Literature Review:

California Senate Bill 1034
Health Care: Mammograms

Summary to the 2018-2019 California State Legislature, April 16, 2018

CALIFORNIA HEALTH BENEFITS REVIEW PROGRAM

AT A GLANCE

On February 26, 2018, the Senate Committee on Health requested that CHBRP conduct a literature review on dense breast notification legislation, as it relates to the introduced version of California Senate Bill (SB) 1034. CHBRP's findings are contained in this brief report. Until January 1, 2019, current law requires that a health facility at which a mammogram is performed include a prescribed notice on breast density in the written report that is sent to patients categorized as having dense breasts. The written notice informs the patient that they have dense breasts, that dense breasts are common, and that this information is intended to inform conversations with their health care provider. The prescribed notice text is included elsewhere in this report. The version of SB 1034 analyzed by CHBRP would extend this provision indefinitely.

Currently, the US Preventive Services Task Force (USPSTF) concludes that: "The evidence on adjunctive screening for breast cancer using breast ultrasound, MRI (magnetic resonance imaging), DBT (digital breast tomosynthesis), or other methods in women identified to have dense breasts on an otherwise negative screening mammogram is insufficient, and the balance of benefits and harms cannot be determined." (Siu, 2016) The 2016 USPSTF breast cancer screening recommendation concluded that current evidence is insufficient to recommend for or against supplemental screening among women with dense breasts and a negative mammogram.

1. **Research approach and methods:** CHBRP conducted a literature search limited to studies published from 2009 to present, because Connecticut passed the first breast density law in 2009. Of the 147 articles found in the literature review, 97 were reviewed for potential inclusion in this report, and a total of 27 studies were included in the medical effectiveness review for this report. The other articles were eliminated because they did not focus on women with dense breasts, were of poor quality, or did not report findings from clinical research studies.
2. **Overview of research questions:** The key questions of this literature review are:
    1. For women with dense breasts, are supplemental screenings effective in detecting cancers or abnormalities not detected by screening mammography?
    2. Does provider categorization of dense breast vary among providers?
    3. Do notification laws affect: (i) provider categorization of dense breasts or other provider behavior; (ii) utilization of supplemental screening; and (iii) cancer detection?
    4. Do patients understand the information included in dense breast notifications?
    5. Do dense breast notifications impact patient anxiety?
3. **Key findings for supplemental screening in women with dense breasts:** CHBRP relied on a systematic review from the USPSTF to answer this question. Overall, the USPSTF review concluded that supplemental screening among women with dense breasts identifies additional breast cancer cases but also increases false-positive results. The review also concluded that the effects of supplemental screening on breast cancer health outcomes is unclear at this time (Melnikow et al., 2016).
4. **Key findings for provider categorization of dense breasts:** CHBRP concludes that, based on one systematic review and four identified studies, there is a preponderance of evidence that there is variability among interpreting providers' designations of dense breast tissue. As a result, women may receive inconsistent information from year to year about whether they are considered to have dense breasts or not, depending on the provider who interprets their mammogram result.
5. **Key findings for dense breast notification laws' impact on provider categorization, utilization and cancer detection:**
    - **Provider categorization:** CHBRP concludes that, based on three studies, there is limited evidence that breast density legislation impacts provider breast density categorization. Three studies found changes in breast density categorization by providers before and after legislation, and all note a decrease in dense breast categorization directly following legislation. However, it is unclear what, if any, impact exists over the longer term.
    - **Utilization of supplemental screening:** Based on two studies, there is limited evidence that dense breast notification laws increase the utilization of breast ultrasounds. Based on four studies, there is limited evidence that dense breast notification laws are associated with increased use of supplemental MRI.
    - **Cancer detection:** Based on four studies, CHBRP concludes there is inconclusive evidence to determine whether dense breast notifications impact breast cancer detection. One study with the largest sample size (~1.3 million) found no significant differences in breast cancer detection between the month prior to enactment, the month after enactment or 10 months after enactment. Three studies of smaller sample sizes reported an increase in cancer detection. However, two studies indicated a low positive predictive value (test's ability to accurately determine actual cancer cases) for follow-up breast ultrasound.
6. **Key findings for patient understanding:** Based on the two studies of awareness of personal breast density in states following implementation of dense breast notification laws, CHBRP concludes that there is insufficient evidence regarding the effect of the notification laws on awareness of personal breast density. Insufficient evidence is not "evidence of no effect." It is possible that an impact could result from these laws, but current evidence is insufficient to inform an estimate.
7. **Key findings for patient anxiety:** Based on five studies, CHBRP determines there is inconclusive evidence regarding the impact of dense breast notifications on patient anxiety.

CONTEXT

On February 26, 2018, the Senate Committee on Health requested that CHBRP complete a literature review examining dense breast notification legislation, as it relates to the introduced version of California Senate Bill (SB) 1034. Breast density refers to the measure of glandular or fibrous tissue (dense tissue) relative to fatty tissue (nondense tissue) in the breast (Dehkordy and Carlos, 2016). Breast density is most commonly determined by visual interpretation of a mammography exam, often by a radiologist or other trained provider. Women with "dense breasts" appear to have more dense tissue than fatty tissue based on a mammogram.

The American College of Radiology (ACR) has established a rating system to categorize breast density known as the Breast Imaging Reporting and Data System (BI-RADS). Using BI-RADs, health care providers interpreting a mammogram can categorize breasts as (ordered from fatty to dense):

a. Almost entirely fatty;

b. Scattered areas of fibroglandular density;

c. Heterogeneously dense, which may obscure small masses; and

d. Extremely dense, which may lower the sensitivity of the mammogram (ACR, 2013a).

Dense breast tissue is common — estimates indicate that 50% of women in the United States have dense breast tissue as interpreted by their health care provider. According to the ACR, the distribution of breast tissue density categorization among U.S. women is as follows: 10% fatty, 40% scattered areas of fibroglandular density, 40% heterogeneously dense, and 10% extremely dense. The distribution has remained steady since the 1990s (D'Orsi et al., 2012; Raj et al., 2018). Younger women more commonly have dense breasts, and breast density can decrease as women age (Hooley, 2017).

Mammography is considered the gold standard for screening for the early detection of breast cancer (Lauby-Secretan et al., 2015; Tabár et al., 2011). It is the only form of screening that has been shown to increase the cancer detection rates in randomized controlled trials and multiple cohort and case control trials (Lauby-Secretan et al., 2015). However, dense breast tissue can impede mammographic sensitivity[1] because dense breast tissue appears opaque on a mammogram and may make it more difficult to identify breast cancers or other abnormal findings (Dehkordy and Carlos, 2016; Hooley, 2017). Several different technologies are used to perform supplemental screening of women with dense breasts (including breast ultrasound, breast MRI, and digital breast tomosynthesis).

Breast density has been demonstrated to be an independent risk factor for breast cancer. However, estimates vary regarding the association between dense breasts and magnitude of increased cancer risk (Hooley, 2017).

At the time of this report's publication, 35 states have passed legislation related to breast density notifications to patients since Connecticut passed the first state law in 2009 (Are You Dense Advocacy Inc., 2018). The Food and Drug Administration oversees the federal Mammography Quality and Standards Act, which requires that breast density be included in the radiology report sent to a referring clinician, but not the patient.[2]

[1] Sensitivity is a test's ability to correctly identify individuals with a condition or disease.
[2] Mammography Quality and Standards Act, P.L. 102-539.

