**INDOOR AIR QUALITY ASSESSMENT**

**Massachusetts Department of Children and Families**

**185 Church Street**

**Village of Whitinsville**

**Northbridge Massachusetts**



Prepared by:

Massachusetts Department of Public Health

Bureau of Environmental Health

Indoor Air Quality Program

March 2018

# Background

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| --- | --- |
| Building: | Department of Children and Families (DCF) |
| Address: | 185 Church Street, Whitinsville, MA. |
| Assessment Requested by: | Filomena Cunha, Senior Leasing Manager, Executive Office of Health and Human Services (EOHHS) |
| Reason for Request: | Chronic disease/cancer concerns and general indoor air quality (IAQ) concerns, including eye irritation, and leaks/possible mold. |
| Dates of Assessment: | September 22, 2017November 9, 2017November 22, 2017 |
| Massachusetts Department of Public Health/Bureau of Environmental Health (MDPH/BEH) Staff Conducting Assessment: | IAQ Program staff:* Mike Feeney, Director

Community Assessment Program (CAP) staff:* Brenda Netreba, Environmental Analyst
* Erin Collins, Epidemiologist
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| Building Description: | The DCF occupies space in a 50-year-old, one-story building that formerly served as a supermarket. The DCF has occupied the space for approximately 30 years. The building has a red-brick exterior and an asphalt-shingled peaked roof. The DCF space reportedly underwent interior renovations approximately two years ago. |
| Windows: | Windows are openable in limited areas of the building. |

# Background

The Whitinsville DCF Office has been visited previously by the IAQ program. These reports can be found on the Massachusetts Department of Public Health website. Reports for several of these visits can be viewed at:

<http://www.mass.gov/eohhs/gov/departments/dph/programs/environmental-health/exposure-topics/iaq/iaq-rpts/>.

In an effort to characterize current conditions within the building, the IAQ staff visited on three occasions. An initial visit was conducted on September 22, 2017. Based on information gathered during that visit, the IAQ Program and the CAP visited on November 9, 2017 to conduct further IAQ air sampling as well as to conduct interviews with concerned individuals. The IAQ program returned to the building on November 22, 2017 to conduct moisture sampling in gypsum wallboard along brick walls as well as to conduct a survey of lighting in occupied areas.

# Methods

Please refer to the IAQ Manual for methods, sampling procedures, and interpretation of results (MDPH, 2015). Light intensity was measured with an Extech Instruments Foot Candle/Lux Meter.

# IAQ Testing Results

The following is a summary of indoor air testing results for the **September 22, 2017** assessment, which was during the cooling season (Table 1).

* ***Carbon dioxide levels*** were below 800 parts per million (ppm) in most areas, with 8 out of 72 areas above.
* ***Temperature*** was within or close to the recommended range of 70°F to 78°F in all areas assessed.
* ***Relative humidity*** was within or close to the recommended range of 40% to 60% in most of the areas assessed. This was reflective of outdoor conditions.
* ***Carbon monoxide*** levels were non-detectable (ND) in all areas tested.
* ***Fine particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 μg/m3 in all areas tested.
* ***Total Volatile Organic Compounds (TVOCs)*** levels were ND in areas tested.

The following is a summary of indoor air testing results for the **November 9, 2017** assessment, which was during the heating season (Table 2).

* ***Carbon dioxide levels*** were above 800 parts per million (ppm) in all but two areas.
* ***Temperature*** was within the recommended range of 70°F to 78°F in all areas assessed.
* ***Relative humidity*** was below the recommended range of 40% to 60% in most of the areas assessed. This was reflective of outdoor conditions.
* ***Carbon monoxide*** levels were ND in all areas tested.
* ***Fine particulate matter (PM2.5)*** concentrations measured were below the National Ambient Air Quality Standard (NAAQS) level of 35 μg/m3 in all areas tested.
* ***Total Volatile Organic Compounds (TVOCs)*** levels were ND in areas tested.

