

# Have screening harms become newsworthy? News coverage of prostate and colorectal cancer screening since the 2008 USPSTF recommendation changes

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**Abstract** In 2008, the US Preventive Services Task Force updated its recommendations to discourage screening for prostate cancer in men over 75 and for colorectal cancer in adults over 85. We aimed to determine whether newspapers portrayed these screenings differently after these recommendation changes. A quantitative content analysis included articles on prostate-specific antigen (PSA) testing or colonoscopy in US newspapers from 2005 to 2012. Outcomes included the number of benefits and harms mentioned and the gist expert and lay readers might get from articles. Benefits in PSA articles ( $n = 222$ ) and harms and benefits in colonoscopy articles ( $n = 65$ ) did not change over time. Mentions of PSA harms increased after 2008 ( $p < .01$ ). Expected expert gist of PSA articles became

more negative after 2008 ( $p < .01$ ). Expected lay gist was positive and did not change. News coverage of PSA testing harms increased without a decrease in the discussion of benefits. Consumers, especially lay consumers, are receiving unbalanced information on cancer screening.

**Keywords** Cancer screening · Media · Prostate-specific antigen test · Colonoscopy · Newspaper article

## Introduction

Cancer screening recommendations have changed substantially in recent years. In 2008, the US Preventive Services Task Force (USPSTF) changed its recommendations on prostate cancer screening. While they again concluded that evidence was insufficient to determine the balance of benefits and harms of prostate cancer screening in men ages 50–75 (“I grade”), they newly concluded that screening men over 75 resulted in net harm and recommended against routinely screening these men (“D grade”) (US Preventive Services Task Force, 2008b). In 2012, the USPSTF further amended its recommendation based on evidence from two major trials (Andriole et al., 2012; Schroder et al., 2012), recommending against routine prostate cancer screening with the prostate-specific antigen (PSA) test for men regardless of age (US Preventive Services Task Force, 2012). The USPSTF also revised its recommendations on colorectal cancer screening in 2008. They reiterated recommendations that all adults age 50–75 regularly screen for colon cancer; however, they also newly recognized that the balance of benefits and harms changes with age and, for those age 76–84, they recommended screening only when individual factors warrant it (“C grade”) and no screening for those over 85 (“D grade”)

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(US Preventive Services Task Force, 2008a). The updated colorectal cancer screening recommendations were largely undisputed, but the prostate cancer screening recommendations in 2008 and 2012 drew criticism from clinicians (Akhter, 2012; Poplin & Ball, 2008; Rosoff, 2008) and patients (Caire et al., 2010; Gersh, 2012; Lee et al., 2009; Maddox et al., 2012) and sparked debate in the media (Gersh, 2012; Parker-Pope, 2008; Vastag, 2012).

It is important to monitor news coverage of screening recommendations given the potential of the media to influence consumer behavior (Noar et al., 2013). In the past, media coverage of cancer screening has focused on benefits, under-emphasizing harms (Jorgensen et al., 2007; Katz et al., 2004; MacKenzie et al., 2007; Smith et al., 2010). Unbalanced cancer screening coverage can increase patient information-seeking (Boudioni et al., 1998; Metcalfe et al., 2011), interpersonal communication about cancer (Myrick et al., 2013), screening uptake (Chapman et al., 2005; MacArthur et al., 2011), and follow-up procedures (e.g., breast biopsies) (Kelaher et al., 2008); however, unbalanced coverage can also increase screening uptake in age groups not normally recommended to receive screening, with no added benefit in cancer outcomes (Kelaher et al., 2008).

This study sought to establish whether newspapers' portrayal of screening harms and benefits changed after the release of the 2008 USPSTF recommendations. It compared newspaper coverage of PSA testing and colonoscopy, allowing us to juxtapose a controversial screening test that has disputed effectiveness (PSA testing) (US Preventive Services Task Force, 2012) with a well-accepted screening test widely considered to be effective (colonoscopy) (Davila et al., 2006; Rex et al., 2009). We expected mentions of PSA testing harms to increase and mentions of PSA testing benefits to decrease in the years following the 2008 recommendation change. This hypothesis was based on the premise that newspapers would describe why the Task Force judged the test's harms to outweigh its benefits for men over 75. We also expected newspapers to increasingly discuss PSA testing harms as the results of two large trials of the effects of prostate cancer screening on cancer-related mortality became available (Andriole et al., 2009, 2012; Schroder et al., 2009) leading up to the 2012 USPSTF recommendation against routine PSA testing in all men. We expected that mentions of harms and benefits in colonoscopy articles would not change because the USPSTF maintained an "A" grade for men ages 50–75 and the changes for adults over 75 were not widely contested.

