

Supplementary Online Content

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This supplementary material has been provided by the authors to give readers additional information about their work.

eTable 1. Details of Health Administrative Databases ^a

Datasets	Description	Clinical Information
Ontario Cancer Registry (OCR)	The OCR contains demographic and clinical information on incident cases of cancer in Ontario, as well as information on mortality. The OCR registers all new cases of cancer, except non-melanoma skin cancer.	Age at breast cancer diagnosis Date of breast cancer diagnosis Pathological stage at diagnosis (American Joint Committee on Cancer) Cause of death
Cancer Care Ontario – Collaborative Staging (CCO-CS)	The Collaborative Staging is the expansion of TNM staging system, and is a part of Cancer Care Ontario’s Stage Capture Project.	Estrogen receptor (ER) Progesterone receptor (PR) ERBB2 receptor
New Drug Funding Plan (NDFP)	The NDFP is a publicly funded drug program under the Ontario Public Drug Programs (OPDP). The NDFP directly covers the cost of many injectable cancer drugs administered in hospitals and cancer centers.	ERBB2 receptor Chemotherapy
Discharge Abstract Database (DAD) & Same Day Surgery (SDS)	The DAD captures administrative, clinical and demographic information on hospital discharges (including deaths, sign-outs and transfers). The SDS database collects information about same-day surgeries and procedures in the Province of Ontario.	Pregnancy (Natural and Assisted Reproductive Technology) Abortion Radiotherapy
MOMBABY	The MOMBABY is an ICES-derived dataset linking the admission records of delivering mothers and their newborns.	Live-birth Stillbirth
Ontario Health Insurance Plan (OHIP)	The OHIP contains information on claims made by physician and other healthcare providers for insured services provided to residents of the Ontario.	Pregnancy (Natural and Assisted Reproductive Technology) Abortion Radiotherapy
National Ambulatory Care Reporting System (NACRS)	The NACRS contains data for all hospital-based and community-based ambulatory care, including day surgery, outpatient and community-based clinics, and emergency departments. The client visit data is collected at time of service in participating facilities.	Pregnancy (Natural and Assisted Reproductive Technology) Abortion Radiotherapy
Ontario Registrar General-Death (ORGD)	The ORGD is a database of population & demographics, and contains information on vital statistics including death.	Date of death

^a Further details at: <https://datadictionary.ices.on.ca/Applications/DataDictionary/Default.aspx>.

eTable 2. Exclusion of Patients

Exclusion	Frequency	Percent
Total	96,676	100.00
Non-female/unknown sex/Death date earlier than diagnosis date	837	0.86
Age less than 20 at time of breast cancer	19	0.02
Age 45 or greater at time of breast cancer	82,725	85.57
History of hysterectomy or oophorectomy	3,164	3.27
History of previous cancer (except skin cancers)	396	0.41
Stage 0 or stage unknown	1,982	2.05
Eligible for study	7,553	7.81

eTable 3. Coding Details of Exposures (Pregnancy, Abortion, and Live Birth/Stillbirth) and Treatment

Discipline	Variable	Source	Code(s)	Description
Exposures	Pregnancy	OHIP Fee codes	A920	MEDICAL MANAGMENT OF EARLY PREGNANCY, INITIAL VISIT
			A921	MEDICAL MANAGEMENT OF EARLY PREGNANCY, SUBSEQUENT VISIT
			P002	High risk prenatal assessment
			P003	OBS.-PRENATAL CARE-GEN.ASSESS-MAJOR PRENATAL VISIT
			P004	OBS.-PRENATAL CARE-MINOR PRENATAL ASSESS. – SUBSEQ.PRENAT.VIS.
			P005	ANTENATAL HEALTH SCREEN
			Q605	ANTENATAL PREVENTIVE HEALTH ASSESSMENT – N.P.
			Q606	PRENATAL CARE – GEN. ASSESS – MAJOR PRENATAL VISIT – N.P.
			Q607	PRENATAL CARE – MIN. ASSESS – SUBSEQ. PRENATAL VISIT- N.P.
		ICD-9	V22.0	Supervision of normal first pregnancy
			V22.1	Supervision of other normal pregnancy
			V22.2	Pregnant state, incidental
			V23.41	Pregnancy with history of pre-term labor
			V23.42	Pregnancy with history of ectopic pregnancy
			V23.49	Pregnancy with other poor obstetric history
			V23.5	Supervision of high-risk pregnancy with other poor reproductive history
			V23.7	Supervision of high-risk pregnancy with insufficient prenatal care
			V23.81	Supervision of high-risk pregnancy with elderly primigravida
			V23.82	Supervision of high-risk pregnancy with elderly multigravida
			V23.83	Supervision of high-risk pregnancy with young primigravida
			V23.84	Supervision of high-risk pregnancy with young multigravida
			V23.86	Pregnancy with history of in utero procedure during previous pregnancy
			V23.89	Supervision of other high-risk pregnancy
			V23.9	Supervision of unspecified high-risk pregnancy
		V72.42	Pregnancy examination or test, positive result	
		CCP	02.88	DIAGNOSTIC ULTRASOUND OF GRAVID UTERUS
		ICD-10	Z32.01	Encounter for pregnancy test, result positive
			Z33.1	Pregnant state, incidental
		CCI	5.AB.01.^	Antepartum care
			5.AB.03.^	Obstetrical ultrasound examinations

eTable 3: Cont'd

Discipline	Variable	Source	Code(s)	Description
Exposures	Pregnancy – Assisted Reproductive Technology (ART)	OHIP Fee codes	G334	D&T GYNAE.TELEPHONE SUPER.NA SAMEDAY/VISIT(MAX.37 PER CYCLE)
			G367	D./T. PROC.-GYNAECOLOGY-ARTIFICIAL INSEMINATION
			E542	ADD ON CODE TO SERVICES WHEN PERFORMED OUTSIDE HOSPITAL
			Z718	FEM.GEN.SYST.FALLOPIAN TUBE-LAPAROSCOPY,OOCYTE RETRIEVAL
		ICD-9	V23.85	Pregnancy resulting from assisted reproductive technology
			V26.1	Artificial insemination
			V26.81	Encounter for assisted reproductive fertility procedure cycle
			V26.82	Encounter for fertility preservation procedure
			V59.70	Egg (oocyte) (ovum) donor, unspecified
			V59.71	Egg (oocyte) (ovum) donor, under age 35,anonymous recipient
			V59.72	Egg (oocyte) (ovum) donor, under age 35,designated recipient
			V59.73	Egg (oocyte) (ovum) donor, age 35 and over,anonymous recipient
			V59.74	Egg (oocyte) (ovum) donor, age 35 and over,designated recipient
		CCP	81.92	ARTIFICIAL INSEMINATION
		ICD-10	O09.81	Supervision of pregnancy resulting from assisted reproductive technology
			Z31.83	Encounter for assisted reproductive fertility procedure cycle
			Z31.84	Encounter for fertility preservation procedure
			Z31.89	Encounter for other procreative management
			Z31.9	Encounter for procreative management, unspecified
			Z52.810	under age 35, anonymous recipient
			Z52.811	under age 35, designated recipient
			Z52.812	age 35 and over, anonymous recipient
			Z52.813	age 35 and over, designated recipient
			Z52.819	unspecified
		CCI	1.RB.57.^A	Extraction, ovary
			1.RB.58.^A	Procurement, ovary
			1.RM.83.^A	Transfer, uterus and surrounding structures
			1.RZ.12.^A	Therapy, female genital tract NEC
			1.ZZ.35.HA-I5	Progestogens, Estrogens, Androgens, Clomiphene, Danazol
			1.ZZ.35.YA-I5	Progestogens, Estrogens, Androgens, Clomiphene, Danazol

eTable 3: Cont'd

Discipline	Variable	Source	Code(s)	Description	
Exposures	Abortion ^a	ICD-9	630-639	Ectopic And Molar Pregnancy And Other Pregnancy With Abortive Outcome	
			630	Hydatidiform mole	
			631	Other abnormal product of conception	
			632	Missed abortion	
			633	Ectopic pregnancy	
			634	Spontaneous abortion	
			635	Legally induced abortion	
			636	Illegal abortion	
			637	Unspecified abortion	
			638	Failed attempted abortion	
		639	Complications following abortion and ectopic and molar pregnancies		
		CCP	78.52	SALPINGECTOMY (PARTIAL) WITH REMOVAL OF TUBAL PREGNANCY	
			81.0	DILATION AND CURETTAGE (OF UTERUS)	
			81.01	DILATION AND CURETTAGE FOLLOWING DELIVERY OR ABORTION	
			81.09	OTHER DILATION AND CURETTAGE	
			81.21	REMOVAL OF INTRALIGAMENOUS ECTOPIC PREGNANCY	
			81.6	ASPIRATION CURETTAGE OF UTERUS	
			81.61	ASPIRATION CURETTAGE FOLLOWING DELIVERY OR ABORTION	
			81.69	OTHER ASPIRATION CURETTAGE OF UTERUS	
			86.3	REMOVAL OF INTRAPERITONEAL EMBRYO	
			86.4	OTHER REMOVAL OF EMBRYO	
			86.41	HYSTEROTOMY TO TERMINATE PREGNANCY	
			86.42	HYSTERECTOMY TO TERMINATE PREGNANCY	
			86.49	OTHER REMOVAL OF EMBRYO NEC	
			87.0	INTRA-AMNIOTIC INJECTION FOR TERMINATION OF PREGNANCY	
			87.1	VACUUM ASPIRATION FOR TERMINATION OF PREGNANCY	
			87.2	OTHER TERMINATION OF PREGNANCY	
			87.21	DILATION AND CURETTAGE FOR TERMINATION OF PREGNANCY	
			87.29	OTHER TERMINATION OF PREGNANCY NEC	
			ICD-10	O00-O08	Pregnancy with abortive outcome
				O00	Ectopic pregnancy
		O01		Hydatidiform mole	
		O02		Other abnormal products of conception	
		O03		Spontaneous abortion	
		O04		Complications following (Induced/Medical) termination of pregnancy	