## Ventilation

The heating, ventilation and air conditioning (HVAC) system consists of rooftop air-handling units (AHUs) ducted to ceiling-mounted diffusers. Air from the space is ducted back to the AHUs via ceiling-mounted return vents. As noted previously, the ventilation system provides an adequate amount of fresh air during temperate weather, but tends to reduce the amount of fresh air during the heating season (Tables 1 and 2). Decreased fresh air supply can result in increased discomfort and irritation to the eyes, nose, and respiratory system.

Of note is the difference in number of fresh air supply vents in comparison to exhaust vents. Every occupied area has a fresh air supply (approximately 70). In comparison, exhaust vents exist in 9 private offices and 8 general office spaces, for a total of 17 (Picture 1). In general, the amount of fresh air supplied into a building should be roughly equal to the amount of exhaust ventilation removed from occupied space. Therefore the exhaust vents would need to draw at a minimum 95% of the total of fresh air provided. If this does not occur, normally occurring environmental pollutants that can be found in any building can build up to cause irritation to the eyes, nose, and respiratory system. In order to have proper ventilation with a mechanical supply and exhaust system, the systems must be balanced to provide an adequate amount of fresh air to the interior of a room while removing stale air from the room. It is recommended that existing ventilation systems be re-balanced every five years to ensure adequate air systems function (SMACNA, 1994). The date of the last balancing of the HVAC system was not available at the time of the assessment.

## Microbial/Moisture Concerns

Concerns were raised about water damage to gypsum wallboard (GW) in work areas around the back of the building. Interior GW installed along exterior brick walls and as exterior doors was assessed for water damage and sampled for moisture during the November 22, 2017 visit. No water damage was found in GW in occupied areas (Table 3) including areas that were remediated due to previous flooding events. GW around two exterior exit doors had signs of water damage and some GW was found moist or saturated (Table 3).

Plants were observed in some offices and cubicles. Some of these plants were located on porous surfaces such as carpet. Plants should be well maintained and not overwatered to prevent odors, water damage and pests.

Small refrigerators and water dispensers were observed in carpeted areas (Table 1). These appliances may spill or leak and lead to carpet damage and microbial growth. It is recommended that these appliances be located in areas without carpeting or on waterproof mats. Carpet squares could also be replaced with tile in areas where water dispensers and refrigerators are located. Refrigerators should be kept clean to prevent odors and microbial growth.

Boxes and paper items were observed on floors. Porous items stored on the floor may be subject to condensation or hidden water damage. Items should be stored on shelving/drawers and away from the floor.

## Other IAQ Evaluations

Exposure to low levels of total volatile organic compounds (TVOCs) may produce eye, nose, throat, and/or respiratory irritation in some sensitive individuals. To determine if VOCs were present, BEH/IAQ staff examined rooms for products containing VOCs. BEH/IAQ staff noted cleaners, hand sanitizers, air fresheners and other products in use within the building (Table 1). All of these products have the potential to be irritants to the eyes, nose, throat, and respiratory system of sensitive individuals.

Cooking equipment, including toasters, microwave ovens and coffee machines, were located in various parts of the office space. Food areas and cooking equipment need to be kept clean to prevent odors and pests. Mold stains were observed on the gasket of a refrigerator in the Staff Support room. These should be cleaned with an antimicrobial solution or replaced if they cannot be adequately cleaned.

The offices were mostly carpeted. Carpets should be vacuumed regularly with a high efficiency particulate arrestance (HEPA) filter-equipped vacuum cleaner and cleaned annually (or semi-annually in soiled/high traffic areas) in accordance with Institute of Inspection, Cleaning and Restoration Certification (IICRC) recommendations (IICRC, 2012).

In some areas, stored materials and accumulated items make it more difficult for custodial staff to clean. Items should be stored neatly and moved periodically to allow for wet- wiping and vacuuming of surfaces.