Additionally, we aimed to capture the "gist" that consumers might take away from newspaper articles on screening. According to fuzzy trace theory, gist memories are vague, qualitative representations that capture bottom-

line meaning. In contrast, verbatim memories are precise, quantitative representations that capture literal details (Reyna, 2008). Verbatim memories fade over time, but gist memories are durable and frequently form the basis of subsequent judgments and decisions (Reyna, 2008). Even when verbatim memories are available to us, we rely upon gist to make decisions (Kirby, 2001). Given that people's gist understanding of something (e.g., screening) impacts judgments and decisions (Reyna, 2008), rather than the verbatim facts they know about it, we assessed the gist that expert and lay consumers might take away from newspaper articles about screening.

## Methods

### Identifying articles

Newspapers frequently set the agenda for other news formats and thus their content may influence and reflect news from other news sources (Smith, 2002; Wakefield et al., 2003). We conducted a quantitative content analysis of news coverage in the top 10 US newspapers with the highest daily circulation (Online Supplement A) as they are the most read and arguably the most influential newspapers in the US. To identify relevant articles, we used four databases: Lexis Nexis (Daily News [New York], LA Times, New York Post, New York Times, San Jose Mercury News, USA Today, and Washington Post); Newspaper Source Plus (Wall Street Journal), America's News (Chicago Sun-Times); and ProQuest Digital Microfilm (Chicago Tribune). We searched for (1) prostate or colon/colorectal, (2) cancer, and (3) screening or synonyms for screening. With Lexis Nexis, for example, the Boolean search string was *((prostate OR colorectal OR colon) AND cancer AND (screen! OR "prostate specific antigen" OR PSA OR P.S.A. OR colonosop! OR detect! OR diagnos! OR test! OR prevent! OR surveillance))*.

The first author coded articles for inclusion. We included articles if prostate cancer screening with the PSA test or colorectal cancer screening with colonoscopy was in the headline or in the article lede (i.e., the first ten sentences) and over half of the sentences in the article were dedicated towards the topic. We included articles published from January 1, 2005, to December 31, 2012, in order to capture the time periods before and after the release of the 2008 USPSTF recommendations for prostate cancer screening (in August, 2008) and colorectal cancer screening (in October, 2008). We excluded articles if they were not relevant (e.g., articles addressing benign prostatic hyper trophy, cancer treatment or vaccination to prevent cancer) or were not a news article (e.g., advertisements, obituaries). We also excluded articles that: addressed screening tests

for prostate cancer other than PSA testing (e.g., experimental tests, digital rectal exam) and screening tests for colorectal cancer other than colonoscopy (e.g., virtual colonoscopy, fecal occult blood testing, sigmoidoscopy); mentioned prostate or colorectal cancer screening only in passing; or discussed screening only generally (e.g., using several screening tests as exemplars).

## Measures

We developed a standardized coding instrument using an iterative process. To pilot test the instrument, two coders (EE, JL) each coded three prostate and three colorectal cancer screening articles, then reviewed and discussed their findings. The coders repeated this process until they reached agreement and revised the coding instrument accordingly. Then, to assess reliability of coding, both coders independently assessed 40 articles (~10 % of the corpus). We calculated reliability using Krippendorff's alpha (Krippendorff, 2004) and included variables with  $\alpha \geq .80$  (Krippendorff, 2004). One author then coded the remaining articles (EE).

The coding instrument included a list of potential harms and benefits generated by 112 primary care clinicians in a previous study (Vu, 2012). Examples of harms included false-positive tests, psychological effects such as worry or stress, unnecessary treatment, physical complications such as pain, bowel perforation, impotence, or incontinence, and hospitalization. Examples of benefits included early detection and early treatment, ruling out cancer, increased longevity, having more information, and reduced worry or anxiety. We coded whether an article mentioned the word "harm" or "benefit" (or a synonym, e.g., "good/bad outcome"), taking context into account (e.g., "no benefit" was not coded as a mention of benefit). We included an "other" category to capture any harms or benefits that were not on our list.