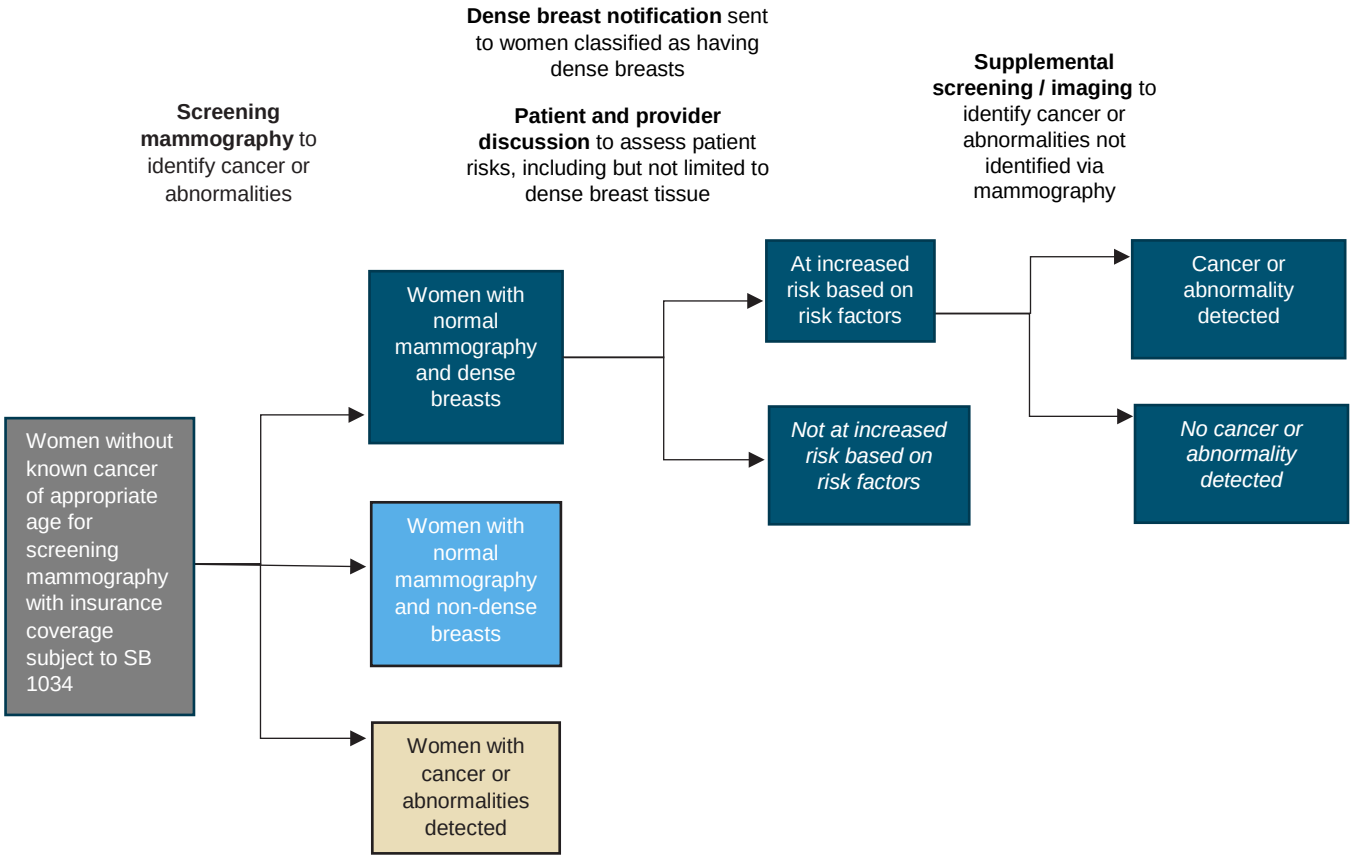
State laws vary in requirements of the notifications; some require specific verbiage or specific information be included. According to the advocacy group Are You Dense, states have varied requirements for notifications sent to women following mammography:

- In six states, dense breast laws require that all women receive general density information, and no information about personal density;
- In 19 states, including California, only women with dense breasts receive a notification stating that the recipient has dense breasts;
- In 10 states, all women receive personal breast density information and women with dense breasts receive additional information.

Five states require insurance coverage for appropriate supplemental imaging for women with dense breasts (Connecticut, Illinois, Indiana, New Jersey, New York) (Are You Dense Advocacy Inc., 2018). California's breast density notification law took effect in 2013. The California Breast Density Information Group, a working group of breast cancer risk specialists and breast imagers has estimated that approximately 2 million women in California receive a breast density notification each year (Price et al., 2013).

Figure 1 describes the pathway for screening mammography, dense breast notifications, and supplemental imaging. This pathway does not describe subsequent steps for women with normal mammography and non-dense breasts nor does it describe subsequent steps for women with cancer or abnormalities detected. Women in these groups may go on to receive additional services, but these groups are not considered directly relevant to SB 1034.

Figure 1. Pathway for Screening Mammography, Dense Breast Notifications and Supplemental Imaging



Source: California Health Benefits Review Program, 2018.

United States Preventive Services Task Force

Currently, the U.S. Preventive Services Task Force (USPSTF) recommendation on breast cancer screening states that: “The evidence on adjunctive screening for breast cancer using breast ultrasound, MRI (magnetic resonance imaging), DBT (digital breast tomosynthesis), or other methods in women identified to have dense breasts on an otherwise negative screening mammogram is insufficient, and the balance of benefits and harms cannot be determined.” (Siu, 2016) The 2016 breast cancer screening recommendation from the USPSTF graded that current evidence is insufficient to recommend for or against supplemental screening among women with dense breasts and a negative mammogram.

A systematic review on supplemental screening in women with dense breasts, prepared to inform the broader USPSTF recommendation on breast cancer screening, is summarized in the literature review of this report.

BILL SUMMARY

Until January 1, 2019, current California state law requires that a health facility at which a mammogram is performed include a prescribed notice on breast density in the written report that is sent to patients categorized as having dense breasts. Patients are categorized as having dense breasts (either "heterogeneously dense" or "extremely dense") based on the Breast Imaging Reporting and Data System established by the American College of Radiology. Current law specifies that the text of the notice state the following:

Your mammogram shows that your breast tissue is dense. Dense breast tissue is common and is not abnormal. However, dense breast tissue can make it harder to evaluate the results of your mammogram and may also be associated with an increased risk of breast cancer.

This information about the results of your mammogram is given to you to raise your awareness and to inform your conversations with your doctor. Together, you can decide which screening options are right for you. A report of your results was sent to your physician.

The version of SB 1034 analyzed by CHBRP would extend this provision indefinitely.

LITERATURE REVIEW: MEDICAL EFFECTIVENESS

Research Approach and Methods

Studies related to dense breast notification were identified through searches of PubMed, the Cochrane Library, Web of Science, Embase, Scopus, and the Cumulative Index of Nursing and Allied Health Literature.[3]

Websites maintained by the following organizations that produce and/or index meta-analyses and systematic reviews were also searched: the Agency for Healthcare Research and Quality (AHRQ), the International Network of Agencies for Health Technology Assessment (INAHTA), the National Health Service (NHS) Centre for Reviews and Dissemination, the National Institute for Health and Clinical Excellence (NICE), the Scottish Intercollegiate Guideline Network, the National Guideline Clearinghouse (NGC), the NHS Centre for Reviews and Dissemination, PubMed Health, the U.S. Preventive Services Task Force, and the World Health Organization.

The search was limited to abstracts of studies published in English.

CHBRP relied on a systematic review published in 2016 for findings from studies related to supplemental screening for women with dense breasts (key question 1, described below). For other key questions, the search was limited to studies published from 2009 to present, because Connecticut passed the first breast density law in 2009. Of the 147 articles found in the literature review, 97 were reviewed for potential inclusion in this report on SB 1034, and a total of 27 studies were included in the medical effectiveness review for this report. The other articles were eliminated because they did not focus on women with dense breasts, were of poor quality, or did not report findings from clinical research studies. A more thorough description of the methods used to conduct the medical effectiveness review and the process used to grade the evidence for each outcome measure is presented in Appendix A.

The conclusions below are based on the best available evidence from peer-reviewed and grey literature. Unpublished studies are not reviewed because the results of such studies, if they exist, cannot be obtained within the 60-day timeframe for CHBRP reports.