### Lighting

IAQ staff noted during their initial visit that many work spaces appeared to be significantly darker than other work areas in the building. To assess this, IAQ staff conducted light measurements at various workstations in the operations centers and at a variety of other areas within the building at tabletop level (approximately 3 feet above the floor). Work areas in interior areas with no windows had light measurements ranging from 1 to 63 foot-candles (10-630 lux) compared to other work areas, which had measurements of 3 to 72 foot-candles (29-775 lux) (Table 4). Of areas measured, 34 of 61 work areas had light measurements below 20 foot-candles (200 lux).

The American National Standard Institute (ANSI) recommends 30–100 foot-candles (300-1,000 lux). Increasing lighting would likely serve to alleviate/reduce the reported symptoms in these work areas. Low light conditions are associated with headaches, tired eyes, and/or irritation (NIOSH, 1998). Lack of light has also been associated with seasonal affective disorder, which among its symptoms is excessive tiredness (NMHA, 2006).

## Health Concerns

During the September 22, 2017 assessment, DCF staff voiced concerns about the incidence of cancer among colleagues. In response, BEH staff from the CAP conducted in-person interviews with interested employees on November 9, 2017 and also offered to conduct interviews over the phone for those unable to attend on that day.

The interviews included the administration of a questionnaire by BEH/CAP staff to obtain information on the type and frequency of symptoms experienced by some employees as well as employment history and residential history. The questionnaire was closely modeled on surveys used previously by BEH as well as those used by the National Institute of Occupational Safety and Health (NIOSH) and the U.S. Environmental Protection Agency (US EPA). The questionnaire elicited information on specific symptoms that have been reported in the scientific/medical literature as commonly experienced by occupants of buildings with indoor air quality problems as well as information on perceived air quality and personal health factors. These types of questionnaires are used to systematically collect building-related health and environmental complaints. The information collected, in conjunction with the assessment of the indoor environment, can be used to evaluate possible associations between indoor air quality and health and to recommend appropriate follow-up, if warranted.

The DCF South Central Area Office has an employee population of approximately 130 individuals. Three individuals (2%) participated in the BEH interview. These responses were reviewed to identify the types of diseases and symptoms that were reported, their frequency of occurrence, and whether any unusual patterns emerged suggestive of a possible association with indoor environmental conditions.

### Employee Interview Results

A total of three current employees participated in the interviews. Due to the small number of participants, limited information about health effects and indoor air quality concerns experienced within the last 4 weeks (of the time of the interview) and additional health and building related concerns was collected. Under both state and federal regulations, personally-identifying information shared by employees is confidential; therefore, the following discussion does not include specific information on the interview results but rather is limited to the concerns that were raised and topics that were discussed.

### Health Effects

A handful of symptoms were reported to have been experienced at least once in the four weeks prior to the interview by the three employees who were interviewed. Again, due to small numbers, the specific symptoms will not be identified here in order to maintain confidentiality. Respondents were asked if they experienced the symptoms primarily inside the building, outside the building, or both. Of the symptoms that were reported, they occurred either primarily inside the building or both inside and outside. Respondents did not report a pattern as to a particular time of day or week when their symptoms became worse or occurred more frequently. Smoking status was obtained in the interviews due to the role of smoking in respiratory health. Employees were also asked if they had been diagnosed by a doctor with any of the following conditions: asthma, eczema, hay fever, or migraine headaches.

The employees who participated in the interviews were asked if they had any other health-related concerns at the DCF South Central Area Office that had not yet been discussed. Some concerns were raised about the incidence of cancer, particularly breast cancer, among employees.

### Building Concerns

BEH/CAP staff also asked employees several questions about their perceptions of environmental conditions in their work surroundings. The most commonly reported conditions were that the air was too dry and the air was too stuffy.

The three employees who participated in the interviews were asked if they had any other building-related concerns at the DCF South Central Area Office that had not yet been discussed. A variety of concerns were raised, including the following:

* Lack of air flow
* Fine dust, possibly coming from the heating system
* Historical flooding and the possibility of mold resulting from it
* An area of charred materials located above a ceiling from a fire that occurred many years ago.

