Psychosocial Adjustment and Perceived Risk Among Adolescent Girls From Families With *BRCA1/2* or Breast Cancer History

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ABSTRACT

Purpose

To evaluate the impact of breast cancer family history and maternal *BRCA1/2* mutation on the psychosocial adjustment and perceived risk in girls age 11 to 19 years old.

Materials and Methods

Girls age 11 to 19 years old with one or more relatives with breast cancer or a familial *BRCA1/2* mutation (breast cancer family history [BCFH] positive, $n = 208$; $n = 69$ with *BRCA1/2*-positive mother), peers (BCFH negative, $n = 112$), and their mothers completed assessments of psychosocial adjustment, breast cancer-specific distress, and perceived risk of breast cancer.

Results

General psychosocial adjustment did not differ significantly between BCFH-positive and BCFH-negative girls, either by self-report or mother report, except for higher self-esteem among BCFH-positive girls ($P = .01$). BCFH-positive girls had higher breast cancer-specific distress than BCFH-negative girls ($P < .001$), but girls from *BRCA1/2*-positive families did not differ from other BCFH-positive peers. BCFH-positive girls were more likely to report themselves at increased self-risk for breast cancer in adulthood than BCFH-negative peers (74% v 33%, respectively; $P \leq .001$). Girls from *BRCA1/2*-positive families were more likely than other BCFH-positive and BCFH-negative peers to report themselves at increased risk ($P < .001$). In all groups, perceived risk of breast cancer was associated with older age. Higher breast cancer-specific distress among adolescent girls was associated with higher self-perceived risk of breast cancer and higher maternal breast cancer-specific distress.

Conclusion

Adolescent girls from *BRCA1/2*-positive and breast cancer families have higher self-esteem and do not have poorer psychosocial adjustment than peers. However, they do experience greater breast cancer-specific distress and perceived risk of breast cancer, particularly among older girls. Understanding the impact is important to optimize responses to growing up in families at familial and genetic risk for breast cancer, particularly given the debate over the genetic testing of children for cancer susceptibility in adulthood.

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INTRODUCTION

Although *BRCA1/2* testing is not recommended during childhood,^{1,2} there is increasing evidence to suggest that adolescence is a key period of carcinogenic vulnerability³ and that childhood exposures are associated with breast cancer risk.³⁻¹⁰ Most parents discuss genetic and familial risk with their adolescent children, and some parents and adolescent providers believe genetic testing should be permitted in adolescence.¹¹⁻¹⁵

Additionally, there are new guidelines recommending return of incidental genomic findings (including *BRCA1/2* mutations) regardless of age.¹⁶ Understanding the psychosocial impact on adolescents growing up in families at familial or genetic risk for breast cancer is critical to ensuring healthy adaptation of youth and the development of genetic testing policies and cancer prevention messaging.

In the multicenter Lessons in Epidemiology and Genetics of Adult Cancer From Youth (LEGACY) Girls Study, we found that 38% of

preadolescent 10- to 13-year-old girls identified themselves as at increased risk for breast cancer and had higher breast cancer-specific distress than peers.¹⁷ Further, we found that mothers' psychosocial adjustment is associated with their daughters' psychosocial adjustment, regardless of maternal breast cancer. This study also identified better psychosocial adjustment in preadolescent daughters from *BRCA1/2* families as compared with their peers, although the number of girls from *BRCA1/2* families was small. Psychosocial adjustment in adolescent girls from breast cancer families remains unknown. Studies in adolescents when a parent has cancer have found increased internalizing and externalizing problems¹⁸⁻²⁰ and distress,²¹⁻²⁴ but these outcomes have not been evaluated in *BRCA1/2* families and those with a family history when a parent does not have cancer. Two small studies have found that the majority of adolescent girls from breast cancer families perceive themselves to be at increased risk for breast cancer in adulthood, suggesting the potential for increased awareness of breast cancer risk as girls progress through adolescence,^{23,25} but the impact of this awareness on psychosocial adjustment remains unknown.