Key Questions

The key questions for this literature review are:

1. For women with dense breasts, are supplemental screenings effective in detecting cancers or abnormalities not detected by screening mammography?
2. Does categorization of dense breast vary among providers?
3. Do notification laws affect:
    a. Provider categorization of dense breasts or other provider behavior;
    b. Utilization of supplemental screening; and
    c. Cancer detection?

[3] Much of the discussion below is focused on reviews of available literature. However, as noted in the ME approach document (see p.8 in the document posted here), in the absence of "fully-applicable to the analysis" peer-reviewed literature on well-designed randomized controlled trials (RCTs), CHBRP's hierarchy of evidence allows for the inclusion of other evidence.

4. Do patients understand the information included in dense breast notifications?
5. Do dense breast notifications impact patient anxiety?

Methodological Considerations

Literature on breast density notifications laws are typically limited in a few ways. First, many of the studies assessed had relatively small sample sizes (particularly studies related to patient understanding, awareness and anxiety, and provider understanding and behavior). Due to these small sample sizes, most of the studies assessed related to patient understanding and provider understanding and behavior may not be generalizable to a broader population. Second, some of the studies described involve a limited period of time following implementation of a notification law, which prevented them from assessing longer-term effects of these laws. Additionally, well-designed studies that identify population-level mortality outcomes typically require a time period of several decades. For example, for studies to examine mortality outcomes at a population level, they would need to follow patients who received a dense breast notification compared to patients of similar risk who did not for several decades to track mortality outcomes. As these are relatively recently enacted laws, CHBRP is unaware of any population-level mortality study for breast density notification laws. Lastly, studies that examine the effects of notification laws on use of supplemental screening are not always able to determine the extent to which increases in screening are due to the notification law. These studies may not have sufficient data about the characteristics of women screened to determine whether increases in screening occurred among women with dense breasts. This limits the studies' ability to determine whether any observed increase in screening is associated with breast density notification laws.

Outcomes Assessed

This review assesses various outcomes, including:

- Effectiveness of supplemental screening among women with dense breasts;
- Provider categorization of dense breasts or other provider behavior;
- Utilization of supplemental screening (breast ultrasound and magnetic resonance imaging [MRI]);
- Cancer detection following normal mammography result using supplemental screening; and
- Patient understanding and patient anxiety.

Study Findings

Supplemental Screening among Women with Dense Breasts

CHBRP relied on the 2016 systematic review prepared for the U.S. Preventive Services Task Force (USPSTF) for the key question related to supplemental screening among women with dense breasts (Melnikow et al., 2016). The systematic review summarizes evidence on test performance characteristics and cancer detection of supplemental screening among women with dense breasts with the following technologies:

- Hand-held ultrasonography (HHUS);
- Automated whole-breast sonography (ABUS);

- Breast magnetic resonance imaging (MRI); and
- Digital breast tomosynthesis (DBT).

Test performance generally describes the following characteristics:

- Sensitivity: [4] Measures a test's ability to correctly classify a patient as having a disease or condition;
- Specificity:[5] Measures a test's ability to correctly classify a patient as disease-free or condition-free;
- Positive predictive value: The percentage of patients with a positive test who have the disease or condition; and
- Negative predictive value: The percentage of patients with a negative test who do not have the disease or condition (Parikh et al., 2008).

In some cases, recall rates were also described. Recall rates indicate the percentage of screening mammograms that appear abnormal, but do not constitute a breast cancer diagnosis, and require follow-up imaging evaluation and/or biopsy (ACR, 2013b; Castells et al., 2006).

Regarding test performance, the USPSTF review included nine studies that reported test performance for supplemental screening using HHUS, ABUS and MRI among women with a negative mammogram, and no studies related to DBT in women with dense breasts. Also, the review identified few studies that evaluated test performance of supplemental screening specifically for women with dense breasts (Melnikow et al., 2016).

Regarding cancer detection, the USPSTF review reported that 18 studies found supplemental screening after a negative mammogram detected additional breast cancer cases. With the exception of DBT, studies reported that supplemental screening led to additional recalls and subsequent biopsies (Melnikow et al., 2016).

Overall, the USPSTF review concluded that supplemental screening among women with dense breasts identifies additional breast cancer cases but also increases false-positive results. The review also concluded that the effects of supplemental screening on breast cancer health outcomes is unclear at this time (Melnikow et al., 2016).

Hand-held ultrasonography (HHUS)[6] and automated whole-breast sonography (ABUS)[7]

Test performance of hand-held ultrasonography (HHUS) and automated whole-breast sonography (ABUS): The USPSTF review included five studies regarding hand-held ultrasonography and one study regarding automated whole-breast sonography. Among women with dense breasts following a recent negative screening mammogram, hand-held ultrasonography sensitivity for detecting breast cancer ranged from 0.80 (95% Confidence Interval [CI], 0.65 to 0.91) to 0.83 (95% CI, 0.59 to 0.96). Reported specificity ranged from 0.86 (95% CI, 0.85 to 0.88) to 0.95 (95% CI, 0.94 to 0.95). Positive predictive value ranged from 0.03 to 0.08 while negative predicted value was reported as 0.99 (Melnikow et al., 2016). Hand-held ultrasonography is likely to detect breast cancer a majority of the time (sensitivity 0.80 to 0.83) and is likely to classify patients without breast cancer as negative results (specificity ranged from

[4] Also known as "true positive rate."
[5] Also known as "true negative rate."
[6] With hand-held ultrasonography, a provider or breast imager uses a hand-held ultrasound probe to perform an ultrasound of the entire breast.
[7] With automated whole-breast sonography, a machine performs the exam with an ultrasound probe.

0.86 to 0.95). However, the test has a low positive predictive value (.03 to .08) meaning that if a woman screens positive following HHUS, there is a 3% to 8% probability that she has breast cancer. Conversely, the test has a high negative predictive value (0.99) meaning that if she has a negative result, there is a 99% probability that she does not have breast cancer. One automated whole-breast sonography study reported that ABUS had similar performance characteristics as HHUS for women with a negative mammogram and with dense breasts (Melnikow et al., 2016).

Cancer detection and recall rates of hand-held ultrasonography (HHUS) and automated whole-breast sonography (ABUS): The review summarized seven studies that reported on cancer detection rates for hand-held ultrasonography. Two studies estimated a cancer detection rate after negative mammogram of 4.4 per 1,000 exams (95% CI, 2.5 to 7.2). The U.S. study reported a recall rate of 14% (95% CI, 12.7% to 15.1%) for supplemental HHUS (Melnikow et al., 2016). These findings indicate that 14% of patients who underwent supplemental hand-held ultrasonography had an abnormal result and had to return for additional testing and/or biopsy.

The review summarized three studies that reported on cancer detection for automated whole-breast sonography. Following a negative mammogram, these three studies reported cancer detection rates of 1.9 to 15.2 cancer cases per 1,000 exams. One study reported that mammography-only cancer detection rate was 4.3 cancer cases per 1,000 exams. The studies reported recall rates for automated whole-breast sonography ranging from 2% (95% CI, 1.1% to 2.0%) to 14% (95% CI, 12.9% to 14.0%) (Melnikow et al., 2016). Findings for automated whole-breast sonography indicate that between 2% and 14% of patients who underwent ABUS had an abnormal result and had to return for additional testing and/or biopsy.

Breast magnetic resonance imaging (MRI)

Test performance of breast magnetic resonance imaging (MRI): For MRI, the USPSTF review described three studies that reported test characteristics of supplemental MRI screening. The review considered study outcomes relevant to women with dense breasts who had a lower risk of breast cancer (i.e., the review did not consider study findings for women at very high risk of breast cancer due to *BRCA1/2* gene mutations, personal histories of breast cancer or radiation exposure). Among lower-risk women with dense breasts, the sensitivity of MRI screening (measuring ability to correctly classify patient as having breast cancer) following a negative mammogram ranged from 0.75 (95% CI, 0.35 to 0.97) to 1.00 (95% CI, 0.59 to 1.00). Specificity (measuring ability to correctly classify patient as disease-free) ranged from 0.78 (95% CI, 0.73 to 0.83) to 0.93 (95% CI, 0.87 to 0.97). Positive predictive value ranged from 0.03 to 0.33 while negative predictive values ranged from 0.99 to 1.00 (Melnikow et al., 2016). This indicates that MRIs are better performing in indicating a negative result for patients who do not have the disease (negative predictive value) compared to poorer performance in indicating positive results for patients who have the disease (positive predictive value).