eTable 3: Cont'd

Discipline	Variable	Source	Code(s)	Description
Exposures	Abortion ^a	ICD-10	O05	Other abortion
			O06	Unspecified abortion
			O07	Failed attempted termination of pregnancy
			O08	Complications following ectopic and molar pregnancy
		CCI	5.CA.20.^A	Pharmacotherapy (in preparation for), termination of pregnancy
			5.CA.24.^A	Preparation by dilating cervix (for), termination of pregnancy
			5.CA.88.^A	Pharmacological termination of pregnancy
			5.CA.89.^A	Surgical termination of pregnancy
		OHIP Fee codes (Use feesuff 'A')	A922	MEDICAL MANAGEMENT OF ECTOPIC PREGNANCY-INITIAL SERVICE
			G397	MANAGEMENT OF ECTOPIC PREGNANCY
			S752	FEM.GENITAL SYST.-INDUCED-CURRENT,INTRA-AMNIOTIC INJ.(COMP.)
			S756	CORPUS UTERI- ABORTION – MISSED.
			S768	FEM.GENITAL SYST.- SPONTANEOUS-INCOMPLETE- INCLUDING D&C
			S784	FALLOP.TUBE-EXC,SUT,REP-ECTOPIC PREGNANCY.(SURG.MANAGMNT).
			S785	FEM.GENITAL SYST.-INDUCED-INTRA-AMNIOTIC INJ. (INCOMP.)
		OHIP DXCODE	632	Missed abortion
			633	Ectopic pregnancy
			634	Incomplete abortion, complete abortion
		Delivery ^b (Live-birth OR Stillbirth)	MOMBAB Y	M_STILLBIRTH
Treatment	Chemotherapy	NACRS (ICD-10)	Z511	
		NDFP	TREATMENT_DATE	
		OHIP	G281; G339; G345; G359; G381; G382; H530 (outpatient)	
	Radiation therapy	ICD-9	V58.0 – Radiotherapy	
		ICD-10	Z510 – Radiotherapy session	
		CCI	1YM27JADA – Radiation, breast using superficial (photon) radiation	
			1YM27JADB – Radiation, breast using orthovoltage (deep) radiation	
1YM27JADC – Radiation, breast using Cobalt 60				

			1YM27JADE – Radiation, breast using linear accelerator 1YM27JADF – Radiation, breast using electron radiation 1YM27JADG – Radiation, breast using particulate beam (e.g. proton beam)
		OHIP	X310 – Radiotherapy – Level 1 – Simple Treatment Planning X311 – Level 2 – Intermediate Treatment Planning X312 – Level 3 – Complex Treatment Planning X313 – Level 4 – Full 3D Treatment Preparation

Abbreviations: OHIP, Ontario Health Insurance Plan; ICD, International Classification of Diseases; CCI, Canadian Classification of Health Intervention; CCP, Canadian Classification of Diagnostic, Therapeutic and Surgical Procedures; NACRS, National Ambulatory Care Reporting System; NDFP, New Drug Funding Plan.

^a Abortion was defined as cessation of pregnancy before 20 weeks of gestation.

^b Stillbirth was defined as cessation of pregnancy from 20 weeks of gestation, or with birth of a fetus 500 g or more, in which fetus lacked vital signs at birth. Live-birth was defined as birth of a live baby from 20 weeks and onwards.

eTable 4. Characteristics of Women in the Study Population

Characteristic	N	%	Proportion who died (%)
All women	7,553	100	13.0
Year of diagnosis			
2004-2007	2,687	35.6	19.7
2008-2011	2,863	37.9	12.4
2012-2014	2,003	26.5	4.6
Age group			
20-29 years	351	4.6	16.2
30-34 years	858	11.4	15.1
35-39 years	1,992	26.4	14.9
40-44 years	4,352	57.6	11.4
Stage at diagnosis			
Stage I	2,082	27.6	4.0
Stage II	3,512	46.5	9.0
Stage III	1,619	21.4	23.5
Stage IV	340	4.5	58.2
Tumor size (mm)			
20mm or less	1,239	34.6	2.4
21-50mm	1,731	48.4	6.4
>50mm	609	17.0	13.8
Unknown size	3,974	-	19.0
Nodal status			
Node-negative	1,756	51.3	2.2
Node-positive	1,669	48.7	9.2
Unknown nodes	4,128	-	19.0
Tumor grade			
Low grade	336	12.2	0.9
Medium grade	1,063	38.6	2.3
High grade	1,355	49.2	9.0
Unknown grade	4,799	-	17.3
Estrogen Receptor status (ER)			
ER-negative	878	25.0	14.6
ER-positive	2,641	75.0	4.2
ER-borderline/unknown	4,034	-	18.3
Progesterone Receptor status (PR)			
PR-negative	1,076	30.6	13.7
PR-positive	2,438	69.4	3.7
PR-borderline/unknown	4,039	-	18.3
ERBB2 status			
ERBB2-negative	1,739	23.7	6.3
ERBB2-positive	1,329	17.6	11.7
ERBB2-borderline/unknown	4,485	59.3	15.9
Chemotherapy			
No	1,445	19.1	7.4
Yes	6,108	80.9	14.3
Radiation therapy			
No	1,955	25.9	14.0
Yes	5,598	74.1	12.6
Mean follow-up time (years) (median; range)	7,553	5.2 (5.0; 0.003- 11.2)	-

eTable 5. Parity of Women From 5 Years Prior to 5 Years After Breast Cancer Diagnosis

Parity	Number of women with live-births	Number of women with abortions	Number of women with total pregnancies
0	6,251 ^{a, b}	6,853 ^c	5,832 ^d
1	1075	590	1,202
2	210	82	398
3 and more ^e	17	28	121
Mean	0.20	0.11	0.32
Range	0-4	0-5	0-5
Total (one or more)	1,302	700	1,721
Total number of women	7,553	7,553	7,553

^a A woman who had no live-birth might had an abortion.

^b Live-birth includes 14 stillbirths.

^c A woman who had no abortion might had a live-birth.

^d No pregnancy includes no live-birth or stillbirth *AND* no abortion.

^e For privacy protection, cells with frequency ≤ 6 have been merged with the parity category '3 or more'.

eTable 6. Characteristics of Women in the Study Population According to the Exposure Groups

Characteristic	All women	Exposure groups ^{a, b}							
		No pregnancy		Pregnancy before breast cancer		Pregnancy-associated breast cancer		Pregnancy following breast cancer	
		N = 7,553	n = 5,832	77.2%	n = 1,108	14.7%	n = 501	6.6%	n = 112
Year of diagnosis									
2004-2007	2,687	2,098	36.0	356	32.1	176	35.1	57	50.9
2008-2011	2,864	2,178	37.3	433	39.1	198	39.5	55	49.1
2012-2014	2,002	1,556	26.7	319	28.8	127	25.3	- ^c	-
Age group									
20-29 years	351	217	3.7	36	3.2	66	13.2	32	28.6
30-34 years	858	431	7.4	214	19.3	168	33.5	45	40.2
35-39 years	1,996	1,325	22.7	452	40.8	184	36.7	35	31.2
40-44 years	4,348	3,859	66.2	406	36.6	83	16.7	- ^c	-
Stage at diagnosis									
Stage I	2,082	1,665	28.5	268	24.2	111	22.2	38	33.9
Stage II	3,512	2,704	46.4	514	46.4	237	47.3	57	50.9
Stage III	1,620	1,207	20.7	268	24.2	128	25.5	17	15.2
Stage IV	339	256	4.4	58	5.2	25	5.0	- ^c	-
Tumor size (mm)									
20 mm or less	1,239	939	34.4	213	37.0	79	31.8	8	34.8
21-50 mm	1,733	1,332	48.8	259	45.0	127	51.2	15	65.2
>50 mm	607	461	16.9	104	18.1	42	16.9	- ^c	-
Unknown	3,974	3,100	-	532	-	253	-	89	-
Nodal status									
Node-negative	1,762	1,364	52.3	263	47.0	114	47.9	21	100.0
Node-positive	1,663	1,242	47.7	297	53.0	124	52.1	- ^c	-
Unknown nodes	4,128	3,226	-	548	-	263	-	91	-
Estrogen Receptor status (ER)									
ER-negative	878	621	23.2	158	27.4	89	36.5	10	45.5
ER-positive	2,641	2,055	76.8	419	72.6	155	63.5	12	54.5
ER-borderline/unknown	4,034	3,156	-	531	-	257	-	90	-

eTable 6: Cont'd

Characteristic	All women	Exposure groups ^{a, b}							
		No pregnancy		Pregnancy before breast cancer		Pregnancy-associated breast cancer		Pregnancy following breast cancer	
		N = 7,553	n = 5,832	77.2%	n = 1,108	14.7%	n = 501	6.6%	n = 112
Progesterone Receptor status (PR)									
PR-negative	1,076	780	29.2	184	31.9	100	41.0	12	54.5
PR-positive	2,438	1,892	70.8	392	68.1	144	59.0	10	45.5
PR-borderline/unknown	4,039	3,160	-	532	-	257	-	90	-
ERBB2 status									
ERBB2-negative	1,739	1,343	23.0	278	25.1	111	22.2	7	6.3
ERBB2-positive	1,329	975	16.7	234	21.2	97	19.4	23	20.5
ERBB2-borderline/unknown	4,485	3,514	60.2	596	53.8	293	58.5	82	73.2
Chemotherapy									
No	1,445	1,191	20.4	158	14.3	78	15.6	18	16.1
Yes	6,108	4,641	79.6	950	85.7	423	84.4	94	83.9
Radiation therapy									
No	1,955	1,498	25.7	297	26.8	135	27.0	25	22.3
Yes	5,598	4,334	74.3	811	73.2	366	73.0	87	77.7
Status as of December 31, 2014									
Alive	6,578	5,104	87.5	955	86.2	407	81.2	112	100.0
Dead ^d	975	728	12.5	153	13.8	94	18.8	- ^c	-
Mean follow-up time (years) (median; range)	5.2 (5.0; 0.003-11.2)	5.3 (5.0; 0.003-11.2)		4.9 (4.5; 0.3-11.2)		5.0 (4.6; 0.3-11.1)		7.2 (6.9; 2.9-11.0)	

^a Pregnancy included abortion, live-birth, and stillbirth.