### *Number of harms and benefits*

We counted the number of harms and benefits mentioned in each article. Inter-coder reliability was  $\alpha = .99$  for the number of harms and  $\alpha = .83$  for the number of benefits.

### *Expected expert gist*

Greater expertise is associated with better discrimination between low and high risks, but these more accurate judgments are due to using fewer dimensions of more appropriate information (Reyna & Lloyd, 2006). Therefore, we reasoned that expert readers (e.g., clinicians) would be better equipped to discriminate between and weigh the

benefits and harms of screening in news articles than laypeople. We further reasoned that experts would boil the information down to an overall gist perception of net benefit/harm. Thus, we created a variable to capture the gist that experts might take away from articles by measuring the balance of the magnitude of benefits and harms in articles. In a previous study (Vu, 2012), clinicians listed and rated the magnitude of PSA testing and colonoscopy benefits [harms] using a four-point rating scale ranging from "almost no benefit [harm] to patient" (coded as 1) to "large benefit [harm] to patient" (coded as 4). We assigned a magnitude to each benefit and harm mentioned in articles corresponding to the mean clinician rating in this previous study (Online Supplement B). For each test, we then calculated expert gist as the summed magnitude of benefits minus the summed magnitude of harms mentioned in the article. A positive expert gist score indicated that an article discussed benefits with greater magnitude than harms, while a negative expert gist score indicated that an article discussed harms with greater magnitude than benefits.

### *Expected lay gist*

In contrast with experts, we reasoned that laypeople would be less well equipped to weigh benefits and harms and formulate perceptions of net benefit/harm, and that the more qualitative, summative statements that appear in article headlines and ledes would be more likely to form the basis of lay consumers' gist of screening. Thus, we created a variable to capture the gist that lay readers might be expected to take away from articles in terms of whether articles gave the overall impression that a person should or should not be screened with PSA/colonoscopy. Since article length varied considerably, coders coded the article lede, defined as the headline and first ten sentences thereafter. Most consumers read less than half of news articles (Garcia & Stark, 1991), and the positive or negative projection of an article lede is strongly correlated with the projection of the entire article (Lawrentschuk et al., 2011). Thus, coding the article lede was unlikely to misrepresent the valence of the complete article. To determine whether the expected lay gist was positive, negative, or neutral towards screening, coders weighed the way the issues were presented through the use of anecdotes, emotion, memorable quotes, or convincing quantitative evidence leaning in one direction. More specifically, coders considered the following questions: Does the article contain a headline that "leans" in one direction? (e.g., "PSA Test Leads to More Harm than Good, Experts Say" would be coded negative); does the article lead with a catchy quote about an individual's positive or negative experience with screening? (e.g., an quote about a man who was relieved to

be tested because he believes it saved his life would be coded positive); does the article begin with definitive quantitative evidence on number lives saved due to screening (would be coded positive), or number of people who experience harm from screening? (would be coded negative); does the article present a relatively balanced and non-biased account of the issues, with approximately equal mention of harms and benefits of screening within the headline and lead? (would be coded neutral). Expected lay gist was coded -1 for negative toward screening, 0 for neutral, and 1 for positive. Inter-coder reliability for expected lay gist was  $\alpha = .85$ .

In some cases, expert and lay gist could be different from each other for a single article. For example, an article could have a negative expert gist (i.e., discuss harms with greater magnitude than benefits) at the same time having a positive lay gist (i.e., article headline and first ten sentences suggests a person should be screened). This could occur if a newspaper article discussed harms with greater magnitude than benefits throughout the entire article, at the same time presenting the screening test in an overall favorable way in article lede.

#### *Other variables*

We coded the year the article was published (2005–2012). We coded two other variables that could influence the outcome variables: article length (in words) and the newspaper that published the article.

**Data analysis** For PSA articles, we compared mean harms to mean benefits using paired *t*-tests. We repeated the same analysis for colonoscopy articles. We then compared mean benefits in PSA articles to mean benefits in colonoscopy articles using independent samples *t*-tests and repeated the analysis for harms. We compared the frequency of mentions of each harm and benefit between articles on PSA and articles on colonoscopy using Chi square tests. We used one-sample *t*-tests to determine whether expected lay gist and expert gist were positive or negative.