Cancer detection and recall rates of magnetic resonance imaging (MRI): The USPSTF review identified three studies related to supplemental MRI following a negative mammogram. They reported breast cancer detection rates from 3.5 (95% CI, 1.3 to 7.6) to 28.6 (95% CI, 5.9 to 81.2) per 1000 exams detecting a small number of cancer cases (2 to 7 cases). Two studies reported cancer detection rates of mammography for women with dense breasts of 4.1 and 7.0 per 1,000 exams. Invasive breast cancer[8] was most commonly detected (67% and 86% in two studies). For MRI, recall rates ranged from 9% (95% CI, 4.0% to 15.7%) to 23% (95% CI, 18.9% to 28.3%) (Melnikow et al., 2016). This indicates that 9% to

[8]Invasive breast cancers spread outside of the duct of the breast and into other tissue of the breast. Noninvasive cancers (also called “in situ”) are confined to the lobules or ducts of the breast, and have not spread. Noninvasive cancers may become invasive cancers over time.

23% of patients who underwent MRI had an abnormal result, but not a cancer diagnosis, and had to return for subsequent testing.

Digital breast tomosynthesis (DBT)

Test performance of digital breast tomosynthesis (DBT): The USPSTF review did not identify any studies examining the test performance characteristics of DBT.

Cancer detection and recall rates of digital breast tomosynthesis (DBT): The USPSTF review included four studies examining DBT among women with dense breasts. Three of the four studies were completed in the United States and were single-site retrospective studies generally examining pre- and post-introduction of DBT (Melnikow et al., 2016).

Three studies described cancer detection rates of digital mammography alone, which ranged from 4.0 to 5.2 per 1,000 exams. Cancer detection rates of combined digital mammography with DBT ranged from 5.4 (95% CI, 3.5 to 7.9) to 6.9 (95% CI, 4.8 to 9.6) per 1,000 exams. One study found that of the cancer cases detected through combined DBT and mammography, 67% were invasive cancers, the same proportion reported for mammography alone (Melnikow et al., 2016).

In three U.S. retrospective studies, recall rates for DBT ranged from 7% (95% CI, 6.2% to 7.7%) to 11% (95% CI, 10.0% to 11.7%). Recall rates for digital mammography alone ranged from 9% (95% CI, 8.4% to 11.0%) to 17% (95% CI, 15.0% to 18.2%) (Melnikow et al., 2016). This indicates that 7% to 11% of patients who underwent DBT had an abnormal result, and had to return for subsequent testing. The lower bound estimates for recall rates are similar for both DBT and mammogram alone, with DBT slightly lower.

Cancer detection and recall rates

The USPSTF review reported that supplemental screening following a negative screening mammography consistently detected additional breast cancer cases; most of these were invasive breast cancers. Eighteen studies reported additional cancers were detected; supplemental tests also generally led to subsequent additional recalls and biopsies (Melnikow et al., 2016).

Harms of supplemental screening

The USPSTF review described harms of supplemental screening, but did not identify studies that examined the harms of supplemental screening in women with dense breasts. Studies included in the systematic review found high levels of false-positive results for supplemental screening with HHUS, ABUS, and MRI generally (not limited to women with dense breasts). Studies on supplemental screening with HHUS and ABUS reported that over 90% of positive results were false-positives. For MRI, studies reported that of all positive test results, 66% to 97% were false-positives (Melnikow et al., 2016).

The review did not identify any studies related to whether focus on breast density as a risk factor diminishes attention to other breast cancer risk factors (Melnikow et al., 2016). The review did discuss harms of breast density notification, described in a later section of this report (the section, *Patient Understanding, Awareness, and Anxiety*).

Key findings of the USPSTF review: Overall, the USPSTF review concluded that supplemental screening among women with dense breasts identifies additional breast cancer cases but also increases false-positive results. The review also concluded that the effects of supplemental screening on breast cancer health outcomes is unclear at this time (Melnikow et al., 2016).

Provider Categorization of Dense Breasts and Provider Awareness, Familiarity with Dense Breasts

CHBRP identified and included 10 studies related to providers and breast density notification laws in addition to the 2016 USPSTF systematic review. These studies examined variability of categorization of dense breasts among providers (e.g., inter-provider variability), provider awareness of breast density legislation, provider familiarity and comfort answering questions about dense breasts and implications, and provider desire for more training or resources related to counseling or treatment of patients with dense breasts.

Variability of dense breast categorization by interpreting provider

The USPSTF systematic review and four other studies were identified regarding provider variability of BI-RADS categorization (Gard et al., 2015; Gur et al., 2015; Lee et al., 2015; Melnikow et al., 2016; Sprague et al., 2016). As stated previously, providers determine whether a patient has dense breast tissue based on their visual interpretation of a mammogram. Interpretation of a mammogram is subjective and may vary from provider to provider. While studies varied in study design and sample size, the systematic review and four identified studies found that there is variation from provider to provider in categorization of breast density based on mammogram.

The USPSTF review found that among community radiologists, the *overall prevalence* of particular BI-RADS density ratings was similar from initial to subsequent interpretations (e.g., prevalence of fatty, scattered, dense). However, the review found disagreement among interpretations of breast density at the *patient/person level*. Overall, reviewed studies found that upon subsequent screening exams and interpretation by the same radiologist, about 1 in 5 women (23%) were moved into a different Bi-RADS density than the initial interpretation. When a subsequent exam was interpreted by a different radiologist, approximately 1 in 3 women were grouped into a different breast density category (Melnikow et al., 2016). Overall, across reviewed studies, 13% to 19% of women were re-categorized from nondense to dense or vice versa. Melnikow et al. reported that because of this potential for reclassification, a woman could receive inconsistent information in dense breast notifications sent from year to year (Melnikow et al., 2016).

Sprague et al. (2016) conducted a multicenter observational study encompassing 30 radiology settings in Pennsylvania, Vermont, New Hampshire, and Massachusetts. The study included radiologists who interpreted at least 500 screening mammograms from 2011 to 2013. They concluded that there was wide variation in assessment of breast density across different radiologists, and the likelihood that a woman would be categorized as having dense breasts varies significantly by the radiologist that interprets the mammogram (Sprague et al., 2016). However, this study did not have a comparative quantitative density measure to compare with the radiologists' assessment based on a mammogram. Computer programs may be used to estimate a quantitative density measure that can be used in place of or in addition to visual interpretation of a mammogram. However, these programs do not appear to be widely used. One study found that among 110 breast imaging facilities (in 34 states and 1 in Canada), 98% of facilities used visual interpretation (BI-RADS categories), while just 2% used a computer-based quantitative determination with or without visual assessment (Nayak et al., 2016). One California survey of 9 breast imaging facilities found that 8 out of 9 facilities estimated breast density by visual methods, and 1 of the 9 used a computer program (Ikeda et al., 2013).

Summary of findings for variability of dense breast categorization by interpreting provider: CHBRP concludes that, based on one systematic review and four identified studies, there is a preponderance of evidence that there is variability among interpreting providers' designations of dense breast tissue. As a result, women may receive inconsistent information from year to year about whether they are considered to have dense breasts or not, depending on the provider who interprets their mammogram result.