^b Definitions of exposure groups: No pregnancy: no conception from 5 years prior to, until 5 years after, the index date of breast cancer diagnosis; Pregnancy before breast cancer: conception in the interval 60 months to 12 months prior to the index date of breast cancer diagnosis; Pregnancy-associated breast cancer: conception in the interval 11 months prior to, until 21 months after, the index date of breast cancer diagnosis; Pregnancy following breast cancer: conception in the interval 22 months to 60 months after the index date of breast cancer diagnosis.

^c For privacy protection, the table does not show cells with frequency ≤6.

^d Dead category includes, (1) death by breast cancer, (2) death by other cause, and (3) death by an unknown cause.

eTable 7. Cox Proportional Hazard Model to Estimate the Hazard Ratio (HR) of All-Cause Mortality for Women Who Had Pregnancy; No Chemotherapy ^{a, b}

Characteristic	Age-Adjusted			Multivariable ^d		
	HR	95% CI	P Value	HR	95% CI	P Value
Age group						
40-44 years	1			1		
35-39 years	1.25	1.06-1.48	.007	1.22	1.03-1.44	.02
30-34 years	1.74	1.41-2.15	<.001	1.55	1.24-1.94	.0001
20-29 years	2.04	1.53-2.74	<.001	1.75	1.30-2.37	.02
Tumor size (mm)						
20 mm or less	1			1		
21-50 mm	2.59	1.73-3.89	<.001	1.74	1.15-2.63	.008
>50 mm	6.77	4.46-10.3	<.001	3.70	2.41-5.67	<.001
Unknown	3.65	2.52-5.27	<.001	4.36	2.35-8.06	<.001
Nodal status						
Node-negative	1			1		
Node-positive	4.24	2.97-6.05	<.001	3.94	2.74-5.68	<.001
Unknown nodes	4.16	2.99-5.78	<.001	12.2	7.70-19.3	<.001
Estrogen Receptor status (ER)						
ER-negative	1			1		
ER-positive	0.26	0.50-0.34	<.001	0.59	0.39-0.91	.02
ER-borderline/unknown	0.54	0.44-0.65	<.001	0.10	0.01-0.79	.03
ERBB2 status						
ERBB2-negative	1			1		
ERBB2-positive	0.97	0.75-1.25	.81	0.65	0.49-0.88	.004
ERBB2-borderline/unknown	1.13	0.92-1.39	.26	0.84	0.64-1.12	.24
Radiation therapy						
No	1			1		
Yes	0.78	0.67-0.92	.002	0.75	0.64-0.88	.004
Exposure groups ^c						
No pregnancy	1			1		
Pregnancy before breast cancer	1.03	0.85-1.27	.73	1.02	0.83-1.25	.84
Pregnancy-associated breast cancer	1.18	0.91-1.53	.20	1.12	0.86-1.45	.40

^a Pregnancy included abortion, live-birth, and stillbirth.

^b This analysis excluded 112 women who had pregnancy following breast cancer. Of the remaining 7,441 women, 5,832 had no pregnancy; 1,108 had pregnancy before breast cancer, and 501 had pregnancy-associated breast cancer.

^c Definitions of exposure groups: No pregnancy: no conception from 5 years prior to, until 5 years after, the index date of breast cancer diagnosis; Pregnancy before breast cancer: conception in the interval 60 months to 12 months prior to the index date of breast cancer diagnosis; Pregnancy-associated breast cancer: conception in the interval 11 months prior to, until 21 months after, the index date of breast cancer diagnosis.

^d Included for the year of diagnosis, age group, tumor size, nodal status, estrogen receptor status, progesterone receptor status, ERBB2 status, and radiation therapy.

eTable 8. Cox Proportional Hazard Model to Estimate the Hazard Ratio (HR) of All-Cause Mortality for Women who had Pregnancy; No Radiotherapy ^{a, b}

Characteristic	Age-Adjusted			Multivariable ^d		
	HR	95% CI	P Value	HR	95% CI	P Value
Age group						
40-44 years	1			1		
35-39 years	1.25	1.06-1.48	.007	1.19	1.00-1.41	.05
30-34 years	1.74	1.41-2.15	<.001	1.51	1.21-1.90	.0003
20-29 years	2.04	1.53-2.74	<.001	1.77	1.31-2.38	.0002
Tumor size (mm)						
20 mm or less	1			1		
21-50 mm	2.59	1.73-3.89	<.001	1.64	1.09-2.47	.02
>50 mm	6.77	4.46-10.3	<.001	3.33	2.18-5.10	<.001
Unknown	3.65	2.52-5.27	<.001	3.88	2.04-7.36	<.001
Nodal status						
Node-negative	1			1		
Node-positive	4.24	2.97-6.05	<.001	3.68	2.56-5.29	<.001
Unknown nodes	4.16	2.99-5.78	<.001	14.3	9.05-22.5	<.001
Estrogen Receptor status (ER)						
ER-negative	1			1		
ER-positive	0.26	0.50-0.34	<.001	0.61	0.39-0.93	.02
ER-borderline/unknown	0.54	0.44-0.65	<.001	0.06	0.01-0.47	.008
ERBB2 status						
ERBB2-negative	1			1		
ERBB2-positive	0.97	0.75-1.25	.81	0.64	0.48-0.86	.003
ERBB2-borderline/unknown	1.13	0.92-1.39	.26	0.90	0.68-1.19	.46
Chemotherapy						
No	1			1		
Yes	1.90	1.51-2.39	<.001	1.70	1.35-2.15	<.001
Exposure groups ^c						
No pregnancy	1			1		
Pregnancy before breast cancer	1.03	0.85-1.27	.73	1.01	0.83-1.24	.88
Pregnancy-associated breast cancer	1.18	0.91-1.53	.20	1.11	0.86-1.44	.42

^a Pregnancy included abortion, live-birth, and stillbirth.

^b This analysis excluded 112 women who had pregnancy following breast cancer. Of the remaining 7,441 women, 5,832 had no pregnancy; 1,108 had pregnancy before breast cancer, and 501 had pregnancy-associated breast cancer.

^c Definitions of exposure groups: No pregnancy: no conception from 5 years prior to, until 5 years after, the index date of breast cancer diagnosis; Pregnancy before breast cancer: conception in the interval 60 months to 12 months prior to the index date of breast cancer diagnosis; Pregnancy-associated breast cancer: conception in the interval 11 months prior to, until 21 months after, the index date of breast cancer diagnosis.

^d Included for the year of diagnosis, age group, tumor size, nodal status, estrogen receptor status, progesterone receptor status, ERBB2 status, and chemotherapy.

eTable 9. Cox Proportional Hazard Model to Estimate the Hazard Ratio (HR) of All-Cause Mortality for Women who had Pregnancy; No Chemotherapy; No Radiotherapy ^{a, b}

Characteristic	Age-Adjusted			Multivariable ^d		
	HR	95% CI	P Value	HR	95% CI	P Value
Age group						
40-44 years	1			1		
35-39 years	1.25	1.06-1.48	.007	1.21	1.02-1.44	.02
30-34 years	1.74	1.41-2.15	<.001	1.56	1.24-1.95	.0001
20-29 years	2.04	1.53-2.74	<.001	1.78	1.32-2.41	.0002
Tumor size (mm)						
20 mm or less	1			1		
21-50 mm	2.59	1.73-3.89	<.001	1.74	1.15-2.63	.008
>50 mm	6.77	4.46-10.3	<.001	3.58	2.34-5.49	<.001
Unknown	3.65	2.52-5.27	<.001	4.35	2.33-8.11	<.001
Nodal status						
Node-negative	1			1		
Node-positive	4.24	2.97-6.05	<.001	3.82	2.66-5.49	<.001
Unknown nodes	4.16	2.99-5.78	<.001	13.3	8.43-21.0	<.001
Estrogen Receptor status (ER)						
ER-negative	1			1		
ER-positive	0.26	0.50-0.34	<.001	0.59	0.39-0.91	.02
ER-borderline/unknown	0.54	0.44-0.65	<.001	0.08	0.01-0.63	.02
ERBB2 status						
ERBB2-negative	1			1		
ERBB2-positive	0.97	0.75-1.25	.81	0.67	0.50-0.90	.007
ERBB2-borderline/unknown	1.13	0.92-1.39	.26	0.88	0.66-1.16	.36
Exposure groups ^c						
No pregnancy	1			1		
Pregnancy before breast cancer	1.03	0.85-1.27	.73	1.02	0.83-1.25	.83
Pregnancy-associated breast cancer	1.18	0.91-1.53	.20	1.12	0.86-1.45	.40

^a Pregnancy included abortion, live-birth, and stillbirth.

^b This analysis excluded 112 women who had pregnancy following breast cancer. Of the remaining 7,441 women, 5,832 had no pregnancy; 1,108 had pregnancy before breast cancer, and 501 had pregnancy-associated breast cancer.

^c Definitions of exposure groups: No pregnancy: no conception from 5 years prior to, until 5 years after, the index date of breast cancer diagnosis; Pregnancy before breast cancer: conception in the interval 60 months to 12 months prior to the index date of breast cancer diagnosis; Pregnancy-associated breast cancer: conception in the interval 11 months prior to, until 21 months after, the index date of breast cancer diagnosis.