### Symptomology and Building Location

The locations where individuals reported working in the building and their health concerns were evaluated with respect to the results from the environmental testing conducted by BEH/IAQ staff. Again, due to small numbers, specific information will not be provided here in order to maintain confidentiality.

## Health Discussion

Three employees participated in the interviews, representing about 2% of the total employee population within the building. Due to the small numbers, limited information on health effects was gathered and meaningful conclusions about the symptoms being experienced by staff within the building cannot be drawn. In addition, under both state and federal regulations, personally-identifying information shared by employees is confidential; therefore, the discussion does not include specific information on individuals but rather is limited to the concerns that were raised.

### Cancer Concerns

Concerns about cancer, particularly breast cancer, were raised by some DCF staff during the initial indoor air assessment on September 22, 2017, and by at least one individual interviewed on November 9, 2017. According to the American Cancer Society, one out of three women and one out of two men develop cancer in their lifetime, and cancer will affect three out of every four families (ACS 2016). For this reason, cancers often appear to occur in “clusters,” and it is understandable that someone may perceive that there are an unusually high number of cancer diagnoses in their neighborhood, workplace or town. Upon close examination, many of these “clusters” are not unusual increases, as first thought, but are related to such factors as local population density or a concentration of individuals who possess related behaviors or risk factors for cancer. Some, however, are unusual; that is, they represent a true excess of cancer in a workplace, a community, or among a subgroup of people. A suspected cluster is more likely to be a true cancer cluster if it involves a high number of diagnoses of one type of cancer in a relatively short time period rather than several different types diagnosed over a long period of time (i.e., 20 years), a rare type of cancer rather than common types, and/or a large number of diagnoses among individuals in age groups not usually affected by that cancer. These types of clusters may warrant further public health investigation.

The Massachusetts Cancer Registry (MCR), a division in the MDPH Office of Data Management and Outcomes Assessment, is a population-based surveillance system that has been monitoring cancer incidence in the Commonwealth since 1982. Individuals diagnosed with cancer in Massachusetts are reported to the MCR based on their residence at diagnosis and not their workplace. For that reason, calculating an expected rate of cancer is difficult at best for a place of employment, such as an office. The most practical first step in evaluating cancer in the workplace is to determine the types of cancer reported at the time of the interviews and whether they represent an unusual pattern.

In Massachusetts, breast cancer has been the most common type of cancer diagnosed among female residents for more than a decade. During 2009 - 2013, this cancer type accounted for approximately 29% of new cancers diagnoses among females in the Commonwealth (MCR 2016). The chance of developing invasive breast cancer at some time in a woman’s life is about 1 in 8 (12%). A woman’s risk of developing breast cancer increases with age, with age being the strongest risk factor for breast cancer. About 1 out of 8 invasive breast cancers are found in women younger than 45. About 2 out of 3 invasive breast cancers are found in women age 55 or older (ACS 2015). Several studies have found that women who work in professional jobs tend to have an increased risk of developing breast cancer (Ruben et al. 1993; Threlfall et al., 1985; MacArthur et al., 2007; King et al., 1994; Pollan and Gustavsson, 1999) while other studies have not (Calle et al., 1998; Petralia et al., 1999). No occupational exposures have been identified in these studies. Rather, researchers suspect that established risk factors for breast cancer such as later maternal age at first birth and lower parity (the number of times a woman has given birth) may be more prevalent in women working in a professional setting than in women who do not. A more detailed discussion of breast cancer risk factors can be found in Appendix A.