Breast density legislation impacts on breast density categorization

Three studies examined whether the passage of a breast density notification law may be associated with a change in provider categorization of dense breasts (Bahl et al., 2016; Gur et al., 2015; Lee et al., 2015,). Lee et al. examined whether California's breast density legislation had an impact on mammographic density reporting. Lee et al. found in the month prior to legislation, dense breast issue was reported in 72.3% of cases compared to 50.1% and 41.3% in the first and second month after legislation enactment (Lee et al., 2015). The decrease in reporting of dense breast tissue between the month before and two months after indicate that categorization is subjective. However, the study period was short (3 months) and did not discern long-term effects.

One retrospective study examined mammogram results from facilities in 13 states including about 1.3 million mammogram results (Bahl et al., 2016). California was one of the 13 states along with: AZ, HI, MD, MN, NJ, NY, NC, OR, PA, TN, TX and VA. Bahl et al. found that the percentage of mammograms reported as dense decreased slightly directly following the enactment of breast density legislation but returned to pre-legislation levels by 10 months later. Gur et al. (2015) surveyed radiologists (n=16) in Pennsylvania and assessed at least 300 reports performed before and after the state's breast density notification law went into effect. They found that 14 of 16 radiologists increased the frequency of reporting scattered fibroglandular tissue after the implementation of a breast density notification law; 7 of 16 had statistically significant increases in reporting scattered fibroglandular tissue (Gur et al., 2015). However, this study was over a short time period and at a single health care facility and is therefore not generalizable to a broader population of providers.

Bahl et al. described a few existing theories related to changes in provider categorization of breast density following enactment of breast density legislation. Some believe that providers may downgrade their assessment of density to avoid reporting requirements or because their facilities do not have the capacity or staff to offer increased volumes of supplemental screening. Others believe that providers may increase their assessment of density to avoid possible liability through supplemental screening (Bahl et al., 2016).

Summary of findings for breast density legislation impact on breast density categorization: CHBRP concludes that, based on three studies, there is limited evidence that breast density legislation impacts provider breast density categorization. Three studies found changes in breast density categorization by providers before and after legislation, and all note a decrease in dense breast categorization directly following legislation. One study found that breast density categorizations returned to pre-legislation levels 10 months later. However, 2 of 3 studies examined a short time period.

Provider awareness of legislation, comfort counseling patients and desire for further training

Five studies examined at least one of the following topics: provider awareness of breast density legislation, provider comfort around counseling patients with dense breasts and provider desire for further training or resources related to patients with dense breasts (Gunn et al., 2018b; Khong et al., 2015; Lin et al., 2017; Lourenco et al., 2017; Maimone et al., 2017).

Provider awareness: CHBRP identified five studies related to provider awareness (Gunn et al., 2018b; Khong et al., 2015; Lin et al., 2017; Lourenco et al., 2017; Maimone et al., 2017). Four of these studies examined provider awareness of breast density legislation among providers (Gunn et al., 2018b; Khong et al., 2015; Lin et al., 2017; Maimone et al., 2017). Three of the four studies examined awareness among referring providers (e.g., mostly primary care physicians but also nurse practitioners, physician assistants) (Gunn et al., 2018b; Khong et al., 2015; Maimone et al., 2017). These studies found that among surveyed referring providers, 51% to 80% reported that they were familiar with breast density legislation.[9] Notably, the lowest rate of provider familiarity with breast density legislation came from Khong et al., a California-based study. This study found that 49% of internal medicine, family medicine, and obstetrics-gynecology physicians surveyed at a single academic medical center reported no knowledge of California's breast density legislation 10 months after the law went into effect; 51% were aware of the law (n=77) (Khong et al., 2015). One of the four studies compared legislation awareness among primary care physicians to radiologists, and found that radiologists were more likely to be familiar with breast density legislation in their state than primary care physicians (69% to 31%) (Lin et al., 2017).

One study reported on provider awareness of density's impact on mammographic sensitivity related to notification legislation (Lourenco et al, 2017). The study surveyed New England radiologists (n=96) about perceived effects of dense breast notifications. Sixty-six percent of respondents felt that breast density legislation improved provider awareness about density's effect on mammographic sensitivity (Lourenco et al., 2017).

Summary of findings for provider awareness: Based on three studies of referring providers, there is limited evidence that familiarity with dense breast notification laws varies by provider with estimates of familiarity ranging from 51% to 80%. These three studies were provider surveys with responses ranging from 77 to 223 providers.

Provider comfort counseling patients: This same group of four studies also examined whether providers were comfortable counseling patients with dense breasts (Gunn et al., 2018b; Khong et al., 2015; Lin et al., 2017; Maimone et al., 2017). Overall, these results indicate that provider discomfort with answering questions about breast density from patients is common. One study indicates that radiologists are more comfortable answering these questions than primary care physicians.

At two urban safety-net hospitals, 49% of primary care providers answered they were not prepared to answer patient questions about breast density (Gunn et al., 2018b). Among the other studies, 10% and 18% of providers answered that they were not comfortable answering patient questions about breast density while 52% and 32% answered that they were somewhat or slightly comfortable answering patient questions (Khong et al., 2015; Maimone et al., 2017). A survey of primary care physicians and radiologists found that primary care physicians were more likely to feel uncomfortable answering questions about breast density (65% compared to 35%) (Lin et al., 2017).

[9] One study, Maimone et al., surveyed providers of the Mayo Clinic in Minnesota, with smaller samplings of Mayo clinic providers in Arizona and Florida. Florida did not have an active breast density reporting law at the time of this study.

Summary of findings for provider comfort counseling patients: Based on three studies, there is limited evidence that some providers are uncomfortable answering questions from patients about breast density, with estimates ranging from 10% to 49% of providers answering they are uncomfortable or feel ill-prepared to answer such questions.

Provider desire for further training: Lastly, three of these studies also examined provider interest in further training or resources related to dense breast tissue. Gunn et al. and Khong et al. found that 75% and 85% of responding providers indicated interest in further training or more education on the topic of breast density (Gunn et al., 2018b; Khong et al., 2015). Lin et al. found that 57% of primary care physicians want more education on breast density compared to 43% of radiologists (Lin et al., 2017).

Changes in Utilization Related to Breast Density Notification

CHBRP identified four studies that examined changes in utilization related to breast density notification legislation (Chau et al., 2017; Horny et al., 2018; Mason et al., 2015; Sanders et al., 2016). All four studies examined utilization changes for supplemental screening using breast ultrasound and two of the four studies examined changes in utilization for supplemental MRI.

Change in utilization of breast ultrasound

A quasi-experimental multistate study (including California) examined whether dense breast notification laws impacted the probability of screening mammogram follow-up with MRI or ultrasound (MRI results reported in the following subsection) (Horny et al., 2018). The study examined 18 states that had passed a notification law ("intervention states"), with 23 comparison states for all intervention states except for California and Hawaii.[10] Across the states, the study sample included approximately 20.6 million screening mammograms among 11.1 million women aged 40 to 64 years. The authors found that implementation of dense breast notification laws was associated with a statistically significant increase in the probability of subsequent breast imaging. For breast ultrasound, they found an increased probability of breast ultrasound within 30 days of a screening mammogram in 15 of 18 dense breast notification states (intervention states), excluding Hawaii, Maryland, and New York (Horny et al., 2018). For California, Horny et al. reported a probability of a breast ultrasound follow-up within 30 days of a screening mammogram as 6.7% before intervention and 8.1% after intervention; the difference was statistically significant.

In a retrospective chart review study at a single New Jersey breast imaging center, screening ultrasounds increased by 651% (from 1,530 to 11,486) at 18 months before to 18 months after state breast density legislation. The authors also found that diagnostic ultrasounds increased by 29% (from 10,698 to 13,847) at 18 months before to 18 months after state breast density legislation (Sanders et al., 2016).

Summary of findings for change in utilization of supplemental breast ultrasound: Based on two studies, there is limited evidence which indicates that dense breast notification laws impact the utilization of breast ultrasounds. The two studies varied in their estimate of increased probability of ultrasound and increased utilization of ultrasound, but both estimated an increase in the use of breast ultrasounds following enactment of dense breast notification laws.