^d Included for the year of diagnosis, age group, tumor size, nodal status, estrogen receptor status, progesterone receptor status, and ERBB2 status.

eTable 10. Cox Proportional Hazard Model to Estimate the Hazard Ratio (HR) of All-Cause Mortality for Women who had an Abortion ^{a, b}

Characteristic	Age-Adjusted			Multivariable ^c		
	HR	95% CI	P Value	HR	95% CI	P Value
Age group						
40-44 years	1			1		
35-39 years	1.34	1.12-1.60	.001	1.29	1.08-1.55	.006
30-34 years	1.59	1.23-2.06	.0004	1.54	1.18-2.01	.001
20-29 years	1.86	1.32-2.62	.0004	1.60	1.13-2.26	.008
Tumor size (mm)						
20 mm or less	1			1		
21-50 mm	3.53	2.18-5.71	<.001	2.13	1.31-3.47	.002
>50 mm	9.03	4.48-14.9	<.001	4.34	2.61-7.23	<.001
Unknown size	4.43	2.83-6.94	<.001	4.98	2.35-10.5	<.001
Nodal status						
Node-negative	1			1		
Node-positive	4.30	2.95-6.29	<.001	3.95	2.68-5.81	<.001
Unknown nodes	3.82	2.69-5.42	<.001	12.1	7.24-20.3	<.001
ER status						
ER-negative	1			1		
ER-positive	0.25	0.19-0.33	<.001	0.59	0.37-0.94	.03
ER-borderline/unknown	0.48	0.39-0.60	<.001	0.02	0.002-0.13	.0001
ERBB2 status						
ERBB2-negative	1			1		
ERBB2-positive	0.89	0.67-1.18	.43	0.51	0.37-0.71	<.001
ERBB2-borderline/unknown	1.03	0.82-1.29	.79	0.73	0.53-0.99	.04
Chemotherapy						
No	1			1		
Yes	1.95	1.53-2.50	<.001	1.91	1.48-2.46	<.001
Radiation therapy						
No	1			1		
Yes	0.76	0.64-0.90	.001	0.64	0.54-0.77	<.001
Exposure groups ^d						
No pregnancy	1			1		
Pregnancy before breast cancer	1.08	0.80-1.46	.65	1.13	0.83-1.53	.43
Pregnancy-associated breast cancer	0.79	0.50-1.23	.30	0.90	0.57-1.41	0.63

^a This analysis excluded 1,051 women who only had live-birth. Of the remaining 6,502 women, 5,832 had no pregnancy; 403 had pregnancy before breast cancer; 210 had pregnancy-associated breast cancer, and 57 had pregnancy following breast cancer. After further excluding women with pregnancy following breast cancer (n=57), a total of 6,445 women qualified for this analysis.

^b Definitions of exposure groups: No pregnancy: no conception from 5 years prior to, until 5 years after, the index date of breast cancer diagnosis; Pregnancy before breast cancer: conception in the interval 60 months to 12 months prior to the index date of breast cancer diagnosis; Pregnancy-associated breast cancer: conception in the interval 11 months prior to, until 21 months after, the index date of breast cancer diagnosis.

^c Included for the year of diagnosis, age group, tumor size, nodal status, estrogen receptor status, progesterone receptor status, ERBB2 status, chemotherapy, and radiation therapy.

eTable 11. Time-Dependent Adjusted Hazard Ratio of All-Cause Mortality for Women who had a Live Birth or Stillbirth^{a, b, c}

Time from breast cancer diagnosis (years)	Number of women who are alive	Number of women who died	Univariate (Adjusted for age only)		Multivariate ^b	
	n (%)		HR (95%CI)	P Value	HR (95%CI)	P Value
All women	6,244 (87.0)	933 (13.0)				
No pregnancy	5,104 (87.5)	728 (12.5)	1		1	
Pregnancy						
-5 to -4 years	392 (86.5)	61 (13.5)	1.11 (0.85-1.46)	.43	1.13 (0.87-1.48)	.36
-4 to -3 years	184 (85.6)	31 (14.4)	1.17 (0.89-1.55)	.27	1.22 (0.92-1.61)	.16
-3 to -2 years	199 (83.3)	40 (16.7)	1.23 (0.92-1.64)	.16	1.12 (0.84-1.50)	.43
-2 to -1 years	137 (72.1)	53 (27.9)	1.70 (1.27-2.27)	.0004	1.48 (1.11-1.98)	.007
-1 to 0.5 years	65 (82.3)	14 (17.7)	1.01 (0.60-1.69)	.98	1.10 (0.65-1.85)	.72
0.5 to 5 years	190 (97.0)	6 (3.0)	0.22 (0.10-0.49)	.0003	0.25 (0.11-0.55)	.0008

^a This analysis included 7,177 women who had live-birth or stillbirth and excluded 376 women who only had abortion.

^b The immortal time is a period during which, by design, the death cannot occur. Not addressing the immortal time in survival analysis can lead to an overestimation of survival. In our study, the immortal time was the time from breast cancer diagnosis to the date of conception in women with pregnancy following breast cancer. We performed time-dependent hazard models in which the follow-up was started from the date of conception, rather than the date of breast cancer diagnosis.

^c Included for the year of diagnosis, age group, tumor size, nodal status, estrogen receptor status, progesterone receptor status, ERBB2 status, chemotherapy, and radiation therapy.

eTable 12. Cox Proportional Hazard Model to Estimate the Hazard Ratio (HR) of All-Cause Mortality Among Women with Pregnancy-Associated Breast Cancer Who Had a Live Birth or Stillbirth ^{a, b}

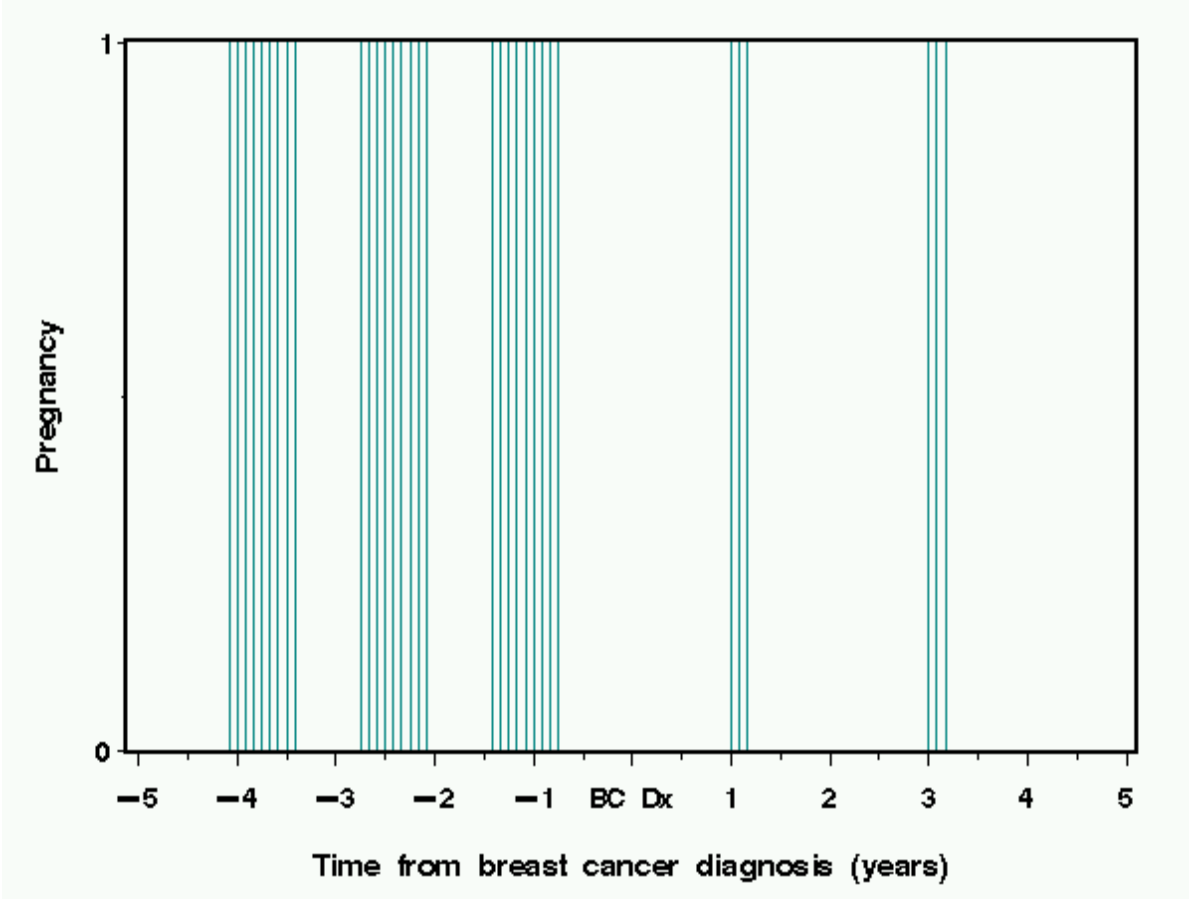
Characteristic	Age-Adjusted Hazard Ratio			Multivariable ^c Hazard Ratio		
	HR	95% CI	P Value	HR	95% CI	P Value
Age group						
40-44 years	1			1	1	
35-39 years	0.70	0.24-2.02	.51	0.75	0.24-2.30	.61
30-34 years	1.75	0.67-4.54	.25	1.71	0.61-4.83	.31
20-29 years	1.93	0.69-5.41	.21	2.06	0.68-6.28	.20
Tumor size (mm)						
20 mm or less	1			1		
21-50 mm	1.75	0.35-8.70	.49	1.50	0.24-9.35	.67
>50 mm	4.49	0.87-23.2	.07	2.99	0.45-20.0	.26
Unknown size	4.34	1.05-17.9	.04	7.22	0.54-96.7	.13
Nodal status						
Node-negative	1			1		
Node-positive	8.31	1.04-66.5	.05	5.51	0.64-47.4	.12
Unknown nodes	14.5	2.00-105.2	.008	64.3	6.53-633.0	.0004
ER status						
ER-negative	1			1	1	
ER-positive	0.40	0.13-1.22	.11	0.37	0.04-3.37	.38
ER-borderline/unknown	1.27	0.62-2.62	.52	0.02	0.01-0.25	.003
ERBB2 status						
ERBB2-negative	1			1		
ERBB2-positive	1.49	0.50-4.44	.48	1.85	0.39-8.64	.44
ERBB2-borderline/unknown	2.25	0.89-5.72	.09	2.99	0.66-13.4	.15
Chemotherapy						
No	1			1	1	
Yes	1.58	0.67-3.70	.30	1.74	0.62-4.83	.29
Radiation therapy						
No	1			1	1	
Yes	1.53	0.81-2.89	.19	1.35	0.65-2.83	.42