In this study, we first aimed to determine whether girls across adolescence (11 to 19 years old) from breast cancer families differ from their peers in psychosocial adjustment, breast cancer-specific distress, and perceived risk of breast cancer. Second, we aimed to determine whether girls from *BRCA1/2*-positive families experience different outcomes from peers. Third, we evaluated how family and personal factors impact adolescent outcomes to inform potential interventions to optimize adjustment to awareness of breast cancer risk in adolescent girls.

MATERIALS AND METHODS

Participants and Procedures

We recruited 320 girls age 11 to 19 years old and their biologic mothers from families with (breast cancer family history [BCFH] positive) and without (BCFH negative) breast cancer. BCFH-positive girls included those with one or more first- or second-degree relatives with breast cancer or a mother with a *BRCA1/2* mutation. BCFH-negative girls had no known family history of breast cancer in first- or second-degree relatives and no known *BRCA1/2* mutation in the mother. Girls were classified on the basis of mother-reported family history and *BRCA1/2* status, given our intent to evaluate the impact of maternal adjustment on daughter outcomes. Girls were recruited from clinical cancer genetics programs at the University of Pennsylvania and Fox Chase Cancer Center (Philadelphia, PA); a national nonprofit awareness group (Facing Our Risk of Cancer Empowered); local pediatric practices, including Children's Hospital of Philadelphia's Pediatric Research Consortium (Philadelphia, PA); community advertisements; and friend nomination by mothers (Table 1). Institutional review board approval was obtained at each site. Mothers provided written informed consent and permission for daughter participation, and girls provided assent (< 18 years old) or consent ($\geq$ 18 years old).

Measures

We used a novel conceptual model²⁶ grounded in the Self-Regulation Theory of Health Behavior²⁷ and developmental theory,^{28,29} previously described in related research,¹⁷ to inform our outcomes and measures. Our model posits that response to a health threat, including psychosocial adjustment and the performance of health and risk behaviors, is a product of one's perceptions of the threat (eg, perceived risk, etiology,

controllability).^{26,27,30} This model is ideal for the study of youths during maturation because it emphasizes common-sense representations, encompasses sociocultural factors, and is iterative and dynamic, providing a unique opportunity to examine changes throughout development.³⁰ Girls and mothers independently completed surveys, either online (98%) or by phone.

Daughter general psychosocial adjustment reported by mothers and self-reported by girls was assessed with the Behavioral Assessment System for Children (BASC-2).³¹ Assessments not meeting validity checks were excluded from analysis. Daughter breast cancer-specific distress was evaluated with the eight-item Child Impact of Events Scale (Cronbach's $\alpha = .83$ to $.90$), a developmentally appropriate version of the Revised Impact of Event Scale³²⁻³⁵ used to evaluate intrusive and avoidant thoughts regarding breast cancer.³⁶⁻³⁸

Daughter perception of breast cancer risk was assessed with a single item adapted from a longitudinal study of families at hereditary risk for breast cancer.^{30,39} Girls were asked, "Do you think your chances of getting breast cancer when you are an adult are the same or different than other girls your age when they become adults?" Response choices ranged, on a 5-point Likert-type scale, from much higher (5 points) to much lower (1 point).

General family function and communication was reported by girls using the general function and communication subscales of the McMaster Family Assessment Device (Cronbach's $\alpha = .78$ to $.88$).^{40,41} Maternal psychosocial adjustment and perceived risk were assessed using the Hospital Anxiety and Depression Scale (Cronbach's $\alpha = .78$ to $.85$),^{42,43} eight items of the Revised Impact of Event Scale (Cronbach's $\alpha = .88$),³²⁻³⁸ and a parallel 5-point Likert-type scale comparing their lifetime risk for breast cancer to that of other women their age.