We tested several predictions from our hypothesis. To test a prediction that mentions of harms of PSA testing would increase after the release of the 2008 USPSTF recommendations, we used piecewise regression. This approach allowed us to test whether the linear slope of mentions of harms was significantly different from zero separately for the time period before the recommendation changes (Time Period 1) and after (Time Period 2). Since the USPSTF released their recommendations in August 2008 for prostate and October 2008 for colorectal cancer screening, and we did not want to capture proximal news

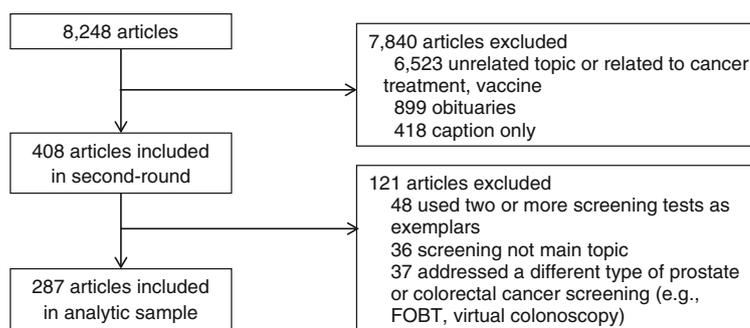
coverage of one but not both of the recommendations, we chose to set a conservative “breakpoint” at the end of 2008. Thus, we created two continuous variables to represent Time Period 1 (2005–2008) and Time Period 2 (2009–2012). We used the same piecewise regression approach to test a second prediction, that mentions of PSA benefits and colonoscopy harms and benefits would not change appreciably in either time period. We also used this approach to examine changes in the valence of articles’ expected expert and lay gist. We predicted that the valence of lay and expert gist in PSA articles would not change in the first time period but would be more negative after 2008, and that there would be no changes in gist for colonoscopy articles in either time period.

Regression analyses controlled for article length and newspaper. To test for clustering effects of articles within newspapers, we calculated the intra-class correlation coefficient (ICC). The ICC was statistically significant ( $\rho .29$ ; *CI* .12–.52), hence we controlled for effects of clustering in regression analyses. Also, coding revealed that two newspapers (Chicago Sun-Times and Daily News [NY]) were sponsoring PSA testing clinics during the study time period, and a majority of articles on PSA testing in these newspapers promoted these clinics. To control for this potential source of variation, we created a dichotomous variable (Chicago Sun-Times and Daily News [NY] vs. the other eight newspapers) and included it as a control variable in our analyses. We report the results of regressions using standardized regression coefficients ( $\beta$ s). Analyses used two-tailed tests and a critical alpha of .05. We conducted analyses in STATA.

## **Results**

Of 8,248 articles we identified, 7,840 were not relevant to our research question or were not a news article (e.g., obituary or advertisement) (Fig. 1). Of the 408 remaining articles, we excluded 121 because they used two or more screening tests as exemplars ( $n = 48$ ), because they did not feature screening as the main topic ( $n = 36$ ), or because they addressed a different type of prostate or colorectal cancer screening test other than PSA or colonoscopy ( $n = 37$ ), leaving 287 articles in the analytic sample.

Over three-quarters of the articles addressed PSA testing ( $n = 222$ ) while about one quarter addressed colonoscopy ( $n = 65$ ) (Table 1). This inequality in proportion of colonoscopy versus PSA articles existed before (PSA  $n = 101$ , colonoscopy  $n = 32$ ) and after (PSA  $n = 121$ , colonoscopy  $n = 33$ ) the 2008 recommendation change. The mean article length was 615 words ( $SD = 424$ ), and each year had about equal numbers of articles, with the most articles appearing in 2011 (18 %) and the fewest in 2005 (9 %). A quarter of the

**Fig. 1** Flow diagram**Table 1** Characteristics of newspaper articles analyzed in study ( $n = 287$ )

Article characteristics	%
<i>Year</i>	
2005	9
2006	12
2007	12
2008	14
2009	11
2010	10
2011	18
2012	14
<i>Newspaper</i>	
Chicago Sun-Times	17
Chicago Tribune	7
Daily News (NY)	25
LA Times	7
New York Post	1
New York Times	22
San Jose Mercury News	4
USA Today	7
Wall Street Journal	7
Washington Post	5
<i>Screening test</i>	
PSA testing	77
Colonoscopy	23
Article length in words, mean (SD)	615 (424)

articles were published in the Daily News (NY), 22 % in the New York Times, and 17 % in the Chicago Sun-Times. The fewest articles appeared in the New York Post (1 %) and San Jose Mercury News (4 %).