^a This analysis excluded 376 women who only had abortion. Of the remaining 7,177 women, 5,832 had no pregnancy; 938 had pregnancy-associated breast cancer; 320 had pregnancy before breast cancer, and 87 had pregnancy following breast cancer. The final analysis included 320 women with pregnancy-associated breast cancer.

^b Pregnancy-associated breast cancer: conception in the interval 11 months prior to, until 21 months after, the index date of breast cancer diagnosis.

^c Included for the year of diagnosis, age group, tumor size, nodal status, estrogen receptor status, progesterone receptor status, ERBB2 status, chemotherapy, and radiation therapy.

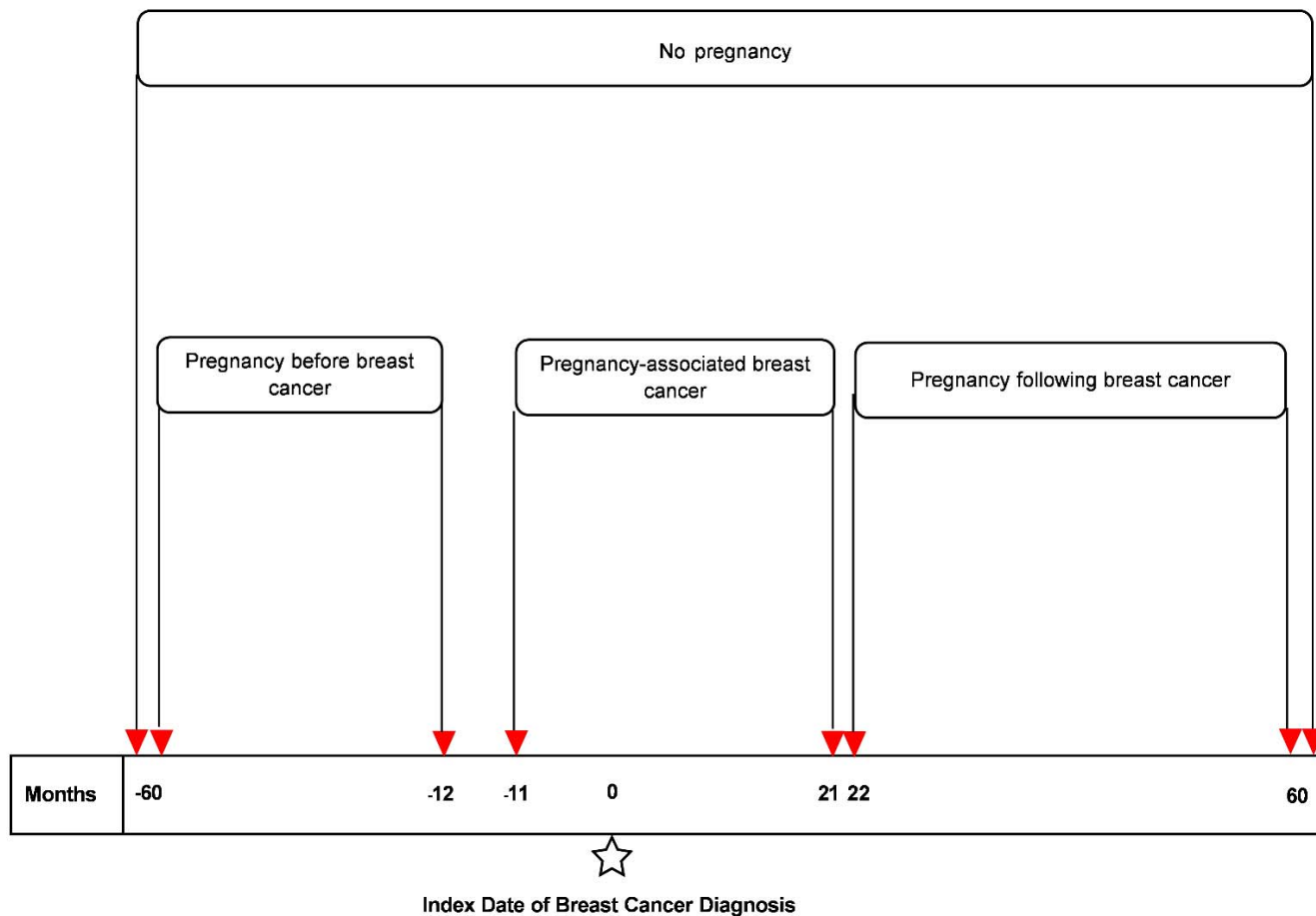
eFigure 1. History of Pregnancy in a Hypothetical Patient ^a



Abbreviations: BC Dx, breast cancer diagnosis.

^a Each bar represents one month of pregnancy. Three bars represent an abortion, and nine bars represent a live-birth or a stillbirth.

eFigure 2. Exposure Groups



Definitions of exposure groups:

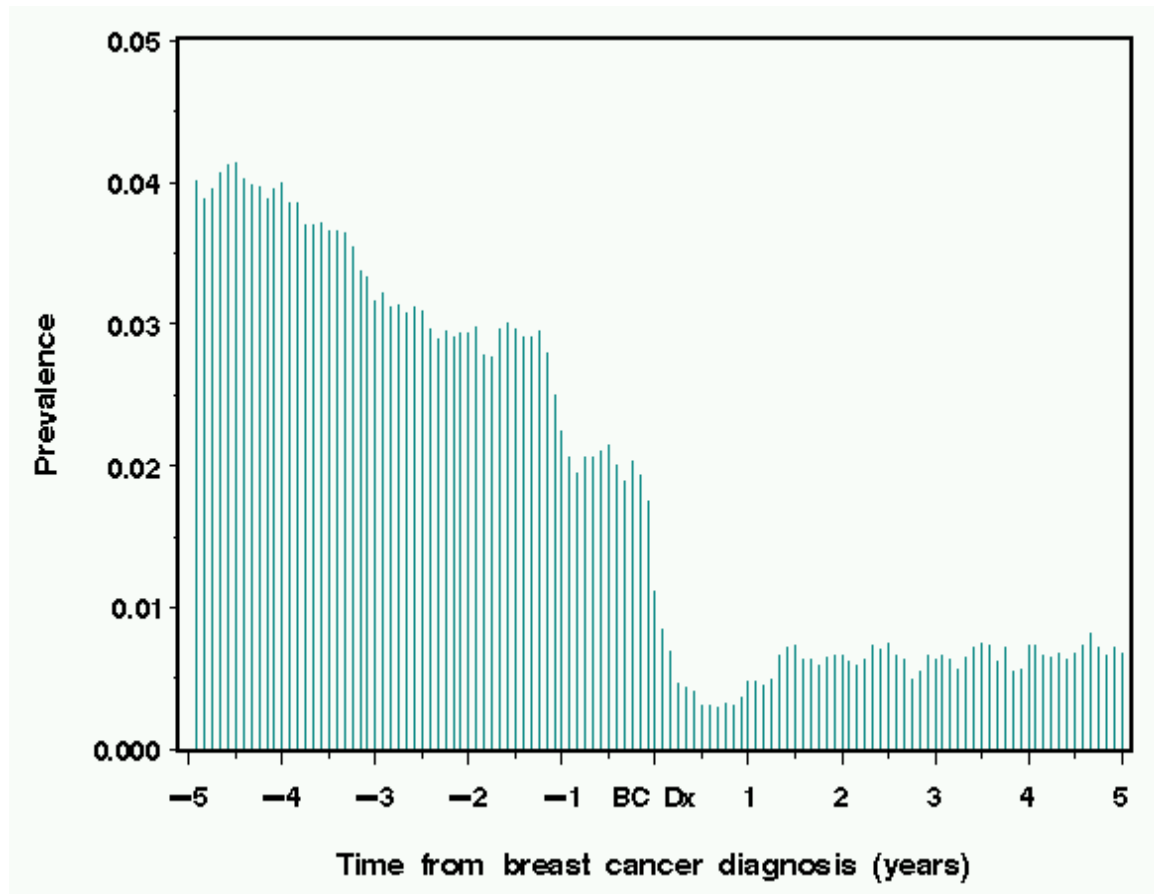
No pregnancy: no conception from 5 years prior to, until 5 years after, the index date of breast cancer diagnosis;

Pregnancy before breast cancer: conception in the interval 60 months to 12 months prior to the index date of breast cancer diagnosis;

Pregnancy-associated breast cancer: conception in the interval 11 months prior to, until 21 months after, the index date of breast cancer diagnosis;