[10] Comparison states were geographic neighbors of intervention states. Authors were unable to establish a comparison state for California because all neighboring states implemented dense breast notification legislation by 2014. Hawaii did not have an appropriate geographic comparison state.

Change in utilization of magnetic resonance imaging (MRI)

The Horny et al. multistate quasi experimental study described in the previous section found a statistically significant increase in the probability of a breast MRI within 60 days of screening mammogram in California, North Carolina, Pennsylvania, and Texas (Horny et al., 2018). In California, they reported that the probability of a breast MRI following a screening mammogram within 60 days increased from 0.36% before to 0.45% following intervention (Horny et al., 2018).

A cohort study examined pre- and post-legislation (pre n = 614,664; post n = 631,478) rates of MRI use in California among women aged 40 to 74 years who were enrollees in Kaiser Permanente of Northern California. After adjusting for race/ethnicity, age, body mass index, neighborhood median income, medical facility, and cancer history, Chau et al. found a relative 16% increase in the MRI rate for the post-legislation group compared to the pre-legislation group (Chau et al., 2017). They found that the greatest increase in MRI use post-legislation appeared among women in their early 40s. This study also found that higher breast density was associated with a supplemental MRI, which may indicate that increases in MRI screening rates could be associated with breast density legislation. However, this study had an important limitation: the authors did not have pre-legislation breast density information and could not tell whether increases in screening MRI were limited to women with dense breasts (Chau et al., 2017).

Studies performed outside of California also found an increase in supplemental MRIs: Mason et al., a single-site study conducted in Texas, reported an increase from two supplementary MRIs in women with dense breasts to 46 supplementary MRIs before and after breast density legislation (Mason et al., 2015). In a retrospective chart review study at a single New Jersey breast imaging center, MRI studies increased by 59.3% (from 2,595 to 4,134) at 18 months before to 18 months after state breast density legislation (Sanders et al., 2016).

Summary of findings for change in utilization of supplemental MRI: Based on four studies, there is limited evidence that dense breast notification laws are associated with increased use of supplemental MRIs. Some of these studies had important limitations (e.g., unable to discern whether increases in screening MRI were limited to women with dense breasts, single-site studies).

Changes in Detection of Breast Cancer

CHBRP identified four studies that examined changes in detection of breast cancer related to breast density notification legislation (Bahl et al., 2016; Parris et al., 2013; Sanders et al., 2016; Weigert, 2017).

Bahl et al. completed a retrospective study of facilities in 13 states with dense breast notification laws as of 2014 with mammogram results reported before and after implementation of the laws. Of approximately 1.3 million reported mammograms, Bahl et al. found no significant differences in breast cancer detection between the month prior to enactment, the month after enactment or 10 months after enactment (Bahl et al., 2016).

In Connecticut, Parris et al. performed a retrospective study of cancer detection before and after notification law enactment for women with a negative mammogram, follow-up ultrasound, and biopsy recommendations (5,519 women post-law, with comparison of 1,319 women pre-law). The study reported an increased cancer detection rate following enactment of the dense breast notification law. However, the number of malignancies was small at 10 malignancies detected in the post-law group; no malignancies were detected in the pre-law group (Parris et al., 2013). Also, Parris et al. reported a low positive predictive value (5.5%) for follow-up breast ultrasound.

Sanders et al. in New Jersey found that at a single-site breast center, there was a 189% increase in cancers detected through screening MRI from nine cancers to 26 cancers diagnosed through a screening MRI. The same study found an increase in cancers identified by ultrasound increasing from three cancers identified by ultrasound to 21 cancers identified by ultrasound, and increase in cancers identified via DBT from 1 to 2 cases (Sanders et al., 2016). However, these represent small numbers of cancer diagnoses at a single site and may not be generalizable to a broader population.

In a retrospective chart review study across five sites in Connecticut, Weigert found that screening ultrasounds almost doubled the cancer detection rate compared to mammography alone (Weigert, 2017). However, the positive predictive value was low, below 10% for the first three years and 20% the fourth year (Weigert, 2017). This indicates that of the people who had an ultrasound screen positive for breast cancer, less than 10% or 20% actually had the disease. Weigert acknowledged a "learning curve" for radiologists and imaging technologists to determine which lesions required biopsy, which could be monitored without biopsy, and which could be classified as benign (Weigert, 2017).

Summary of findings for change in breast cancer detection: Based on 4 studies, CHBRP concludes there is inconclusive evidence to determine whether dense breast notifications impact breast cancer detection. One study with the largest sample size (~1.3 million) reported no significant differences in breast cancer detection between the month prior to enactment, the month after enactment, or 10 months after enactment. Three studies of smaller sample sizes reported an increase in cancer detection. However, two studies indicated a low positive predictive value (the test's ability to accurately determine actual cancer cases) for breast ultrasound.

Figure 2. Change in breast cancer detection.

Patient Understanding, Awareness, and Anxiety

CHBRP identified seven studies related to patient awareness and understanding of breast density related to breast density notification laws. Six studies primarily used a survey instrument to measure various aspects of patient awareness, patient understanding of breast density notifications and their implications for breast cancer risk. One study involved qualitative interviews to assess patient perception of breast density notifications.

The sample sizes of these studies varied from 30 women interviewed for a qualitative interview study (Gunn) to 1,506 survey respondents (Gunn et al., 2018a; Rhodes et al., 2015). One of these studies represented a national sampling while all other studies reported within a state (e.g., statewide or representing multiple health care facilities) or were single-site studies. Unless otherwise stated, all studies were conducted in states that have passed breast density notification laws. The studies were limited to post-legislation periods and did not compare patient understanding, awareness, and anxiety in pre- and post-legislation settings.

Recollection of notification, understanding of breast density

Four studies reported on patient recollection of breast density notifications and understanding of the concept of breast density and one study reported on the readability of dense breast notifications (Gunn et al., 2018a; Guterbock et al., 2017; Kressin et al., 2016; Rhodes et al., 2015). A national cross-sectional

survey administered in both English and Spanish (n=1,506) found that 58% of surveyed women had heard of breast density, 49% knew that breast density affects detection of breast cancer, and 53% knew that breast density affects cancer risk (Rhodes et al., 2015). A phone interview study of Virginia women without breast cancer (n=1,024) reported that one in five women surveyed were aware that breast density reduces the sensitivity of a mammogram; the authors concluded that while women may be familiar with the term "breast density," they may not understand its relationship to cancer detection via mammography or to breast cancer risk (Guterbock et al., 2017). Similarly, one single-site study in a Massachusetts safety-net hospital included qualitative interviews with patients, and found that of the 30 women interviewed, the majority recalled receiving a breast density notification (81%) (Gunn et al., 2018a). However, few of the women interviewed could recall specific content from the notification, appeared to have a limited understanding and misperceptions of the implications of dense breast tissue (Gunn et al., 2018a). Differences in these studies may be due to the different study methods; phone interviews allow for more in-depth questioning than written surveys.

Kressin et al. reported on the readability of dense breast notification laws in place as of 2016, excluding Delaware. They used two readability scales and one scale for understandability: Flesch-Kincaid readability levels, Dale-Chall readability grade scoring, and PEMAT understandability. Most notifications were above the recommended readability level (around a grade 7-8 reading level) and all notifications scored poorly on the PEMAT understandability rating. California's notification was graded an 8.2 grade reading level on the Flesh-Kincaid score, an 8.2 (grade 11-12) on the Dale-Chall scale,[11] and a 22% out of 100% on the PEMAT understandability scale (Kressin et al., 2016). CHBRP did not identify studies that examined both readability scales and other assessments of patient awareness or understanding of breast density notifications.

Summary of findings for patient recollection of notification, understanding of breast density: Based on four studies, CHBRP concludes there is inconclusive evidence about patient recollection of breast density notifications and whether the notifications impact patient understanding of breast density, the implications of breast density on mammographic sensitivity and breast cancer risk.