#### PSA testing articles

PSA testing articles mentioned a mean of 2.83 benefits ( $SD = .12$ ). The most commonly mentioned benefits of PSA testing were diagnosis/detection, lifesaving/reduction in mortality, low cost, early treatment, and convenience (Table 2). PSA articles mentioned a mean of 3.67 harms

( $SD = .25$ ). The most commonly mentioned harms of PSA testing were impotence, overdiagnosis, unnecessary treatment, incontinence, harms of follow up procedures, psychological harms (e.g., worry, anxiety), and false positive tests (Table 2).

PSA articles mentioned more harms than benefits (mean harms per article = 3.67,  $SD = .25$  vs. mean benefits per article = 2.83,  $SD = .12$ ;  $p < .01$ ). On average, the gist a lay person might get from PSA articles was positive (mean = .18,  $SD = .06$ ;  $p < .01$ ), but the gist an expert might get was negative (mean =  $-2.01$ ,  $SD = .78$ ,  $p = .01$ ).

#### Colonoscopy articles

Colonoscopy articles mentioned a mean of 2.97 benefits ( $SD = .22$ ). The most commonly mentioned benefits of colonoscopy were diagnosis/detection, lifesaving/reduction in mortality, preventing cancer, and early treatment (Table 2). Four percent of colonoscopy articles specifically mentioned the word “harm” (or a synonym). Colonoscopy articles mentioned a mean of 1.06 harms ( $SD = .21$ ). The most commonly mentioned colonoscopy harms were financial cost, discomfort of “prep,” bowel perforation, unnecessary treatment, bleeding, and harm from follow-up procedures (Table 2).

Colonoscopy articles mentioned more benefits than harms (mean benefits per article = 2.97,  $SD = .22$  versus mean harms per article = 1.06,  $SD = .21$ ;  $p < .01$ ). On average, the gist that lay people and experts might get was positive for colonoscopy articles (mean expected lay gist = .78,  $SD = .08$ ;  $p < .01$ ) (mean expected expert gist = 5.17,  $SD = .73$ ;  $p < .01$ ).

#### PSA testing articles compared to colonoscopy articles

Articles about PSA mentioned more harms, on average, than articles about colonoscopy ( $M = 3.53$  vs. 1.29 harms;  $p < .01$ ). Thirty-five percent of PSA articles specifically used the word “harm” (or a synonym) compared to only 4 % of colonoscopy articles ( $p < .001$ ) (Table 2). Most of the specific harms that were mentioned appeared more

often in articles about PSA testing, and the harms with the largest difference between PSA and colonoscopy articles were overdiagnosis and overtreatment (both  $p < .001$ ). The mean number of benefits mentioned in PSA articles did not differ from the mean number of benefits mentioned in colonoscopy articles (PSA  $M = 2.83$ , colonoscopy  $M = 2.97$ ;  $p = .25$ ). The word “benefit” (or a synonym) appeared more frequently in PSA articles (34 vs. 13 %,  $p < .001$ ). Mentions of most types of benefits did not differ by screening test. However, articles mentioned the benefits of preventing cancer more often for colonoscopy and convenience more often for PSA (both  $p < .001$ ).

The gist that a lay person might get from articles about colonoscopy was more positive than for PSA testing articles (colonoscopy  $M = .78$ , PSA  $M = .18$ ;  $p < .001$ ). The gist an expert might get from the articles was also more positive for colonoscopy articles (colonoscopy  $M = 5.17$ , PSA  $M = -2.01$ ;  $p < .001$ ).

Changes over time

Mentions of PSA harms in newspaper articles did not change between 2005 and 2008 (Fig. 2; Table 3). However, mentions of PSA harms increased between 2009 and 2012 ( $\beta = .19$ ,  $p = .002$ ). Mentions of PSA benefits did not change in either time period (Fig. 2; Table 3). Longer PSA articles mentioned more harms ( $\beta = .31$ ,  $p < .001$ ) and more benefits ( $\beta = .30$ ,  $p < .001$ ). The Daily News (NY) and Chicago Sun Times mentioned fewer harms ( $\beta = -.46$ ,  $p < .001$ ) and more benefits ( $\beta = .43$ ,  $p < .001$ ) of PSA testing compared with the other newspapers.