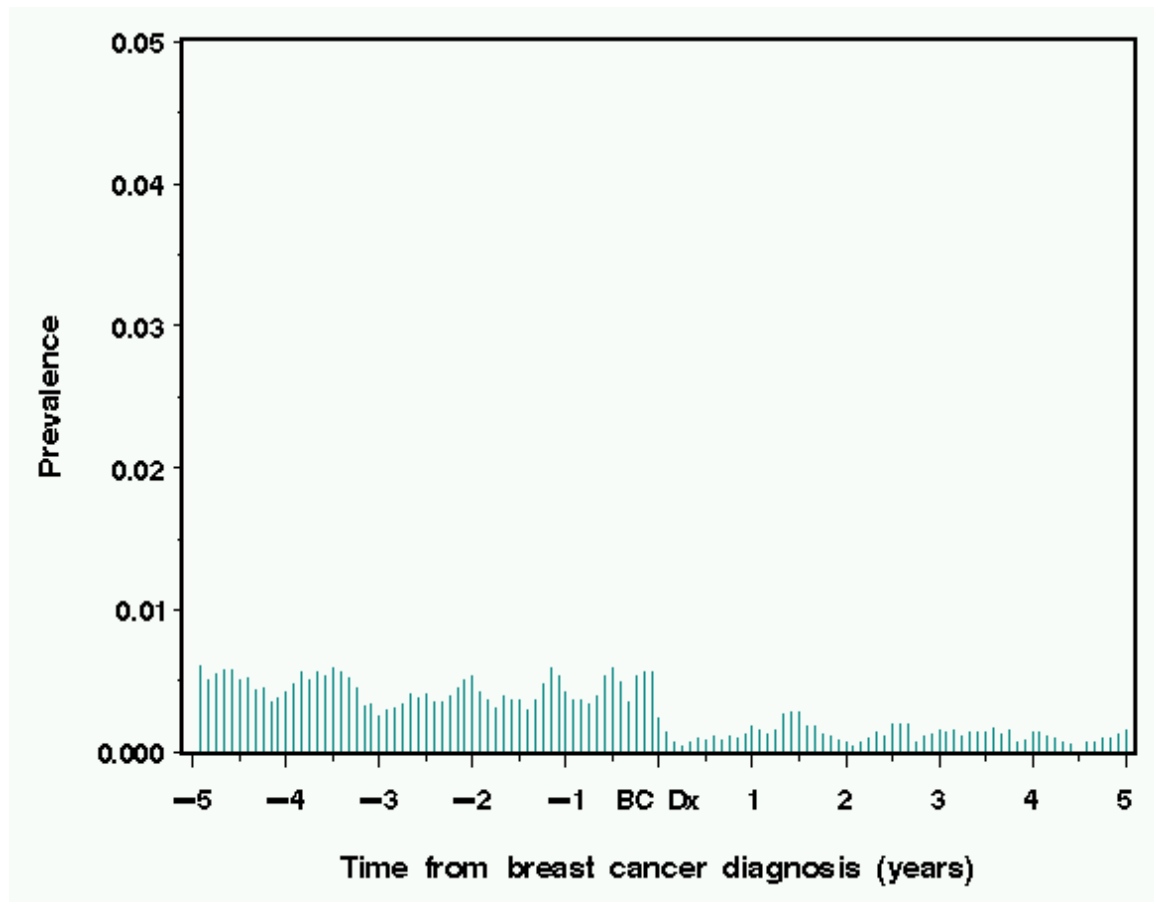
Pregnancy following breast cancer: conception in the interval 22 months to 60 months after the index date of breast cancer diagnosis.

eFigure 3. Prevalence of Pregnancy in 7,553 Women by the Time From Breast Cancer Diagnosis



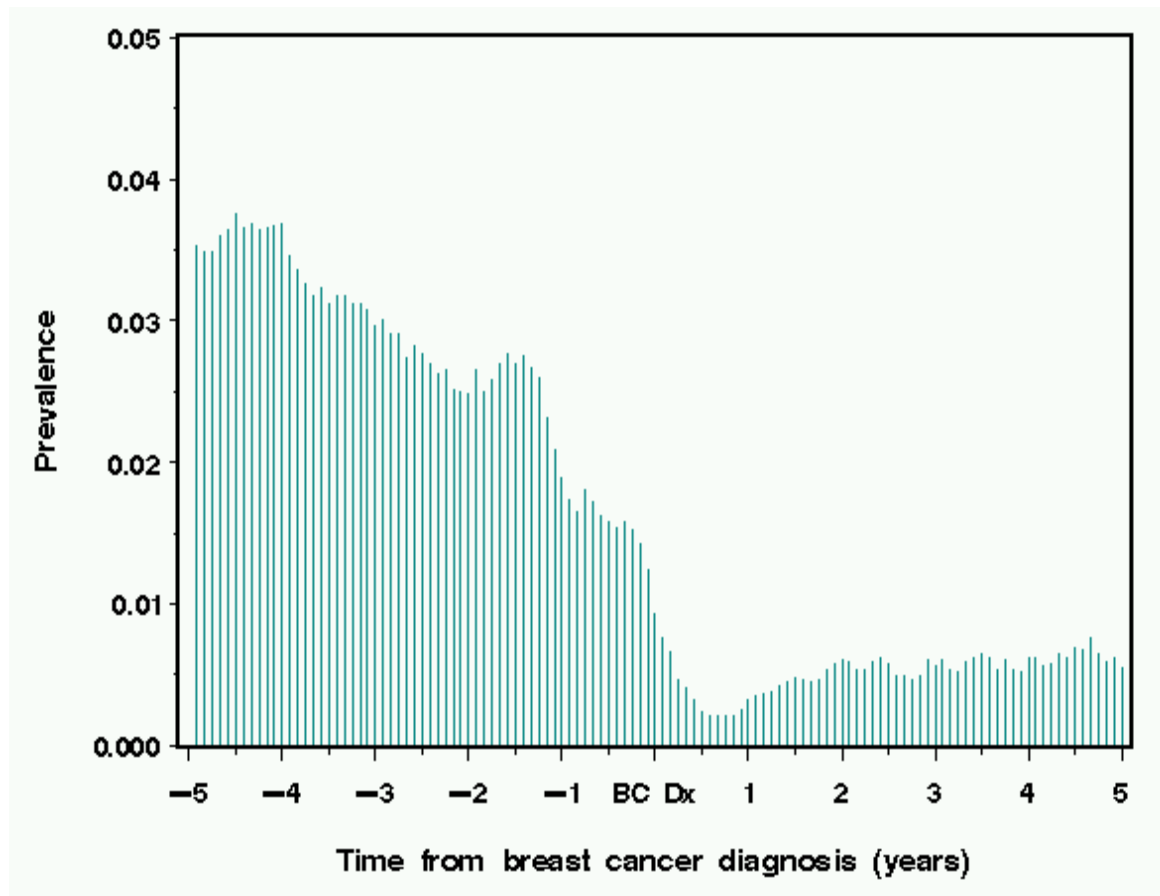
Abbreviations: BC Dx represents 'Breast Cancer Diagnosis.'

eFigure 4. Prevalence of Abortion in 7,553 Women by the Time From Breast Cancer Diagnosis



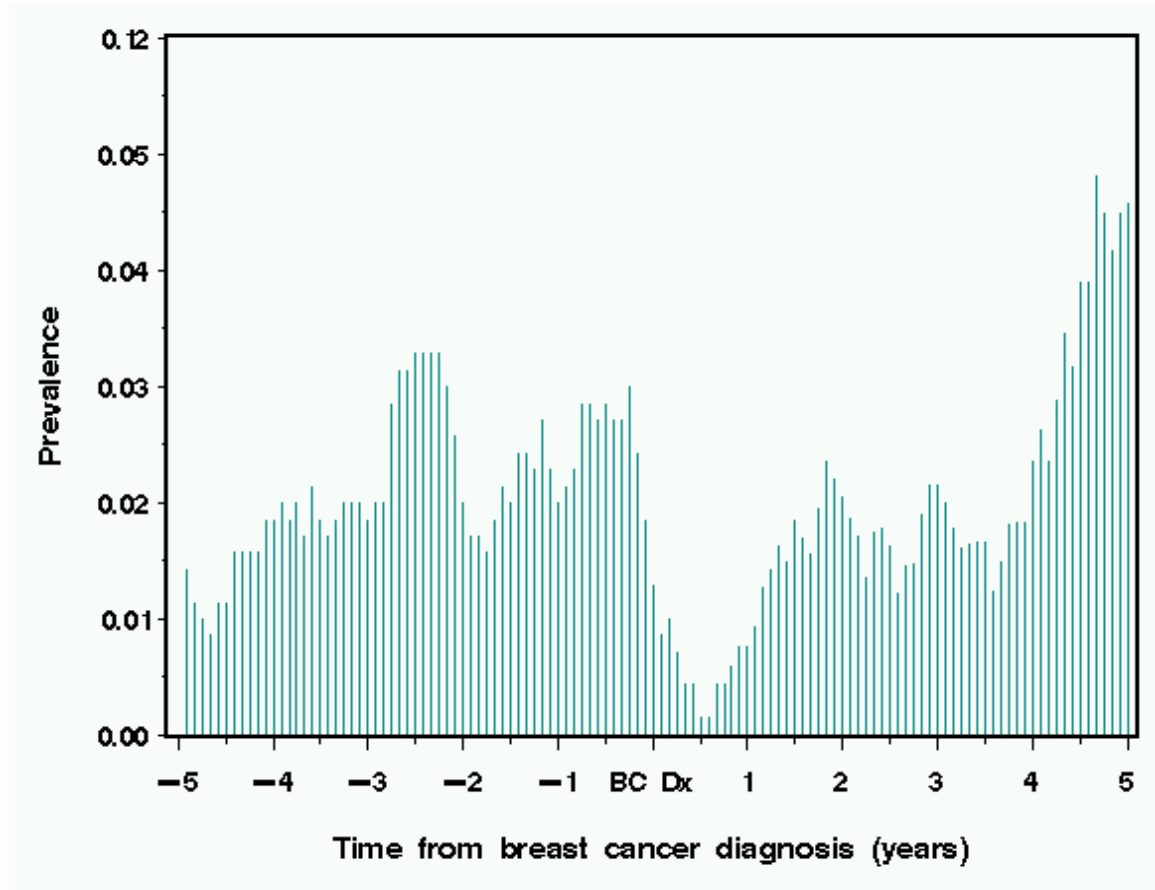
Abbreviations: BC Dx represents 'Breast Cancer Diagnosis.'