Demographic, Health, and Family History Information and Breast Cancer Experiences

Mothers provided demographic information. Mothers and daughters independently reported family history, including whether any first- or second-degree relatives of the daughter had cancer and the type of cancer. Mothers reported their *BRCA1/2* status. Daughters were asked how many individuals they knew with breast cancer, including both relatives and individuals outside their family who had breast cancer (eg, friends' parents, neighbors, teachers, coaches) to assess total breast cancer acquaintances. They were also asked whether they were aware of *BRCA1/2* genes in general and if they knew anyone who had had *BRCA1/2* testing.

Statistical Analyses

In primary analyses informed by our theoretical model, we compared general psychosocial adjustment, breast cancer-specific distress, perception of breast cancer risk, and knowledge of breast cancer genes between BCFH-positive and BCFH-negative girls. In secondary analyses, we evaluated differences between the following three groups: girls with a *BRCA1/2*-positive mother, BCFH-positive girls with a mother who is *BRCA1/2* negative or untested (ie, *BRCA1/2* negative/unknown), and BCFH-negative girls. We also evaluated outcomes among daughters with *BRCA1/2*-positive mothers on the basis of their reported knowledge of their mother's testing. We used linear or logistic regressions to investigate whether general psychosocial adjustment, breast cancer-specific distress, and perceptions of breast cancer risk differed by family history group in the two-group and three-group comparisons. To account for families with more than one daughter, we used robust standard errors that accounted for within-family correlation.⁴⁴ We used interaction terms in the models to test for age (as a continuous variable) by risk group interactions. Statistical significance was considered as $P < .05$ (two-sided). Analyses were conducted using STATA versions 12 and 13 (Statacorp, College Station, TX). We designed the study with 80% power to detect differences using simple linear regressions for standardized effect sizes of 0.28, anticipating imbalanced access to each group and assuming 150 BCFH-negative girls and 300 BCFH-positive girls. Our final sample size (112 BCFH-negative and 208 BCFH-positive girls) gave us power to detect standardized differences between the groups of 0.33, which were still modest-sized associations.

RESULTS

Participant Characteristics

We screened 288 families; 263 mothers had eligible girls and consented for their own and their daughter's participation. Among 335 eligible girls, 320 girls (96%) from 247 families were enrolled and completed surveys. Two hundred eight girls were classified as

BCFH positive, of whom 69 had a *BRCA1/2*-positive mother. Characteristics of mothers and daughters are listed in Table 1. Girls with a *BRCA1/2*-positive mother were younger than girls with mothers who were *BRCA1/2* negative or unknown (age, 14.9 v 15.7 years, respectively; $P = .03$). There were no other significant differences between groups. All girls accurately reported their mother's history of breast cancer, and 55% of girls with a *BRCA1/2*-positive mother reported knowledge of their mother's *BRCA1/2* testing.

