47)
	> 10	0.30 (0.28–0.32)	0.10 (0.10–0.10)	0.39 (0.38–0.40)
Charlson comorbidity score	0	Ref	Ref	Ref
	1	0.88 (0.83–0.93)	0.85 (0.83–0.87)	0.97 (0.95–0.99)
	2	0.82 (0.76–0.87)	0.70 (0.68–0.73)	0.97 (0.95–0.99)
	3+	0.62 (0.58–0.66)	0.50 (0.49–0.51)	0.94 (0.93–0.96)

Separate models fit to each organ. Missing Charlson score excluded. Ns for models: breast $N = 45{,}398$; colorectal $N = 1{,}258{,}320$; cervical $N = 1{,}569{,}095$

individuals screening beyond the recommended ages was low for cervical and colorectal, at less than 5%, but was nearly a quarter of the breast cancer cohort. The screening tests occurred a median of 3–5 years past the recommended age, and between 31 and 63% of screeners across the three cancer types had a comorbidity score of two or more. Colorectal cancer screening had the highest proportion of screeners with a comorbidity score of three or higher. As the number of years past the recommended age for screening increased, the proportion of individuals with high comorbidity scores increased among colorectal and cervical cancer screening. After adjusting for covariates, we found that a higher comorbidity burden was not associated with the odds of colorectal screening. Yet for breast and cervical screening, advancing age and higher comorbidity burden were both associated with reduced odds of screening.

Screening past the guideline-based age is frequent for breast, cervical, and colorectal cancers.[15] In a study using the national Behavioral Risk Factor Surveillance Survey (BRFSS) data to assess overscreening—(screening past the guideline-based age recommendations or among those with limited life expectancy)—over half of women and men aged > 75 years old reported colorectal cancer screening, while almost three quarters (74%) of women age 75+ years old reported breast cancer screening and 46% > 65 years old reported cervical cancer screening.[16] While some of these reported screenings may be consistent with guidelines due to clinical considerations, our findings of lower odds of screening past guideline age may differ from the national survey because we had primary data collection of screening events versus self-report from the BRFSS, careful ascertainment

of screening indications as opposed to testing for any indication, as well as data from managed care systems, such as Kaiser Permanente. Nevertheless, the prevalence of screening past the guideline-based ages points to the potential for overscreening[17], which can lead to harm from downstream work-up of abnormal screening tests, and, particularly for colorectal cancer screening, physical risks of harm from the screening test itself (e.g., perforation with colonoscopy).[18]

We expected the odds of screening past the guideline-based age to decline in the presence of a greater comorbidity burden, due to (1) limited life expectancy decreasing screening benefits; (2) comorbidities that may limit the ability to access screening or to undergo the screening test; and (3) greater potential risk from screening tests. Guideline-based ages for stopping screening are intended for the general population, and therefore, do not account for individual life expectancies or health status. We observed an expected decrease in the odds of screening beyond the guideline-based age as comorbidity burden increased among breast and cervical cancer screening cohorts. However, colorectal cancer screening was not associated with comorbidity burden, even with a relatively high comorbidity burden of three or more, and when accounting for primary care visits. One speculative reason for this may be a perceived low burden of testing with non-invasive modalities, such as FOBT or FIT, such that the test itself would not pose a burden to complete. However, false positives from such testing would necessitate an endoscopic exam. It is also possible that in colorectal cancer screening, the current USPSTF recommendation for "selective screening" up to age 85 may have been a clinical approach, even if not officially part of the guidelines at the time of this study. The relatively higher comorbidity burden among those undergoing colorectal cancer screening could be due to heightened documentation of comorbidities for colonoscopy screening, given inherent risks (such as perforation or bleeding). Such reporting bias is less likely to occur for breast or cervical cancer screening, given the negligible clinical risk profile of those exams. However, we note we would still expect to see attenuation of colorectal cancer screening with higher comorbidity burden, despite any potential reporting bias.

