2010 Breast Cancer Incidence per Year per Age Group with Respect to OC Usage

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Population Data Source: http://www.census.gov/prod/cen2010/briefs/c2010br-03.pdf

Pill Usage Data Source: http://www.cdc.gov/nchs/data/series/sr_23/sr23_029.pdf

Women

Age	Population in 2010	in ~2007*	# using pill in ~2007	Percent	2010 Usage**
15 - 19	10,736,677	10,431,000	1,591,081	15.25%	1,637,707
20 - 24	10,571,823	10,140,000	2,663,040	26.26%	2,776,448
25 - 29	10,466,258	10,250,000	2,310,633	22.54%	2,359,384
30 - 34	9,965,599	9,587,000	1,670,776	17.43%	1,736,756
35 - 39	10,137,620	10,475,000	1,516,787	14.48%	1,467,934
40 - 44	10,496,987	10,982,000	948,717	8.64%	906,818
					0
	Total 62,374,964.00	61,865,000	10,701,034	17.30%	10,789,244

Birth rates have been declining since 1960. Today they're about half of what they were then.
(see http://money.cnn.com/2013/09/06/news/economy/birth-rate-low/index.html).

* Interviews for contraceptive usage data took place from 2006 to 2008, through 2007.

** Since no data is available for contraceptive usage for 2010, the percent usage from ~2007 is applied to population data from 2010.

Adding all women between the ages of 15 and 44 gives a total of 10,701,034

The incidence of breast cancer for women between 25 and 39 years of ages in **1973** was 1.53 per 100,000. In **2009** it was 2.9 per 100,000, a 2% increase. Source:
http://www.foxnews.com/health/2013/02/27/late-stage-breast-cancer-on-rise-in-younger-women/

Assuming a normal rate of breast cancer development of 1.5 women per 100,000 per year for women ages 15 to 44:

10,701,034 / 100,000 = **107**; **107** x 1.5 =

161 women develop cancer every year normally.

Now lets consider the increased risk caused by oral contraceptives. First, since our study from the the Netherlands (see Ref #1 below) indicated that before the age of 36, the Relative Risk (RR) for developing breast cancer is **2.1** for four or more years of estrogen-progestin contraceptive use, when compared with shorter use, we have to look at only those women younger than 36.

Adding the total number of women using contraceptives in 2010, who are between 15 and 34:

	1,637,707
	2,776,448
	2,359,384
	1,736,756
Total =	8,510,296

Roughly 8,510,296 women between 15 and 34 were using contraceptives in 2010.

For our comparison we're only going to look at women taking oral contraceptives containing

estrogen-progestin combos, as opposed to other dose forms containg both hormones, e.g. patches.

Assuming a normal probability of developing breast cancer of 1.5 per 100,000 per year, in women age 15 to 34, with Relative Risk defined as:

RR = ("P"of event when exposed / "P" of event when not exposed)

where "P" = Probability.

Knowing our Relative Risk is **2.1**, we can generate the following equation:

2.1 = (Y / 1.5); Y = 3.15 **Y = 3.15**

Y = Probability of event when exposed or incidence.

Thus, we have 3.15 women per 100,000 developing breast cancer as a result of using OCs for 4 or more years.

To apply this to our population data from above:

8,510,296 / 100,000 = 85

85 x **3.15** = 258 **Thus, 268 of these women would develop breast cancer each year if taking OCs regularly for at least four years prior.**

85 x **1.5** = 123 **128 of these women would develop breast cancer if none were taking Ocs, a difference of 140.**

For a more detailed assessment:
If we assume that those just about to turn 35 years old started using oral contraception on their 15th birthday and used it continuously, we can approximate the increased incidence of breast cancer due to starting at a younger age. To do this, we'll first assume that there's an equal distribution between each age group for an average of 327,541 in each group, e.g. 327,541 15 year olds, 327,541 16 years old, etc.

1,637,707 divided by 5 = 327,541

These women would have a cumulative increased Relative Risk of 1.44 for developing breast cancer for each year of use prior to the age of 20, according to the study conducted in the netherlands, due to starting at a young age. Since the normal rate, probability or incidence is 1.5 per 100,000, we'll multiply that by the increased risk due to using OCs prior to the age of 20 (1.44), and then after four years of use, by the relative risk of **2.1**.