Table 1. Characteristics of Girls From Families With and Without Breast Cancer

Characteristic	BCFH Positive (n = 208)	BCFH Negative (n = 112)	P
Mean age, years (SD)	15.4 (2.5)	15.1 (2.3)	.30
Age distribution, years, No. (%)			.90
11-13	55 (26)	32 (29)	
14-16	78 (38)	42 (38)	
17-19	75 (36)	38 (34)	
Race/ethnicity, No. (%)			.33
Non-Hispanic white	181 (87)	89 (79)	
Non-Hispanic black	15 (7)	14 (13)	
Other	12 (6)	9 (9)	
Recruitment source, No. (%)			< .001
Fox Chase Cancer Center Risk Assessment Program	73 (35)	9 (8)	
University of Pennsylvania Cancer Risk Assessment Program	64 (31)	3 (3)	
FORCE	38 (18)	1 (1)	
Community advertisement	11 (5)	38 (34)	
Community pediatric practices	12 (6)	36 (32)	
Friend nomination by mothers	10 (5)	25 (22)	
Family history* and breast cancer experiences, No. (%)			< .001
Mother with breast cancer	93 (45)	0 (0)	
Mother had genetic testing	134 (64)	6 (5)	
Mother has a <i>BRCA1/2</i> mutation	69 (33)	0 (0)	
<i>BRCA1/2</i> -positive mother with BC	34 (49)	—	
<i>BRCA1/2</i> -positive mother without BC	35 (51)	—	
Mother tested negative for <i>BRCA1/2</i> †	63 (47)	6 (100)	
No. of FDRs/SDRs with BC, reported by mother, mean (SD, range)	1.5 (0.7, 0-4)	0 (0.2, 0-1)‡	
No. of acquaintances with BC§ reported by girls, mean (SD, range)	1.9 (1.2, 0-6)	0.6 (0.7, 0-3)	
Development (reported by girls)			
Tanner pubic score, mean (SD)	4.3 (1.0)	4.4 (0.9)	.86
Tanner breast score, mean (SD)	4.0 (1.0)	4.1 (0.9)	.58
Have had menses, No. (%)	173 (83)	95 (85)	.71
Mother education, No. (%)			.49
≤ High school	8 (4)	6 (5)	
Vocation/tech school/some college	39 (19)	25 (22)	
Bachelor's	68 (33)	43 (38)	
Graduate	92 (44)	37 (33)	
Maternal affective responses to breast cancer risk and perceived risk	158	85	
General anxiety score (range 0-21), mean (SD)	6.7 (4.0)	6.0 (4.2)	.22
General depression (range 0-21), mean (SD)	3.0 (3.0)	3.0 (2.9)	.97
Total breast cancer-specific distress (range 0-32), mean (SD)	7.4 (8.3)	2.2 (4.1)	< .001
Report perceived lifetime risk of BC higher than other women, No. (%)	107 (69)	21 (25)	< .001

Abbreviations: BC, breast cancer; BCFH, breast cancer family history positive; FDR, first-degree relative; FORCE, Facing Our Risk of Cancer Empowered; SD, standard deviation; SDR, second-degree relative.

*By mother report; four mothers had missing data.

†There were no variants of uncertain significance reported.

‡Relatives of true-negative parents.

§Daughters reported how many individuals they knew with breast cancer (including both relatives and individuals outside their family).

||Range is 1 to 5.

Mother self-reported general anxiety and depression scores did not differ significantly between groups, but BCFH-positive mothers reported significantly higher breast cancer-specific distress than BCFH-negative mothers (Table 1), and more *BRCA1/2*-positive mothers met criteria for clinically significant distress compared with *BRCA1/2*-negative/unknown mothers (25% v 12%, respectively; $P = .043$). *BRCA1/2*-positive mothers reported lower perceived risk for breast cancer; many had undergone prophylactic surgery (65% mastectomy; 81% oophorectomy).

Differences in Girls' General Psychosocial Adjustment and Breast Cancer-Specific Distress

Mother-reported internalizing and externalizing scores did not differ significantly between BCFH-positive and BCFH-negative girls. Internalizing composite scores reported by girls did not differ between groups (Table 2). In secondary analyses evaluating BASC-2 subscales, BCFH-positive girls reported higher self-esteem than BCFH-negative peers (Table 2). BCFH-positive girls reported higher breast cancer-specific distress compared with peers, and significantly more BCFH-positive than BCFH-negative girls (11% v 1%, respectively) met criteria for clinically significant breast cancer-specific distress (Table 2). These findings did not differ in similar analyses by daughter-reported family history. Among the subset of 69 girls with *BRCA1/2*-positive mothers, those who reported knowledge of their mother's testing did not experience

significantly different BASC-2 or breast cancer-specific distress scores compared with those who did not report knowledge of their mother's genetic testing.

We conducted exploratory cross-sectional analyses by age to evaluate how select outcomes may differ by age, BCFH group, and mother *BRCA1/2* status. The data suggest the potential for differences in general anxiety between BCFH groups by age (Fig 1A; P for age $\times$ BCFH status interaction = .009). There were no significant differences in associations of age with self-esteem, depression, or breast cancer-specific distress.