Mentions of colonoscopy harms and benefits did not change in either time period (Fig. 2; Table 3). Longer articles mentioned more colonoscopy harms ( $\beta = .52$ ,  $p < .001$ ) and more benefits ( $\beta = .24$ ,  $p = .05$ ). There was no variation in mentions of colonoscopy harms by newspaper. The Daily News (NY) and Chicago Sun-Times discussed more colonoscopy benefits compared with the other eight newspapers ( $\beta = .36$ ,  $p = .004$ ).

The gist that a lay person might get from PSA or colonoscopy articles did not change in either time period (Table 3). Longer PSA articles tended to have more negative expected lay gist ( $\beta = -.16$ ,  $p = .007$ ). The Daily News (NY) and Chicago Sun-Times printed more PSA articles with positive expected lay gist compared with the other eight newspapers ( $\beta = .57$ ,  $p < .001$ ). Expected lay gist did not change for colonoscopy articles.

The gist an expert might take away from PSA articles decreased between 2009 and 2012 ( $\beta = -.17$ ,  $p = .006$ ), indicating that PSA articles increasingly discussed harms with greater magnitude after 2008 (Table 3). Longer articles mentioned more harms with greater magnitude than shorter ones ( $\beta = -.13$ ,  $p = .01$ ). The expert gist of articles in Daily

**Table 2** Harms and benefits of PSA testing and colonoscopy mentioned in newspaper articles

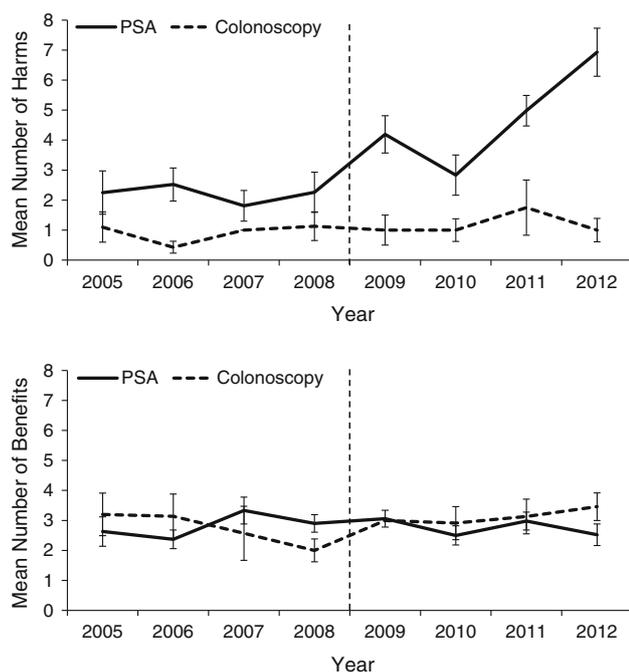
	% of PSA testing articles ( $n = 222$ )	% of Colonoscopy articles ( $n = 65$ )
<i>Harms</i>		
“Harm” (or synonym)	35	4**
Bleeding	4	3
Discomfort of “prep” for colonoscopy	N/A	15
False negatives	12	7**
False positives	17	0**
Financial cost	1	17**
Follow-up procedures	27	3**
Impotence	44	0**
Incontinence	38	1**
Increased mortality	7	1
Infection	7	1
“Other” harm	19	14
Overdiagnosis	41	0**
Pain	11	1*
Perforation	N/A	13
Psychological effects (e.g., anxiety)	18	7*
Unnecessary treatment	40	3**
<i>Benefits</i>		
“Benefit” (or synonym)	34	13**
Convenience	18	1**
Diagnosis/detection	60	51
Early treatment	7	1
Knowledge/having more information	24	26
Lifesaving/reduced mortality	44	50
Longevity	5	3
Low cost	30	12**
“Other” benefit	11	12
Prevent cancer	0	42**
Psychological effects (e.g., peace of mind)	4	3
Rule out cancer	1	4

\*  $p < .05$ ; \*\*  $p < .001$

News (NY) and Chicago Sun-Times was more positive than articles in the other eight newspapers ( $\beta = .62$ ,  $p < .001$ ). Expert gist did not change for colonoscopy articles.