From 15 to 16 years old:	= 1.44 * **1.5**	=	**2.16** Increased Relative Risk

Y = Probability when exposed: **2.16** = (Y / 1.5); Y = 2.16 * 1.5; **Y = 3.24**

Thus, 3 in 100,000 of these women taking Ocs will develop breast cancer compared to 1.5 in 100,000 not taking OCS.

From 15 to 17 years old:	= 1.44 * 2.16	=	3.110	Increased Relative Risk

Y = Probability when exposed: 4.355 = (Y / 1.5); Y = 4.355 * 1.5; Y = 6.532

7 in 100,000 will develop breast cancer

From 17 to 18 years old:	= 1.44 * 3.11	=	4.479	Increased Relative Risk

Y = Probability when exposed: 6.271 = (Y / 1.5); Y = 6.271 * 1.5; Y = 9.407

9 in 100,000 develop breast cancer

From 18 to 19 years old:	= 1.44 * 4.48	=	6.450	Increased Relative Risk

Y = Probability when exposed: 9.030 = (Y / 1.5); Y = 9.030 * 1.5; Y = 13.545

14 in 100,000 develop breast cancer

From 19 to 20 years old:	= 1.44 * 2.1 * 6.45 =	27.30672	Increased Relative Risk

Y = Probability when exposed: 27.307 = (Y / 1.5); Y = 27.307 * 1.5; Y = 40.96

41 in 100,000 develop breast cancer

*Note that this year includes the RR of **2.1** since there were four years of previous use.

Comparing use vs. non-use at ages 15 - 34:

	Using Oral Contraceptives			Not using Oral Contraceptives	
# people	Age	Y value*	incidence cancer	Age	normal incidence cancer
327,541	15	3.24	11	15	5
	(327,541 / 100,000) * 3.24 =		11	(327,541 / 100,000) * 1.5 =	5
327,541	16	6.532	21	16	5
327,541	17	9.407	31	17	5
327,541	18	13.545	44	18	5
327,541	19	40.96	134	19	5
555,290	20	3.15	17	20	8
555,290	21	3.15	17	21	8
555,290	22	3.15	17	22	8
555,290	23	3.15	17	23	8
555,290	24	3.15	17	24	8
471,876	25	3.15	15	25	7
471,876	26	3.15	15	26	7
471,876	27	3.15	15	27	7
471,876	28	3.15	15	28	7
471,876	29	3.15	15	29	7
347,351	30	3.15	11	30	5
347,351	31	3.15	11	31	5

347,351	32	**3.15**	11	32	5
347,351	33	**3.15**	11	33	5
347,351	34	**3.15**	11	34	5
New cases of breast cancer every year			**458**		**128**
Estimated new cases every five years			2,289		638

*** The Y value for RR equation is the probability of cancer per 100,000 people using contraceptives.**

We should find evidence that corroborates the data. And, we do…
...researchers found that since 1976, there has been a small but steady increase in cases of breast cancer that has spread to other organs (metastasized) at the time of diagnosis in women ages 25 to 39.
According to lead researcher Rebecca H. Johnson, MD, there were about 250 cases of metastatic breast cancer among that age group in 1976, and about 800 cases a year in 2008-2009. The analysis focused on the numbers, but did not investigate the cause of the increase.
Source: http://www.cancer.org/cancer/news/study-more-young-women-being-diagnosed-with-advanced-breast-cancer

Digging deeper, if the number of women between the ages of 15 and 44 who used oral contraceptives in 2010 was: 10,789,244 , and the typical use failure rate for oral contraceptives is **9%,** around **971,032** women would have become unintendedly pregnant in 2010. We should find evidence that corroborates our estimate:
There were 765,651 medical and surgical abortions reported to the CDC from 49 reporting areas in 2010 (Source: http://www.cdc.gov/mmwr/preview/mmwrhtml/ss6208a1.htm)

References:
1. Rookus MA, van Leeuwen FE. Oral contraceptives and risk of breast cancer in women aged 20-54 years. Netherlands Oral Contraceptives and Breast Cancer Study Group. Lancet 1994;344:844 – 51.

Additional information:
1. Press Release No. 167, "IARC Monographs Programme Finds Combined Estrogen-Progestogen Contraceptives (the "pill") and Menopausal Therapy Are Carcinogenic to Humans," World Health Organization International Agency for Research on Cancer, July 29, 2005. < http://www.iarc.fr/en/media-centre/pr/2005/pr167.html >.