Differences in Perceived Risk of Breast Cancer and Awareness of Breast Cancer Genes

BCFH-positive girls had 5.7 greater odds (95% CI, 3.4 to 9.6) of reporting themselves at increased lifetime risk for breast cancer than BCFH-negative peers. Girls with a *BRCA1/2*-positive mother had 2.0 (95% CI, 1.0 to 4.0) and 9.4 (95% CI, 4.6 to 19.1) greater odds of reporting themselves at increased lifetime risk for breast cancer compared with girls of a *BRCA1/2*-negative/unknown mother and BCFH-negative peers, respectively (Table 2). Girls of *BRCA1/2*-positive mothers also had 6.1 (95% CI, 3.0 to 12.4) and 17.5 (95% CI, 7.1 to 42.8) greater odds of reporting knowledge of *BRCA1/2* genes in general compared with those with a *BRCA1/2*-negative/unknown mother and BCFH-negative peers, respectively. Among the subset of girls with a *BRCA1/2*-positive mother, 92% of

Table 2. Psychosocial Adjustment, BC-Specific Distress, Knowledge of BC Genes, and Perception of Risk (self-reported by girls)

Measure	BCFH Negative (n = 112)	BCFH Positive (n = 208)	<i>P</i>	<i>BRCA1/2</i> -Positive Subgroup of BCFH-Positive Group (n = 69)	<i>BRCA1/2</i> -Negative or Unknown Subgroup of BCFH-Positive Group (n = 139)	<i>P</i>
Internalizing score, mean (SD)*						
Composite	48.1 (26.1)	46.1 (27.2)	.58	45.6 (26.5)	46.3 (27.6)	.98
% at risk	12	12	.89	9	14	.38
General anxiety	61 (28.9)	60.6 (28.1)	.93	62.4 (28.4)	59.6 (28)	.35
% at risk	36	31	.36	37	27	.08
Depression	42.8 (26.9)	40.3 (28.5)	.52	39.6 (30.3)	40.7 (27.6)	.88
% at risk	8	9	.85	10	9	.74
Self-esteem	48.3 (27)	57.7 (28.2)	.01	58.2 (29.5)	57.4 (27.6)	.79
% at risk	18	11	.09	11	10	.68
BC-specific distress score						
Intrusive BC distress (range 0-18), mean (SD)	1.1 (2.6)	2.5 (3.8)	< .001	2.8 (3.7)	2.3 (3.9)	.23
Avoidant BC distress (range 0-20), mean (SD)	0.7 (2.2)	2.5 (4.8)	< .001	2.7 (4.7)	2.4 (4.9)	.69
Total BC distress (range 0-38), mean (SD)	1.8 (4.3)	4.9 (7.8)	< .001	5.4 (7.6)	4.7 (7.9)	.44
% clinical	1	11	.01	13	9	.33
Knowledge and perceptions of breast cancer risk, No. (%)						
Report perceived risk of BC higher than peers	35 (32)	150 (73)	< .001	56 (81)	94 (68)	.006
Awareness of BC genes	8 (7)	64 (31)	< .001	39 (57)	25 (18)	< .001
Know someone who was tested for <i>BRCA1/2</i>	2 (2)	54 (26)	< .001	39 (57)	15 (11)	< .001

NOTE. Percentages reflect the percentage with nonmissing data. Only select subscales are reported. All girls and mothers reporting internalizing and externalizing Behavioral Assessment System for Children subscales were evaluated and had no statistically significant differences. Means represent Behavioral Assessment System for Children percentile scores. Clinically at risk was defined as a *t*-score greater than 60 for negative scales and less than 30 for the self-esteem subscale. Total BC distress scores greater than 17 are considered clinically relevant.

Abbreviations: BC, breast cancer; BCFH, breast cancer family history positive; SD, standard deviation.

*Forty-four scores were discarded as a result of poor validity (n = 29 BCFH positive [n = 22 *BRCA1/2* negative or unknown, n = 7 *BRCA1/2* positive], n = 15 BCFH negative). Analyses controlled for age and accounted for within-family clustering. Results were also run by daughter-reported assignment to BCFH-positive or BCFH-negative group, and there were no significant changes in the results.