**Discussion**

News coverage is an important way that the public receives health messages. Newspaper coverage of PSA testing harms increased after 2008, apace with new research



**Fig. 2** Number of PSA testing and colonoscopy harms and benefits mentioned in newspaper articles over time

showing the harms of prostate cancer screening outweigh its benefits and pursuant USPSTF recommendation changes. However, between 2005 and 2012, newspapers did not scale back their discussion of PSA testing's benefits. Newspapers mentioned the benefits of PSA testing, a screening test with disputed effectiveness, as much as they mentioned the benefits of colonoscopy, an effective screening test. This suggests that potential benefits of PSA testing such as cancer detection and reduced mortality were newsworthy irrespective of test efficacy or balance of benefit to harm. We also found that, while the gist an expert

might have gotten from PSA articles was negative and became more negative over time, the gist a lay person might have gotten from PSA articles was positive and did not change. Thus, lay consumers may be receiving unbalanced information on PSA testing. In addition, the gist both lay and expert consumers may have taken away from colonoscopy articles was positive, and colonoscopy articles mentioned few harms. This finding suggests that older consumers, many of whom are more likely to be harmed from colonoscopy than to benefit from it (US Preventive Services Task Force, 2008a), are receiving an unbalanced and possibly misleading message about colorectal cancer screening from the news.

Our findings related to newspapers' portrayal of cancer screening benefits are in line with previous studies showing that the media is biased towards discussing the benefits of screening (Katz et al., 2004; MacKenzie et al., 2007; Smith et al., 2010). However, the observed increase in media discussion of PSA testing harms is a new finding. The simplest explanation for this finding is that newspapers have been describing and providing rationale for the 2008 USPSTF recommendation changes and the more recent changes in 2012. Namely, the USPSTF recommended against screening for all men in 2012 after assessing new mortality evidence from two major randomized trials (Andriole et al., 2012; Schroder et al., 2012) as well as additional evidence of PSA harms (Crowell et al., 2009; Loeb et al., 2011; Rosario et al., 2012). Thus, the observed increase in coverage of PSA testing harms may reflect a growing evidence base that PSA is more harmful than beneficial.

Another possible explanation for the observed increase in news coverage of prostate cancer screening harms may have to do with the controversy surrounding PSA testing. PSA testing has been controversial for many years (Barry,

**Table 3** Changes in newspaper coverage of PSA testing and colonoscopy over time, 2005–2012

Outcomes	Year, 2005–2008 $\beta$	Year, 2009–2012 B	Length of Article $\beta$	Newspaper <sup>a</sup> $\beta$
<i>Correlates</i>				
PSA testing benefits	.14	.05	.30**	.42**
PSA testing harms	.12	.19*	.31**	-.46**
PSA testing expected lay gist	.11	.00	-.16*	.57**
PSA testing expected expert gist	-.04	-.17*	-.13*	.62**
Colonoscopy benefits	-.19	.26	.24*	.36*
Colonoscopy harms	-.10	-.06	.52**	-.11
Colonoscopy expected lay gist	-.32	.18	-.03	.18
Colonoscopy expected expert gist	-.15	.32	-.20	.33*

Each row of the table presents results from a separate model of PSA articles ( $n = 222$ ) or colonoscopy articles ( $n = 65$ )

<sup>a</sup> Daily News (NY) and Chicago Sun-Times versus other newspapers

\*  $p \leq .05$ ; \*\*  $p < .001$

2009) due to disagreement and uncertainty over test effectiveness and how best to interpret and act upon test results. As well, changes in recommendations can lead to public confusion over the incorrect belief that the government is rationing health care (Squiers et al., 2011). Media coverage often functions in a circular, self-sustaining way: a news story sparks controversy, which in turn becomes a news media story in and of itself, leading to yet more public response and more coverage (Kuran & Sunstein, 1999). In this way, the increasing discussion of harms documented in the present study may reflect the controversy surrounding PSA testing. In contrast, past studies have found that colorectal cancer screening is under-reported in the media (Mackenzie et al., 2008, 2010), and it is relatively less controversial than prostate cancer screening. Thus, it is not surprising that we retrieved less than a third as many articles about colonoscopy as about PSA testing.

Our findings related to expected expert and lay gist of PSA articles contradicted each other: while expert gist decreased after 2008, indicating that PSA articles were increasingly discussing harms with greater magnitude, the gist a lay person might have taken away from the same articles was positive toward screening. This suggests that while reporters may have described the potential harms of PSA testing in greater technical detail than its benefits, the overall takeaway message of these articles was that men should be screened. A past study of newspaper coverage of the two major randomized trials of prostate cancer screening (Andriole et al., 2009; Schroder et al., 2009) found that newspapers portrayed prostate cancer screening as a negative endeavor (Lawrentschuk et al., 2011). This past finding is consistent with our findings for expected expert gist but not expected lay gist, which may reflect this previous study's focus on coverage of randomized trials, which are likely to have included technical details about harms. Overall, our findings related to gist suggest that expert consumers may be receiving more balanced information on prostate cancer screening than lay consumers.

