



Influences of race and breast density on related cognitive and emotion outcomes before mandated breast density notification



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ABSTRACT

Rationale: Many states have adopted laws mandating breast density (BD) notification for applicable women; however, very little is known about what women knew or felt about BD and related breast cancer (BC) risk before implementation of BD notification laws.

Objective: We examined between-race differences in the extent to which having dense breasts was associated with women's related BD cognition and emotion, and with health care providers' communication about BD.

Methods: We received surveys between May and October of 2015 assessing health care provider (HCP) communication about BD, BD-related knowledge, BD-related anxiety and BC worry from 182 African American (AA) and 113 European American (EA) women in the state of Michigan for whom we had radiologists' assessments of BD.

Results: Whereas having dense breasts was not associated with any BD-related cognition or emotion, there were robust effects of race as follows: EA women were more likely to have been told about BD by a HCP, more likely to know their BD status, had greater knowledge of BD and of BC risk, and had greater perceptions of BC risk and worry; AA women had greater BD-related anxieties. EA women's greater knowledge of their own BD status was directly related to the increased likelihood of HCP communication about BD. However, HCP communication about BD attenuated anxiety for AA women only.

Conclusion: We present the only data of which we are aware that examines between-race differences in the associations between actual BD, HCP communication and BD related cognition and emotion before the implementation of BD notification laws. Our findings suggest that the BD notification laws could yield positive benefits for disparities in BD-related knowledge and anxiety when the notifications are followed by discussions with health care providers.

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Increased breast density (BD: ratio of fibro-glandular to fatty breast tissue) is associated with greater breast cancer (BC) risk (Boyd et al., 2010, 2011; McCormack and dos Santos Silva, 2006). Although women are somewhat aware of this risk, few women actually know how dense their own breasts are (Manning et al., 2013; O'Neill et al., 2014). BD notification laws, adopted in 27 of the United States (Are You Dense Advocacy Inc, 2016), address this lack of awareness by mandating disclosure of dense breast status via mammogram reports. Despite arguments that BD notifications may unnecessarily make some women anxious (Grady, 2012; Hardy, 2012), no research has examined whether women's actual BD, and their awareness of their BD, predict related cognitions (e.g.,

BC and BD risk knowledge, BC risk perception) and emotions (e.g., BD anxiety, BC worry) prior to implementation of mandated BD notification in any state. Thus it is impossible to say whether BD notifications make women with dense breasts more anxious relative to their non-dense counterparts, or whether they were more anxious to begin with.

BD anxiety and related psychological responses are important because risk-related cognition and emotion predict relevant health behaviors (Conner and Sparks, 1996; Fishbein, 2008; Rosenstock, 1990). Epidemiological studies have shown that supplemental BC screening rates increased after BD notification laws were introduced (Destounis et al., 2015; Weigert and Steenbergen, 2012, 2015). However, lacking an existing frame of reference for how having dense breasts influence cognition and emotion, we may only speculate that women's psychological responses to BD notifications (in contrast to their physicians' propensities for referral)

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lead to increased supplemental screening rates. Therefore, we examined the associations between having dense breasts and related cognitions and emotions in a cohort of women before implementation of BD notification.

We also examined whether there were between-race differences in the effects of breast density on related cognition and emotion. African American (AA) women reported more anxiety compared to European American (EA) women after receiving BD notifications; however, anxiety strengthens EA women's, but weakens AA women's intentions to discuss notifications with their physicians (Manning et al., 2016a, 2016b). Those differences in emotional responses may be due to pre-existing cognitive differences, given studies showing that EA women have more knowledge of what BD is (Manning et al., 2013; O'Neill et al., 2014), and that AA women scrutinize information about BD more (Manning et al., 2016c). The differential effects of anxiety on behavioral intentions is noteworthy given the robust association between intentions and behavior (Ajzen, 1991). The findings portend between-race differences in important post-notification follow-up behaviors (e.g., requests and referrals for supplemental BC screening), which in turn suggests that BD notification laws may differentially impact AA and EA women. This could directly impact racial health disparities since differences in BC screening accounts for some of the racial disparity in BC mortality (Curtis et al., 2008). To definitively assert that AA and EA women respond differently to receiving BD notifications, we must first discern how and why AA and EA women's cognition and emotion differed before implementation of the law.