Fig 1. (A) Anxiety by breast cancer family history (BCFH) group and age of girls. The youngest BCFH-positive girls had lower anxiety than BCFH-negative girls ($P < .034$ comparing two BCFH-positive subgroups to BCFH-negative subgroup). Anxiety was lower among older BCFH-negative girls ($P = .002$), but there were no significant differences in anxiety by age group among either BCFH-positive subgroup. The difference in the relationship between age and anxiety between BCFH-positive girls (both subgroups) and BCFH-negative girls was statistically significant ($P < .009$ for interaction terms). (B) Percentage of girls who believe they are at higher risk for breast cancer than peers by age and breast cancer family history (BCFH group). Older age was significantly associated with higher perceived risk ($P < .01$). Compared with 11- to 13-year-old girls, 14- to 16-year old girls (odds ratio, 2.18; 95% CI, 1.26 to 3.79) and 17- to 19-year-old girls (odds ratio, 4.21; 95% CI, 2.28 to 7.77) were more likely to report themselves at increased risk on a verbal scale. There were significant differences between BCFH-positive and BCFH-negative groups at the youngest ages ($P < .01$ comparing BCFH-negative with each of the three other risk categories) but no statistically significant differences among the three BCFH-positive groups. The relationship of age with perceived risk was not moderated by the four risk groups ($P > .2$ for interaction terms).

those who reported knowledge of the mother's testing reported themselves at greater lifetime risk for breast cancer, compared with 69% of those who did not report knowledge of the mother's genetic testing. Perceived risk of breast cancer was significantly associated with older age among all groups and was generally higher among BCFH-positive girls compared with BCFH-negative peers (Fig 1B; the interaction between age and BCFH status was not statistically significant, $P > .2$).

Factors Associated With Girls' Psychosocial Adjustment, Breast Cancer-Specific Distress, and Perceived Risk

We conducted multivariable analyses to evaluate whether factors suggested by our theoretical model (eg, family history, maternal adjustment and distress, and family and girl factors) were associated with daughter outcomes. Higher general anxiety in girls was associated with higher mother anxiety and poorer family communication (Table 3). Higher self-esteem in girls was associated with lower mother anxiety and better family communication, more relatives with breast cancer, higher mother breast cancer-specific distress, and fewer breast cancer acquaintances reported by girls. Higher breast cancer-specific distress in girls was significantly associated only with higher mother breast cancer-specific distress and girls' perceived risk (Table 3). Higher perceived

risk for breast cancer among girls was significantly associated with older age, more first- and second-degree relatives with breast cancer, maternal breast cancer, maternal *BRCA1/2* mutation, daughter knowledge of mom's genetic testing, and maternal depression (Table 4).

DISCUSSION

To our knowledge, this is the first study to evaluate the impact of family history of breast cancer or a familial *BRCA1/2* mutation on adolescent girls. Similar to the LEGACY Girls Study, which reported outcomes among a younger 10- to 13-year-old cohort,¹⁷ 11- to 19-year-old BCFH-positive girls did not experience worse general psychosocial adjustment than peers. Interestingly, self-esteem was higher among BCFH-positive girls and girls with stronger family history of breast cancer, whereas depression was lower with increasing number of relatives with breast cancer. These data suggest that exposure to relatives with cancer in the family might foster adaptive responses, but these outcomes may also be differentially influenced by individual, mother, and family factors.