Awareness of personal breast density

Three studies reported on patient awareness of personal breast density (e.g., a woman's awareness of her own breast density level). Two studies were performed following dense breast notification law implementation, one in Connecticut and one in Virginia. These studies varied in their assessment of women's awareness of their own breast density following implementation of a dense breast notification law (ranging from 39% of women surveyed to 92% of women surveyed reporting awareness of their own breast density). One single-site study in Connecticut found that among surveyed women patients of an academic breast imaging center, 92% were aware of their breast density (n=950) (Moothathu et al., 2017). A study in Virginia found that 39% of women surveyed reported that their health care provider had informed them of their breast density (Guterbock et al., 2017).

Another study in California was performed prior to implementation of the state's dense breast notification law. Although it was conducted prior to the law's implementation, it is included here as a California-specific study that examines existing differences between academic and county facilities. Trinh et al. examined patient awareness of breast density at an academic facility and at a county hospital; 23% of the

[11] A Dale-Chall score of 8.0-9.0 indicates that the content is easily understood by an average 11th or 12th-grade student.

surveyed patients at the academic facility were aware of their breast density compared to 5% at the county hospital (Trinh et al., 2015).

Summary of findings for awareness of personal breast density: Based on the two studies of awareness of personal breast density in states following implementation of dense breast notification laws, CHBRP concludes that there is insufficient evidence regarding the effect of the notification laws on awareness of personal breast density. The studies did not compare awareness of personal breast density before and after notification laws went into effect, and because of this, they could not determine the impact of the law. Insufficient evidence is not "evidence of no effect." It is possible that an impact could result from these laws, but current evidence is insufficient to inform an estimate.

Disparities related to awareness of breast density and health care provider communication

Four studies reported disparities related to patient awareness of breast density by demographic characteristic and also differences in health care provider communication with patients about breast density by patient demographic characteristics (Guterbock et al., 2017; Manning et al., 2016; Moothathu et al., 2017; Rhodes et al., 2015). The findings of these studies indicate that race and ethnicity, level of education, and income are important factors to consider related to breast density awareness and provider communication. Across the studies, Caucasian women, women with higher levels of educational attainment (generally college degree or above), and women with higher incomes had higher awareness of breast density, often tied to communication with their health care provider. Comparatively, African American women and women who are not Caucasian, women with lower levels of educational attainment, and women with lower incomes had lower awareness of breast density (Guterbock et al., 2017; Manning et al., 2016; Moothathu et al., 2017). The findings of these studies indicate the importance of health care provider communication in increasing patient understanding of breast density.

Summary of findings for disparities in awareness of breast density and provider communication: Based on four studies, CHBRP concludes that there is a preponderance of evidence that disparities related to awareness of breast density and health care provider communication exist by race and ethnicity, education level, and income.

Patient anxiety

CHBRP identified five studies related to patient anxiety and dense breast notifications (Bottorff et al., 2007, Lourenco et al., 2017, Moothathu et al., 2017, Manning et al., 2016, Manning et al., 2017) The 2016 USPSTF review identified one randomized controlled trial in Canada (Bottorff et al., 2007, Melnikow et al., 2016). Women were randomly assigned (n=285, intervention) to receive a report of their personal breast density with a summary of their mammogram results and information on breast cancer risk factors including breast density; the information did not recommend supplemental screening. Women in the control group (n=333, control) received their mammogram results and no information on breast density. At four weeks after receiving results, women who received breast density information had a statistically significant increased knowledge of breast density, but were also more likely to perceive that they had an elevated risk for breast cancer. However, the differences dissipated by 6 months follow-up. Bottorff et al. reported that psychological distress, breast cancer worry, and preoccupation with breast cancer were not different between intervention or control groups.

In a single-site Connecticut study (n=950), Moothathu et al. found that of the 92% of patients surveyed who were aware of their personal breast density, 43% expressed increased anxiety about developing breast cancer related to dense breast issue (Moothathu et al., 2017).

Manning et al. indicated that patient anxiety outcomes may differ by race and ethnicity. Manning et al. found that, compared to European American women (n=113), African American women (n=182) had greater breast density related anxieties. However, communication with a health care provider about breast density attenuated anxiety for African American women, but did not impact anxiety for European American women (Manning et al., 2016). In a separate study, Manning et al. found that regardless of breast density awareness prior to receiving a notification, African American women reported more negative psychological responses to receiving a breast density notification (n=457). However, African American women had more positive perceptions of discussing their breast density notifications with their physician (Manning et al., 2017). These two studies suggest the importance of provider communication in potentially attenuating patient related anxiety, particularly among African American women.

One survey of a radiologists in New England (n=96) reported that 69% of respondents felt that breast density notifications increased patient anxiety, but 74% of respondents answered that they also increased patient understanding of the impact of dense breasts on mammographic sensitivity (Lourenco et al., 2017). However, this study only surveyed providers and did not survey patients about breast cancer-related anxiety and included a small sample size.

Summary of findings for patient anxiety: Based on five studies, CHBRP determines there is inconclusive evidence about the impact of dense breast notifications on patient anxiety. One RCT of a relatively small sample size indicated no difference in perception of elevated risk for breast cancer by 6 months follow up, and one single-site study indicated increased anxiety among patients aware of their personal breast density. Two studies indicated differences in anxiety by race and ethnicity. One study indicated that providers perceived increased patient anxiety related to breast density notifications.

Conclusion

This literature review examined evidence related to the impact of dense breast notification laws on provider behavior, utilization of supplemental screening and on patient understanding and anxiety. Previously, the USPSTF has graded supplemental screening among women with dense breasts as “insufficient evidence.” A systematic review prepared for the USPSTF has concluded that based on current evidence, it is unclear whether the benefits of supplemental screening for breast cancer outweigh the harms for women classified as having dense breasts and negative mammogram results. As summarized in this review, evidence suggests that there is a potential to detect cancer that is not detected via mammograms. However, false positive results can occur frequently. Additionally, provider categorization of dense breasts is subjective and variable. As a result, women may not receive consistent messaging about whether they have dense breasts from year to year, depending on which provider interprets their mammogram results. Lastly, there are some limitations of studies on this topic. Studies related to patient awareness, patient anxiety, and provider behavior tend to have small sample sizes, limiting their generalizability. Additionally, well-designed studies on dense breast notification impact on population level health outcomes, such as breast cancer mortality, have not been conducted. Finally, studies that examine the effects of notification laws on use of supplemental screening are not always able to determine the extent to which increases in screening are due to the notification law, as some of these studies have limited information about patient characteristics such as breast density.

APPENDIX A TEXT OF BILL

On February 8, the California Assembly Committee on Health requested that CHBRP analyze SB 1034.

SENATE BILL **No. 1034**

Introduced by Senator Mitchell

February 08, 2018

An act to amend Section 123222.3 of the Health and Safety Code, relating to health.

LEGISLATIVE COUNSEL'S DIGEST

SB 1034, as introduced, Mitchell. Health care: mammograms.

Existing law requires, until January 1, 2019, a health facility at which a mammography examination is performed to include a prescribed notice on breast density in the summary of the written report that is sent to a patient, if specified circumstances apply.

This bill would extend the operation of that provision indefinitely. The bill would also make technical and conforming changes.

DIGEST KEY

Vote: majority Appropriation: no Fiscal Committee: yes Local Program: no

BILL TEXT

THE PEOPLE OF THE STATE OF CALIFORNIA DO ENACT AS FOLLOWS:

SECTION 1.

Section 123222.3 of the Health and Safety Code is amended to read:

123222.3.

(a) A health facility at which a mammography examination is performed shall, if a patient is categorized by the facility as having heterogeneously dense breasts or extremely dense breasts, based on the Breast Imaging Reporting and Data System established by the American College of Radiology, include in the summary of the written report that is sent to the patient, as required by federal law, the following notice:

Your mammogram shows that your breast tissue is dense. Dense breast tissue is common and is not abnormal. However, dense breast tissue can make it harder to evaluate the results of your mammogram and may also be associated with an increased risk of breast cancer.
This information about the results of your mammogram is given to you to raise your awareness and to inform your conversations with your doctor. Together, you can decide which screening options are right for you. A report of your results was sent to your physician.