The possibility of colorectal cancer surveillance or diagnostic exams being incorrectly classified as screening is a limitation of this study. Also, it is possible that a portion of the screening beyond guideline-based ages is due to "catch-up" screening, that is, individuals who had missed screening or not initiated prior. Another limitation is that we did not follow the same individuals longitudinally over time. Instead, we took a population-level approach to exam screening by age and comorbidity. As a result, we could not describe individual-level screening patterns. While we were able to capture comorbidity burden, we were not able to account for severity of comorbidities. Similarly, we captured the comorbidity burden at the individual level as a main effect, in addition to age, but we did not account for other factors related to life expectancy, such as functional related indicators.[19] However, our study had the benefit of including a large, diverse, population-based denominator for each of the cancer sites, with individual-level factors measured and primary data collection related to screening exams. Of note in this study are the inherent differences in the likelihood of being screened beyond the guideline-based age based on differing screening intervals for the cancer type and by modality.

The guideline-based ages for screening cessation are typically set based on the age range from which the evidence is derived. In the absence of good empirical evidence for screening at older ages seeing notable variation is not surprising and likely reflects provider-based recommendations, patient preferences, and care processes. This study suggests that neither age nor comorbidity status are strong drivers for attenuation of screening beyond the age for which screening benefit has been demonstrated. These findings are important in that while age alone may not be sufficient to discontinue screening, high comorbidity burden—representing competing mortality risks—should be considered, even though current evidence and clinical tools may only allow for subjective considerations. Without evidence to guide decision-making, both patients and providers are likely to make decisions regarding continuation of screening based on beliefs, values, and some but inadequate empirical evidence.[19,20] More empirical evidence is needed based on life expectancy, competing risks, functional status, and patient preferences to guide both patient and provider decision-making on the tradeoffs (harms vs. benefits) for screening beyoevidence.[21–23]

APPENDIX

Table 4 Tabular Values Corresponding to Fig. 1, Showing the Number and Percent of Individuals by Age that Screened Beyond the Recommended Age for Breast, Cervical, and Colon Cancer in the PROSPR-1 Screening Cohort ($N = 1{,}049{,}149$)

Cancer type	Age	N*	Screened		Median % screened
			N	%	
Breast	75	10,735	4171	38.85	29.83
	76	9924	3693	37.21	
	77	9161	3389	36.99	
	78	8473	2969	35.04	
	79	7855	2685	34.18	
	80	7248	2302	31.76	
	81	6798	2108	31.01	
	82	6243	1862	29.83	
	83	5688	1555	27.34	
	84	5079	1295	25.50	
	85	4522	1086	24.02	
	86	3967	888	22.38	
	87	3466	682	19.68	
	88	2889	491	17.00	
	89	2320	362	15.60	
Cervical	66	146,712	13,797	9.40	1.72
	67	133,630	9997	7.48	
	68	120,059	7938	6.61	
	69	111,274	6328	5.69	
	70	103,203	4403	4.27	
	71	95,042	3660	3.85	
	72	88,162	2868	3.25	
	73	83,227	2395	2.88	
	74	78,683	2123	2.70	
	75	74,890	1669	2.23	
	76	70,529	1408	2.00	
	77	66,765	1250	1.87	
	78	63,245	994	1.57	
	79	59,541	846	1.42	
	80	56,542	599	1.06	
	81	53,700	521	0.97	
	82	50,518	433	0.86	
	83	47,526	353	0.74	
	84	44,483	303	0.68	
	85	41,744	216	0.52	
	86	38,875	181	0.47	
	87	35,540	142	0.40	
	88	32,148	98	0.30	
	89	28,524	88	0.31	
Colorectal	76	146,511	15,204	10.38	4.61
	77	140,916	10,281	7.30	
	78	132,646	9133	6.89	
	79	124,611	7966	6.39	
	80	117,234	6147	5.24	
	81	109,009	5313	4.87	
	82	100,345	4676	4.66	
	83	91,975	4190	4.56	
	84	83,546	3445	4.12	
	85	76,390	2895	3.79	
	86	69,093	2551	3.69	
	87	61,867	2173	3.51	
	88	54,809	1853	3.38	
	89	47,872	1518	3.17	

*Individuals can be represented multiple times as they age through the cohort

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Data Availability *Data availability details may be obtained through PROSPR DataShare. PROSPR DataShare (cancer.gov) https://healthcaredelivery.cancer.gov/prospr/datashare/.*

Declarations

Conflict of Interest *The authors declare no conflicts of interest relating to this work.*

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