Similar to the LEGACY Girls Study, we found that 11- to 19-year-old BCFH-positive girls report higher breast cancer-specific distress than peers and that distress increased with greater

Table 3. Factors Associated With Psychosocial Adjustment in Adolescent Girls in Adjusted Multivariable Models

Covariate	Depression	General Anxiety	Self-Esteem	BC-Specific Distress
Family history and BC experiences				
No. of FDRs or SDRs with BC, reported by mother	$\beta = -6.9, P = .004$	NS	$\beta = 6.9, P = .008$	NS
Mother history of BC	$\beta = 9.5, P = .053$	NS	NS	NS
<i>BRCA1/2</i> -positive mother	NS	NS	NS	NS
Acquaintances with BC reported by girls	$\beta = 5.6, P < .001$	NS	$\beta = -4.2, P = .02$	NS
Daughter knows of mother's genetic testing	NS	NS	NS	NS
Maternal factors				
Depression	NS	NS	NS	NS
Anxiety	$\beta = 1.6, P < .001$	$\beta = 1.6, P = .003$	$\beta = -1.6, P = .001$	NS
BC-specific distress	$\beta = -0.7, P = .004$	NS	$\beta = 0.5, P = .046$	$\beta = 0.3, P = .001$
Daughter factors				
Reported perceived risk higher than peers	NS	NS	NS	$\beta = 1.9, P = .047$
Age	$\beta = -2.0, P = .05$	NS	NS	NS
Breast development	$\beta = 5.0, P = .03$	NS	NS	NS
Family factors reported by girls				
Poor family communication	NS	$\beta = 14.2, P = .02$	$\beta = -17.6, P = .002$	NS
Poor general family functioning	$\beta = 20.1, P < .001$	NS	NS	NS

NOTE. Models accounted for within-family clustering.

Abbreviations: BC, breast cancer; FDR, first-degree relative; NS, not significant; SDR, second-degree relative.

mother breast cancer-specific distress. Additionally, the majority of adolescent girls from breast cancer families are aware of their familial risk for breast cancer in adulthood, which is highest among older girls and those who report knowledge of their mother's *BRCA1/2* testing. This is not surprising given the majority of parents discuss familial and genetic risk for breast cancer with their children, particularly as they age.¹¹ Thus, even though *BRCA1/2*

testing is not currently recommended for children and adolescents, the majority of girls in families at familial and genetic risk report themselves to be at higher lifetime risk for breast cancer than their peers, particularly among girls who report knowledge of their mother's *BRCA1/2*-positive testing.

The clinical impact of heightened breast cancer risk awareness and higher distress in BCFH-positive girls remains unclear. These findings, consistent with our theoretical model, suggest the importance of continuing assessment of biopsychosocial factors that impact the long-term psychosocial and medical well-being of adolescents in BCFH-positive families. This can better inform development of interventions or subgroups for whom interventions may be particularly beneficial. Chronic psychosocial stressors can impact psychological and physical health,⁴⁵⁻⁴⁸ and psychosocial distress can be associated with greater risk behaviors (eg, tobacco, alcohol use). Furthermore, many health and risk behaviors in adolescence relate to the adoption and maintenance of health and risk behaviors throughout life.^{28,29,49-51} At the same time, risk awareness in the context of low levels of distress might motivate adolescents to engage in health-promoting behaviors. Given data that lifestyle factors (eg, diet, exercise, tobacco and alcohol use) in adolescence may impact risk for breast cancer in adulthood,³⁻¹⁰ there is a great need to understand the longitudinal outcomes and impact on health behaviors in girls from breast cancer and *BRCA1/2*-positive families.

Consistent with the literature, the LEGACY Girls Study, and our theoretical model, poorer daughter psychosocial adjustment subscales (eg, anxiety, depression, self-esteem) are strongly associated with poorer family function, poorer mother adjustment, and higher daughter distress with higher mother distress.^{19,20,38,52-54} This provides additional data supporting efforts to assess and address psychosocial issues of not just survivors of breast cancer with adolescent daughters, but also "pre-vivors"¹⁷ (ie, individuals

Table 4. Factors Associated With Higher Perceived Risk Reported by Girls in Adjusted Multivariable Models

Factor	Reported Perceived Risk Higher Than Peers (OR)	P
Family history and BC experiences		
No. of FDRs or SDRs with BC, reported by mother	2.1	.007
Mother history of BC	2.7	.03
<i>BRCA1/2</i> -positive mother	3.8	.006
Acquaintances with BC reported by girls	NS	
Daughter knows of mother's genetic testing	6.5	.015
Mother affective factors		
Depression	1.2	.001
General anxiety	NS	
BC-specific distress	NS	
Daughter factors		
Age	1.4	< .001
Breast development (Tanner stage)	NS	
Family factors reported by girls		
Poor family general function	NS	
Poor family communication	NS	

NOTE. Models accounted for within family clustering.