eFigure 5. Prevalence of Live Birth in 7,553 Women by the Time From Breast Cancer Diagnosis



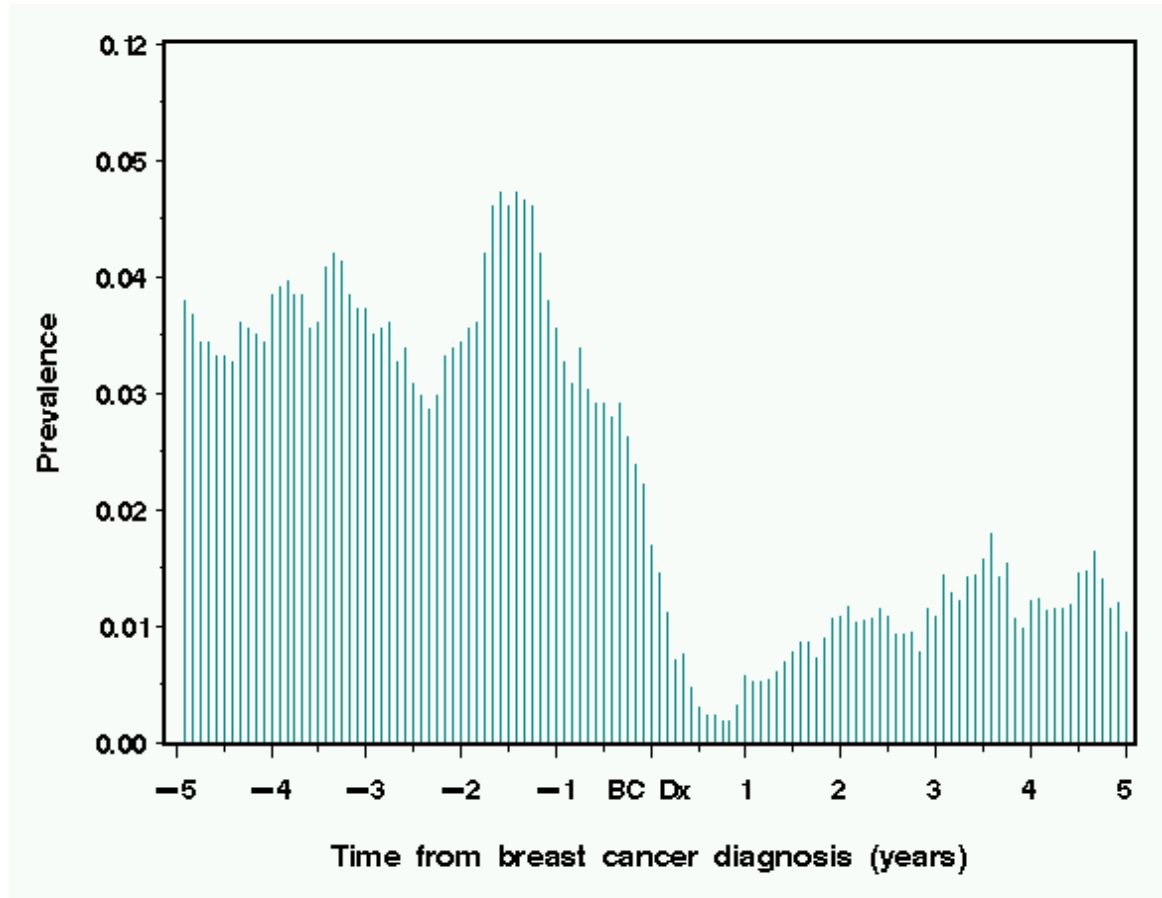
Abbreviations: BC Dx represents 'Breast Cancer Diagnosis.'

eFigure 6. Prevalence of Live Birth in 351 Women Age 20-29 Years by the Time From Breast Cancer Diagnosis



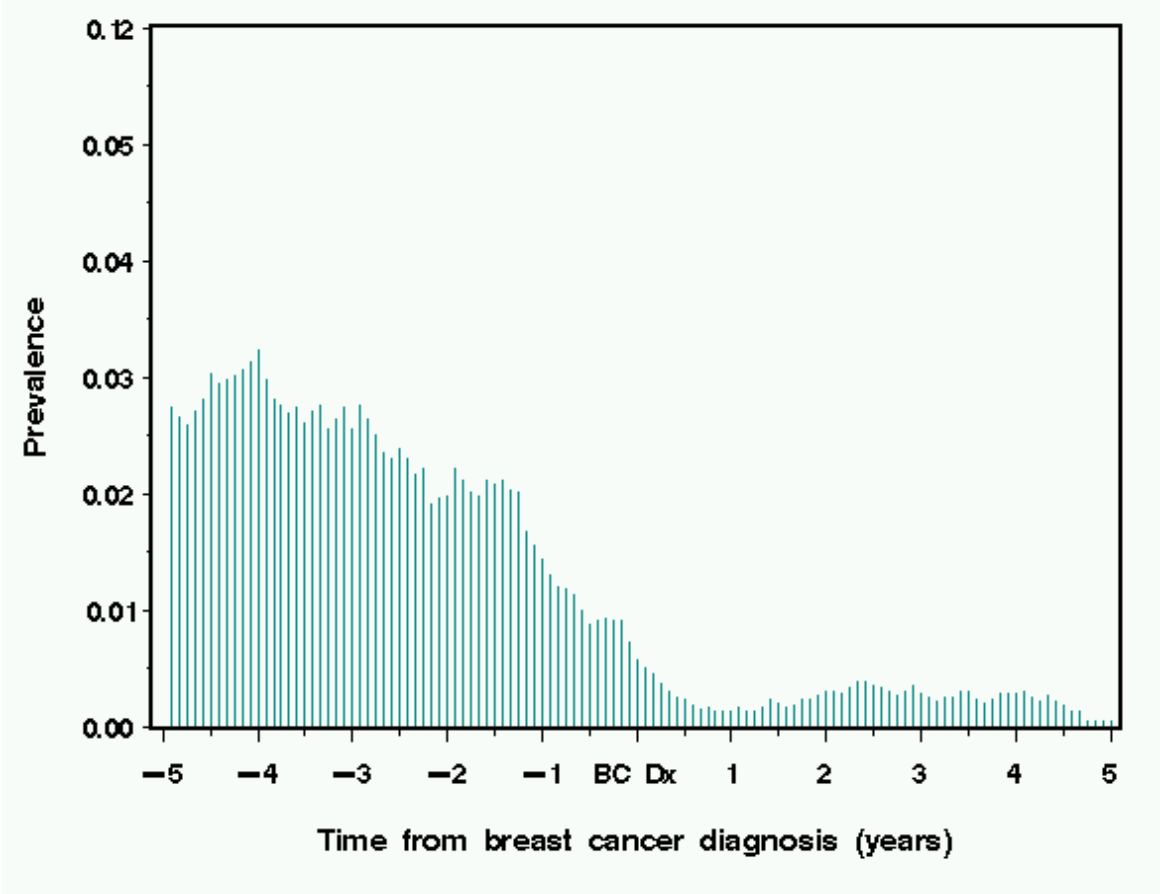
Abbreviations: BC Dx represents 'Breast Cancer Diagnosis.'

eFigure 7. Prevalence of Live Birth in 858 Women Age 30-34 Years by the Time From Breast Cancer Diagnosis



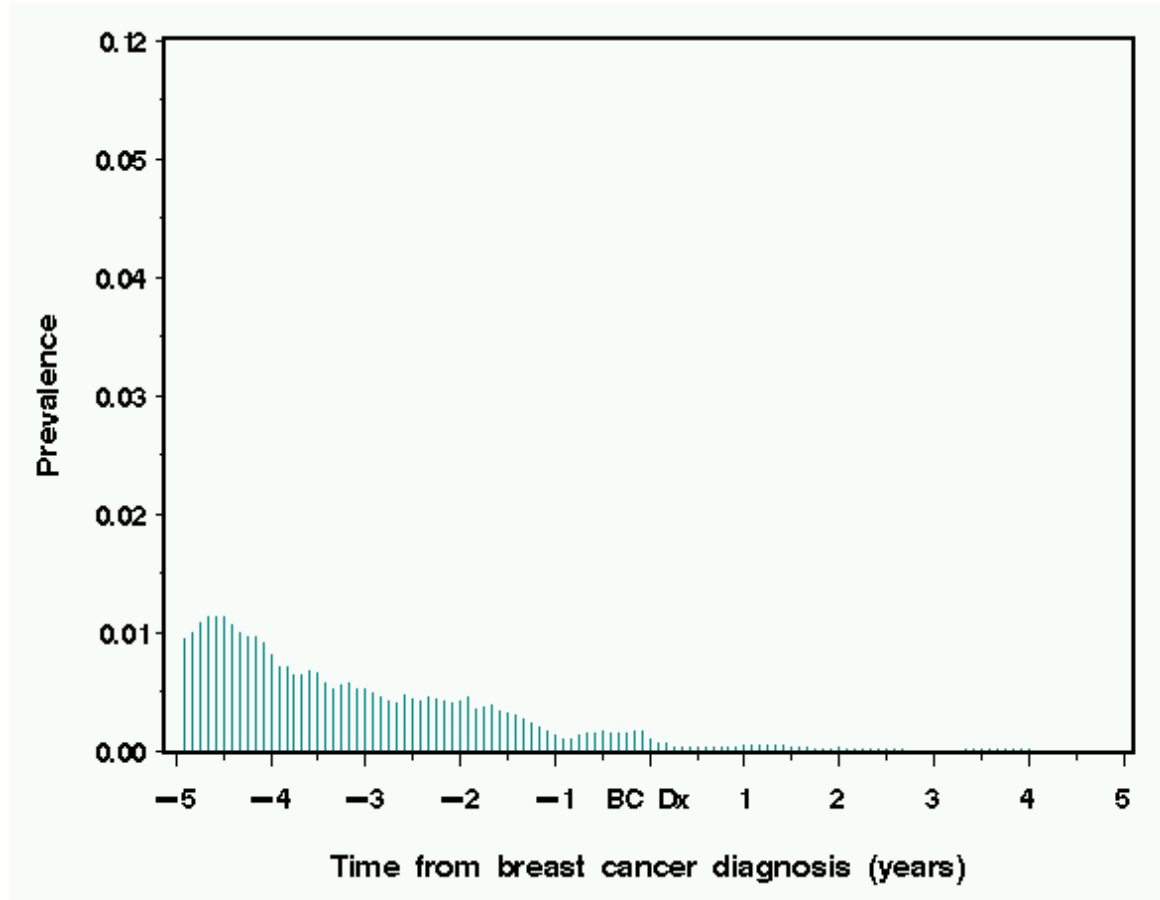
Abbreviations: BC Dx represents 'Breast Cancer Diagnosis.'