It is reasonable to expect that health care provider (HCP) communication about BD influences cognition and emotion - we use HCP to describe any clinician who may discuss health and health care with a patient (e.g., primary care physicians, radiologists, nurse practitioners, etc.). Since BD evaluation is image-based, women must be informed about their BD by their HCP. Prior to mandated BD notification, HCPs' reporting of BD to their patients was, anecdotally, inconsistent at best. To date, no studies have described how being informed about having dense breasts influenced women's related cognitions and emotion, especially before reporting was mandated BD. A woman who is told that she has dense breasts should ostensibly have greater BD and BC risk knowledge and increased perception of BC risk. Some studies show that perceptions of greater risk lead to anxiety and worry (Dillard et al., 2012; Portnoy et al., 2014; Shaw et al., 1999); however, separate evidence showed that when women were informed of another BC risk (BRCA1/2 mutations) there were no increases in anxiety (Claes et al., 2005; Kinney et al., 2005) - though this may be due to the voluntary nature of genetic testing and findings that BRCA testing may relieve anxiety among individuals who are aware of a BC family history (Garg et al., 2016; Ormondroyd et al., 2007). In the current study, we examined how HCP communication about BD influenced women's BD and BC related cognitions and emotions.

We also examined whether HCP communication, and the effects of HCP communication, differed by race. Despite diminishing between-race differences in incidence and mortality for other cancers, comparatively poorer BC mortality persists for AA women (DeSantis et al., 2016b; O'Keefe et al., 2015). The differences in BC mortality has been directly related to differences in BC screening uptake (Curtis et al., 2008; Smith-Bindman et al., 2006), which is itself related to differences in HCP communication and recommendations for screening (Rauscher et al., 2005; Young et al., 2011). HCP communication may be poorer among AA women given the high likelihood that many AA women in and around Detroit have racially discordant medical interactions (i.e., an AA patient with a non-AA HCP). Prior research has documented the dearth of minority physicians at all levels of medical practice and training (Basco et al., 2010; Sullivan and Suez Mittman, 2010). A cursory

examination of websites such as RateMD (RateMDs Inc, 2016) and healthgrades (Healthgrades Operating Company Inc., 2016) cross referenced with listings for AA physicians (Black Doctor Inc., 2016) indicates that only a small fraction of family medicine, internal medicine and obstetricians/gynecologists that practice in and around metro-Detroit are AA. Racially-discordant medical interactions feature lower quality communication and transfer of information (Eggly et al., 2011, 2013). Therefore, we expect that, compared to EA women, AA women with dense breasts are less likely to be informed about it by their HCPs. We further expect that between-race differences in HCP communication will partially explain between-race differences in the effects of having dense breasts on women's cognition and emotion.

In summary, we examined between-race differences in [1] the association between actual BD and women's relevant cognitions and emotions, [2] HCP communication about BD, and [3] the extent to which HCP communication mediated the association between actual BD and relevant cognitions and emotions before implementation of mandated BD reporting in the state of Michigan. To our knowledge, we are the first to examine the effects of women's actual BD on related cognitions and emotions.

1. Methods

1.1. Participants and procedure

We sent survey invitations to 2500 women who were previously screened at a cancer center in Detroit MI and for whom we had BD data. Women were eligible to participate if they had no prior diagnosed BC. The survey was administered online between May and October 2015 via Qualtrics (Qualtrics, 2015). Participants signed into survey with unique password, read an information sheet which served as informed consent, and completed items assessing demographics, cancer history, related cognitions and emotions, HCPs communication, and other constructs not reported here (e.g., communication with family members, BC and BD information seeking, etc.). Our study was approved by Wayne State University's institutional review board. We received responses from 345 women (14% response rate) of whom 311 were self-reported AA or EA - we excluded other races from analyses given their low frequencies. We excluded two individuals who identified as males and three who indicated no gender. We also excluded 10 women who self-reported prior BC diagnoses, and one who did not respond to the item.

1.2. Measures

Actual BD was assigned by a radiologist following each woman's screening mammogram. Women whose BD was classified as either Breast Imaging Reporting And Data System (BI-RADS) density categories *a* (entirely fatty) or *b* (scattered density) were designated as not having dense breasts, and women classified as *c* (heterogeneously dense) or *d* (extremely dense) were designated as having dense breasts. We used contrast codes (-0.5 for non-dense breasts; 0.5 for dense breasts) when actual BD was included as a predictor in path analysis.

BD Awareness was assessed with binary responses ("Yes", "No") to the item "Do you know how dense your own breasts are?" We used contrast codes (-0.5 for No, 0.5 for Yes) when entered as predictors in path analysis.

BD Knowledge was assessed with responses to the item "Do you know what breast density is?" Women responded on a scale from 1 ("I have never heard about it") to 5 ("I know exactly what it is").

BC Risk Knowledge was assessed with procedures suggested by prior research (McMenamin et al., 2005). Participants indicated

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