~~(b)This section shall become operative on April 1, 2013.~~
~~(c)(1)Nothing in this section shall be construed to create or impose liability on a health care facility for failing to comply with the requirements of this section prior to April 1, 2013.~~
~~(2)~~
(b) (1) Nothing in this section shall be deemed to create a duty of care or other legal obligation beyond the duty to provide notice as set forth in this section.
~~(3)~~
(2) Nothing in this section shall be deemed to require a notice that is inconsistent with the provisions of the federal Mammography Quality Standards Act (42 U.S.C. Sec. 263b) or any regulations promulgated pursuant to that act.
~~(d)This section shall remain in effect only until January 1, 2019, and as of that date is repealed, unless a later enacted statute, that is enacted before January 1, 2019, deletes or extends that date.~~

APPENDIX B LITERATURE REVIEW METHODS

This appendix describes methods used in the medical effectiveness literature review conducted for this report. A discussion of CHBRP's system for grading evidence, as well as lists of MeSH Terms, publication types, and keywords, follows.

Studies related to dense breast notification were identified through searches of PubMed, the Cochrane Library, Web of Science, Embase, Scopus, and the Cumulative Index of Nursing and Allied Health Literature.[12]

Websites maintained by the following organizations that produce and/or index meta-analyses and systematic reviews were also searched: the Agency for Healthcare Research and Quality (AHRQ), the International Network of Agencies for Health Technology Assessment (INAHTA), the National Health Service (NHS) Centre for Reviews and Dissemination, the National Institute for Health and Clinical Excellence (NICE), the Scottish Intercollegiate Guideline Network, the National Guideline Clearinghouse (NGC), the NHS Centre for Reviews and Dissemination, PubMed Health, the U.S. Preventive Services Task Force, and the World Health Organization.

The search was limited to abstracts of studies published in English. Reviewers screened the title and abstract of each citation retrieved by the literature search to determine eligibility for inclusion. The reviewers acquired the full text of articles that were deemed eligible for inclusion in the review and reapplied the initial eligibility criteria.

CHBRP relied on a systematic review published in 2016 for findings from studies related to supplemental screening for women with dense breasts (Key Question 1, described below). For other key questions, the search was limited to studies published from 2009 to present, because Connecticut passed the first breast density law in 2009. Of the 147 articles found in the literature review, 97 were reviewed for potential inclusion in this report on SB 1034, and a total of 27 studies were included in the medical effectiveness review for this report. The other articles were eliminated because they did not focus on women with dense breasts, were of poor quality, or did not report findings from clinical research studies.

Evidence Grading System

In making a "call" for each outcome measure, the medical effectiveness lead and the content expert consider the number of studies as well the strength of the evidence. Further information about the criteria CHBRP uses to evaluate evidence of medical effectiveness can be found in CHBRP's *Medical Effectiveness Analysis Research Approach.*[13] To grade the evidence for each outcome measured, the team uses a grading system that has the following categories:

- Research design;
- Statistical significance;
- Direction of effect;

[12] Much of the discussion below is focused on reviews of available literature. However, as noted in the medical effectiveness approach document (available at: http://chbrp.com/analysis_methodology/medical_effectiveness_analysis.php; see p.8), in the absence of "fully-applicable to the analysis" peer-reviewed literature on well-designed randomized controlled trials (RCTs), CHBRP's hierarchy of evidence allows for the inclusion of other evidence.

[13] Available at: www.chbrp.org/analysis_methodology/docs/medeffect_methods_detail.pdf.

- Size of effect; and
- Generalizability of findings.

The grading system also contains an overall conclusion that encompasses findings in these five domains. The conclusion is a statement that captures the strength and consistency of the evidence of an intervention's effect on an outcome. The following terms are used to characterize the body of evidence regarding an outcome:

- Clear and convincing evidence;
- Preponderance of evidence;
- Limited evidence
- Inconclusive evidence; and
- Insufficient evidence.

A grade of *clear and convincing evidence* indicates that there are multiple studies of a treatment and that the large majority of studies are of high quality and consistently find that the treatment is either effective or not effective.

A grade of *preponderance of evidence* indicates that the majority of the studies reviewed are consistent in their findings that treatment is either effective or not effective.

A grade of *limited evidence* indicates that the studies had limited generalizability to the population of interest and/or the studies had a fatal flaw in research design or implementation.

A grade of *inconclusive evidence* indicates that although some studies included in the medical effectiveness review find that a treatment is effective, a similar number of studies of equal quality suggest the treatment is not effective.

A grade of *insufficient evidence* indicates that there is not enough evidence available to know whether or not a treatment is effective, either because there are too few studies of the treatment or because the available studies are not of high quality. It does not indicate that a treatment is not effective.

Search Terms (* indicates truncation of word stem)

PubMed MeSH terms

Adverse effect
Anxiety
Breast/diagnostic imaging
Breast density
Breast neoplasms/diagnosis/diagnostic imaging
Disclosure/legislation & jurisprudence
Early detection of cancer
Fear
Magnetic Resonance Imaging
Mammography
Mass screening
Molecular imaging
Patient harm
Risk
Ultrasonography

EMBASE Emtree Terms

Anxiety
Breast cancer
Breast density
Breast screening
Breast tissue
Cancer diagnosis
Cancer mortality
Cancer risk

Density
Diagnosis
Follow up
Law
Mammography
Mandatory Reporting
Molecular imaging
Nuclear magnetic resonance imaging
Patient worry
Risk assessment
Risk benefit analysis
Screening test
Ultrasound

Keywords used to search PubMed, EMBASE, Web of Science, Google Scholar and Google

3-D mammogram
Additional
Anxiety
Benefit*
Breast cancer
Breast cancer screening*
Breast imaging
Breast screening
Breast tomosynthesis
Breast MRI
Breast ultrasound
Cost effective*
Death
Dense breast*
Dense breast notification*
Density notification
Early detection
Effect*
Fear
Harm*
Impact
Law*
Legislation
Mammogram
Molecular breast imaging
Notification legislation
Regulation*
Supplemental ultrasound
Unnecessary

APPENDIX C INFORMATION SUBMITTED BY OUTSIDE PARTIES

In accordance with the California Health Benefits Review Program (CHBRP) policy to analyze information submitted by outside parties during the first 2 weeks of the CHBRP review, the following parties chose to submit information.

The following information was submitted by the Office of Senator Mitchell in February 2018.

Leigh S. 'Dense Breasts' Eclipse All Other Known Breast Cancer Risk Factors. UCSF. Feb 2, 2017. Available at: https://www.ucsf.edu/news/2017/02/405711/dense-breasts-eclipse-all-other-known-breast-cancer-risk-factors.

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Submitted information is available upon request. For information on the processes for submitting information to CHBRP for review and consideration please visit: www.chbrp.org/requests.html

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CALIFORNIA HEALTH BENEFITS REVIEW PROGRAM COMMITTEES AND STAFF

A group of faculty, researchers, and staff complete the analysis that informs California Health Benefits Review Program (CHBRP) reports. The CHBRP **Faculty Task Force** comprises rotating senior faculty from University of California (UC) campuses. In addition to these representatives, there are other ongoing researchers and analysts who are **Task Force Contributors** to CHBRP from UC that conduct much of the analysis. The **CHBRP staff** coordinates the efforts of the Faculty Task Force, works with Task Force members in preparing parts of the analysis, and manages all external communications, including those with the California Legislature. As required by CHBRP's authorizing legislation, UC contracts with a certified actuary, **PricewaterhouseCoopers**, to assist in assessing the financial impact of each legislative proposal mandating or repealing a health insurance benefit.

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**A small percentage of AJ Scheitler's time is available to serve as a backup CHBRP staff resource.*

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