We found that from 2005 to 2012 the Chicago Sun-Times and Daily News (NY) mentioned fewer harms, more benefits, and published more articles that had positive expected lay gist relative to the other eight newspapers in our sample. News stories frequently include anecdotes and personal experiences, which can be especially powerful in perpetuating misunderstandings about the benefits of screening (e.g., a news article may quote a man claiming that PSA testing saved his life, however, it is not possible for that man to know whether he had a deadly or harmless prostate cancer) (Arkes & Gaissmaier, 2012). During the study time period, a majority of articles published in the Chicago Sun-Times and Daily News (NY) promoted their free PSA testing clinics (with headlines such as “It can

save your life! Deadly scourge of prostate cancer is often curable if caught on time” and “Do the right thing, men: Take our prostate test”) (Moritz, 2009; The Chicago Sun-Times, 2008), which may explain why so many articles published in these papers were “pro” PSA testing. Together, these two papers produced 42 % of the sample of articles included in this study. If 42 % of what is being said about prostate cancer screening in the top 10 US newspapers over the past 8 years has been predominantly positive about the PSA test, this may in part contribute to high PSA testing rates (Behavioral Risk Factor Surveillance System (BRFSS), 2011; Goodwin et al., 2013) and enthusiasm for prostate cancer screening in the US (Schwartz et al., 2004). Furthermore, these clinics may not offer men the opportunity to discuss harms and benefits with their providers, a significant aspect of making an informed decision about screening.

While the juxtaposition of PSA to colonoscopy was illuminating, these two screening tests are qualitatively different in ways that make this comparison an imperfect one. PSA testing and colonoscopy involve different procedures (i.e., blood test versus internal exam) that have different harms that occur at different stages of the screening process. However, we wanted to compare the harms and benefits of PSA testing over time to a relatively effective screening test, making colonoscopy (the other major cancer screening test that men regularly receive) the most appropriate comparator. A related trade-off was that we chose to compare two screening tests rather than to compare PSA testing to all USPSTF-recommended screening tests for colorectal cancer screening (e.g., sigmoidoscopy, FOBT). Thus, our study is limited to colorectal cancer screening articles that primarily address colonoscopy. This study was also limited to newspaper coverage and did not include online news sources. However, online versions of print newspapers typically replicate what is in the print versions, with the exception of blogs. Thus, our analysis of newspapers may also reflect online versions of the top 10 US newspapers and therefore an additional source of news with potential for impact on public knowledge, attitudes, and beliefs. Moreover, to our knowledge, it is not currently possible to conduct systematic, replicable retrospective searches of online news sites. This is because Internet search engines act as information “gatekeepers,” limiting searches of their content via their application programming interfaces (Fowler, 2005). Search engines rapidly trim news from their search results, making retrospective searches of online content difficult, if not impossible, to replicate. As well, since our study examined only the 10 most popular US newspapers, generalizability to local newspapers remains to be established. However, many people across the country subscribe to newspapers such as the New York Times and Wall Street Journal or

access them online. Thus, many of the newspapers in our sample have a broader impact than just the area within which the print editions are distributed.

This study documents an increased discussion of the harms of PSA testing in the most popular US newspapers without a corresponding decrease in the discussion of its benefits. By emphasizing certain topics and events, the news media has the potential to affect the availability of information, the public's risk perception related to screening (Combs & Slovic, 1979; Lichtenstein et al., 1978; Tyler & Cook, 1984), screening decisions and other behavioral health outcomes (Noar et al., 2013). Findings may be of particular interest to clinicians, who may be interested in how the media could be influencing their patients' perceptions of screening. Given recent efforts to raise awareness about the harms of clinical preventive services (e.g., the Choosing Wisely campaign) (ABIM Foundation, 2013) and extensive media attention to breast cancer screening with mammography (Orenstein, 2013; Steenhuisen & Orlofsky, 2012), future research is needed to establish whether our findings are limited to PSA testing or whether they are part of a broader trend in media coverage of cancer screening harms. Future research should also assess the impact of media coverage of changes to screening recommendations on consumer behaviors such as clinicians' screening recommendations and screening uptake among patients.

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