Abbreviations: BC, breast cancer; FDR, first-degree relative; NS, not significant; OR, odds ratio; SDR, second-degree relative.

without cancer but at genetic risk). Such efforts could have benefits for their adolescent daughters at critical points throughout their development. This will become increasingly important as susceptibility testing for cancer expands, increasing the population of at-risk families.

Historically, guidelines have recommended against genetic testing of children for adult-onset disease, although recent guidelines have suggested that testing may be permitted in some circumstances.⁵⁵ Additionally, recent guidelines recommend returning incidental findings in adult-onset susceptibility genes (including *BRCA1/2*) regardless of age.¹⁶ Although many oppose an obligation to return incidental *BRCA1/2* mutations to children and adolescents, advances in genetic sequencing will continue to heighten the debate over the risks and benefits of testing youth for disease that will not manifest until adulthood.^{56,57} Although we do not suggest that these data provide evidence to change existing policy, they do highlight the need to better understand the potential benefits and harms of extending testing for *BRCA1/2* and other adult conditions during childhood and adolescence. There might be potential benefits to genetic testing in adolescence, such as relief from uncertainty and reduced cancer-specific distress for those who test negative or early incorporation of genetic identity into self-concept during adolescence and motivation for early lifestyle changes among carriers. There are also potential harms, including negative impact on family relations, increased distress, risk behaviors, and survivor guilt. These data do suggest that there could be benefits to testing children and adolescents, because, by mid to late adolescence, the overwhelming majority of girls of *BRCA1/2*-positive mothers consider themselves to be at increased risk for breast cancer. Nonetheless, empirical studies are needed to understand the balance of risks and benefits across the developmental trajectory to inform genetic testing policies of minors for adult-onset disease.

We acknowledge limitations to this study. Participants might represent a biased sample, which might not be generalizable to all girls and mothers. The study included few ethnic minorities, and BCFH-positive and BCFH-negative families were recruited from different sources. We focused on mother-daughter pairs. These data might not reflect outcomes for daughters whose mother is deceased or the impact of fathers or other parent figures. Although, to our knowledge, this study represents the largest number of girls from *BRCA1/2*-positive families to date, confirmation in a larger population of *BRCA1/2*-positive families is needed. Although outcomes did not differ on the basis of mother- versus daughter-reported family history, more detailed query about what girls know of cancer and susceptibility testing in the family could be useful.

Additionally, we do not report specifically what mothers communicated to daughters regarding cancer in the family and the mother's diagnosis or *BRCA1/2* status. A better understanding of this communication is an important area of further research. Similarly, the impact of daughter exposure to affected mothers' treatment was not included.

These data reveal that adolescent girls from breast cancer families report greater self-esteem but also greater breast cancer-specific distress and perceived risk of breast cancer. Identifying girls with a family history of breast cancer and providing referrals for maternal and familial psychosocial support for mothers might promote optimal psychosocial and behavioral adaptation of their daughters. Understanding the role of maternal factors on outcomes, how daughter outcomes change developmentally, and their impact on health and risk behaviors is necessary to inform interventions that optimize responses to growing up in families at familial and genetic risk for breast cancer. Further research on the risks and benefits of testing children for familial *BRCA1/2* or other breast cancer susceptibility genes is needed to inform policies regarding the genetic testing of children for adult-onset cancer susceptibility.

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Disclosures provided by the authors are available with this article at www.jco.org.

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Psychosocial Adjustment and Perceived Risk Among Adolescent Girls From Families With *BRCA1/2* or Breast Cancer History

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