eFigure 8. Prevalence of Live Birth in 1,992 Women Age 35-39 Years by the Time From Breast Cancer Diagnosis



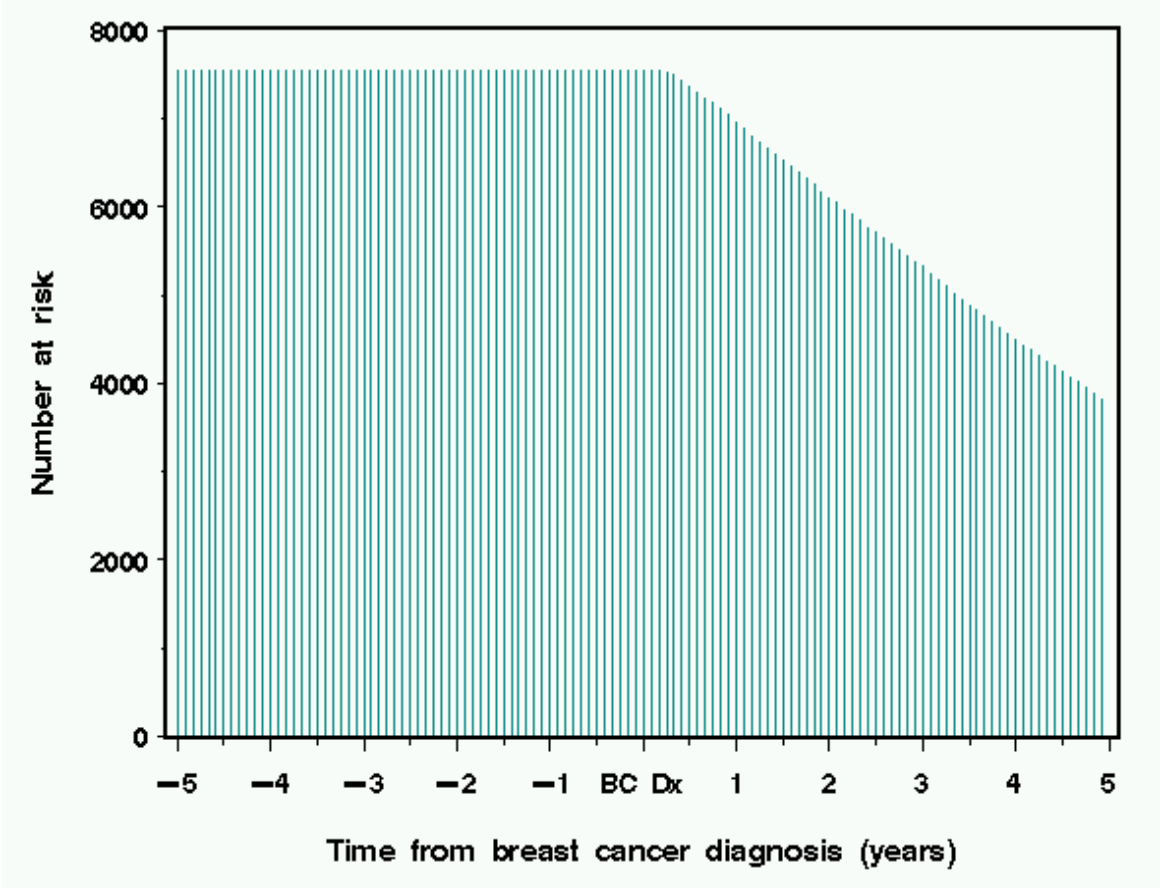
Abbreviations: BC Dx represents 'Breast Cancer Diagnosis.'

eFigure 9. Prevalence of Live Birth in 4,352 Women Age 40-44 Years by the Time From Breast Cancer Diagnosis



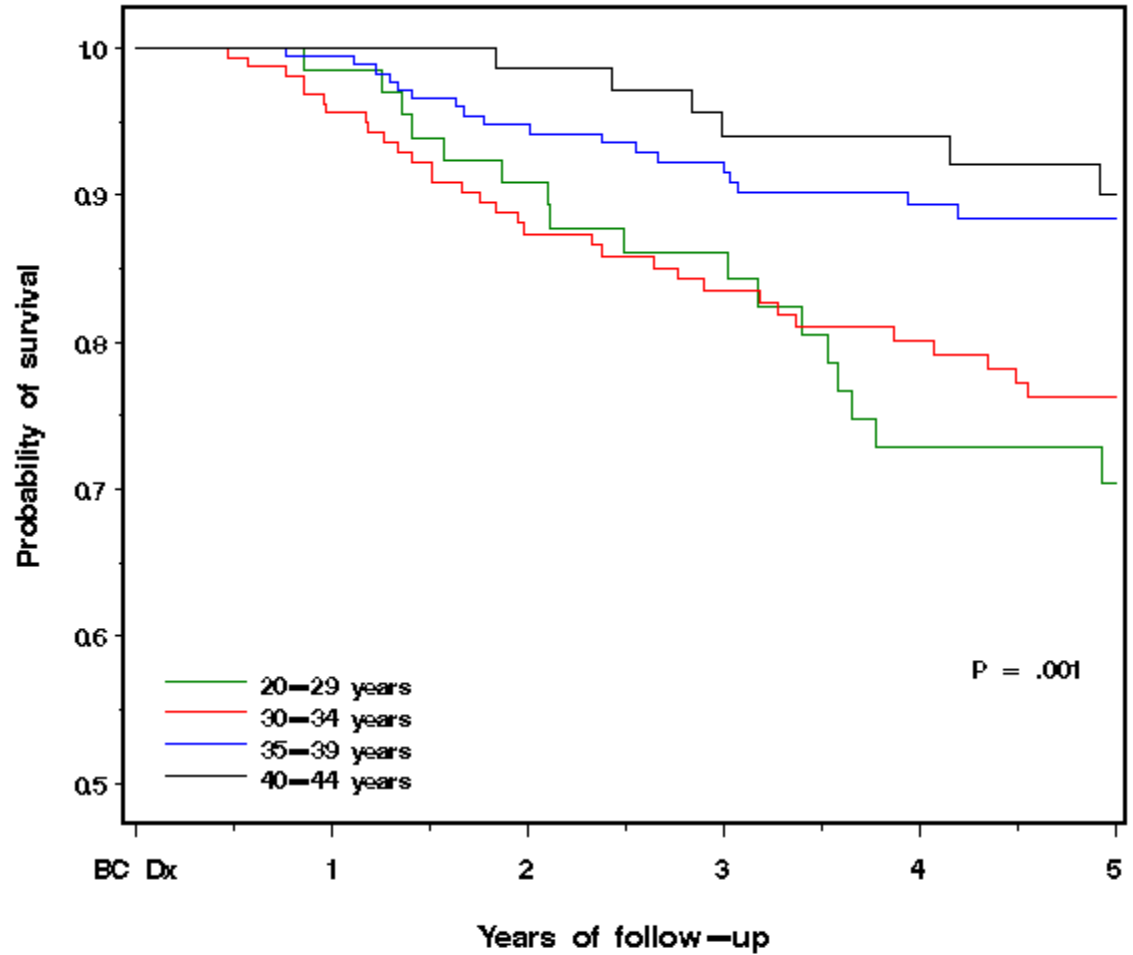
Abbreviations: BC Dx represents 'Breast Cancer Diagnosis.'

eFigure 10. Number of Women at Risk of Death From All Causes in 7,553 Patients by the Time From Breast Cancer Diagnosis



Abbreviations: BC Dx represents 'Breast Cancer Diagnosis.'

eFigure 11. 5-year Overall Survival in Women with Pregnancy-Associated Breast Cancer According to Age Groups at Diagnosis; Unadjusted ^a



Numbers at risk

	BC Dx	1	2	3	4	5
Age 20-29 years	66	65	59	47	34	29
Age 30-34 years	168	148	118	103	90	71
Age 35-39 years	184	176	157	133	111	89
Age 40-44 years	83	78	70	59	53	42

Abbreviations: BC Dx represents 'Breast Cancer Diagnosis.'

^a Definition of pregnancy-associated breast cancer: conception in the interval 11 months prior to, until 21 months after, the index date of breast cancer diagnosis.