Many cancers occur because of changes to cells that happen by random chance. These are called sporadic or spontaneous mutations and are not due to any particular exposure to a cancer-causing agent (i.e., carcinogen). Other times, exposure may be an initiating or contributing factor to the development of cancer in an individual. The latency period is the time interval between an initiating event (such as a random mutation or exposure to a carcinogen) and the appearance of symptoms of the disease or its diagnosis. Cancer, in general, has a long latency period but it may vary depending on the type, magnitude, and timing of the exposure. Cancers that are solid tumors, such as breast cancer, are believed to have a long latency period, estimated to be no shorter than 10 years and possibly as long as 50 years or more (Hall 2006; NRC 2005; UNSCEAR 2000; Bang 1996; Frumkin 1995). Due to the long latency period for most types of cancer, it is difficult to identify exactly what may have contributed to an individual’s cancer development. It is likely that multiple risk factors influence the development of most cancers. In addition, an individual’s risk of developing cancer may change over time and may depend upon a complex interaction between their genetic makeup and exposure to a cancer-causing agent.

### Building Concerns

Lack of air flow and poor circulation were a concern raised by at least one participant who was interviewed. Symptoms commonly associated with ventilation problems in buildings include respiratory symptoms such as stuffy nose, itchy eyes, and sore throat as well as headache and fatigue. It should be noted that other factors (e.g., odors, microbiological contamination) may also contribute (Passarelli, 2009; Norbäck, 2009; Burge, 2004; Stolwijk, 1991). Almost all areas tested during BEH’s inspections on November 9, 2017 had carbon dioxide levels above the recommended limit of 800 parts per million.

Some of the concerns that were raised represent opportunities for exposure to allergens, i.e., potential mold growth from water damage and dust. Given that exposure to excessive dust and mold can exacerbate pre-existing symptoms (e.g., asthma, allergies), it is possible that some individuals may react differently than the general population. Allergic responses may include hay fever-type symptoms such as runny nose and red eyes. It is important to note that the onset of an allergic reaction to triggers such as mold/moisture can be either immediate or delayed.

Concerns were also raised about the presence of charred materials located above a ceiling as a result of a fire that occurred many years ago. The concept of exposure is important to keep in mind when considering this concern. In this situation, the charred materials are limited to a location that is not accessible to employees within the building. Therefore, contact cannot occur and the potential for exposure can be eliminated.

Results from the indoor assessment indicate a number of locations within the building with inadequate levels of light. Very dim or low light conditions are associated with eye strain, which may lead to the following conditions: headaches; dry, itching, burning, watering or irritated eyes; sore neck, shoulders or back; unusual tiredness or drowsiness; and/or difficulty concentrating. Symptoms of eyestrain should go away once one has rested their eyes and steps are taken to reduce the discomfort (NIOSH, 1998; Mayo Clinic 2015). Lack of light has also been associated with seasonal depression, also known as seasonal affective disorder (SAD), which among its symptoms is excessive tiredness and difficulty concentrating. The symptoms of SAD occur around the same time each year, most often beginning in late fall or early winter and ending during the sunnier days of spring and summer. SAD occurs more often in women and the age of onset is usually between 20 to 30 years (NMHA, 2006; Mayo Clinic 2017).

# Conclusions/Recommendations

## Health Conclusions

Due to the small number of participants, limited information about health and building related concerns was collected. In order to maintain confidentiality, specific information on the interview results is not provided.

Although the incidence of cancer among employees of the DCF South Central Area Office was a concern expressed by some staff during the initial indoor air assessment on September 22, 2017, and by at least one individual interviewed on November 9, 2017, it is important to consider the following:

* Different types of cancer are individual diseases with separate causes and risk factors.
* Cancers in general have long latency or development periods that can range from 10 to 50 years in adults, particularly for solid tumors such as breast cancer.
* A great deal of research has been reported and more is being done to understand possible environmental influences on breast cancer risk. To date, however, there are no established environmental risk factors.
* The development of most cancers is likely influenced by multiple risk factors.

## Indoor Air Quality Recommendations

Based on observations at the time of assessment, the following is recommended:

1. Implement all recommendations made in previous IAQ reports.
2. Consider creating a log book for staff to submit specific cleaning/maintenance requests. Make log book available for staff/management in a central location. Cleaning/Maintenance requests should include date, requester, a detailed description of where and what the issue is as well as a section for cleaning/maintenance personnel to sign off or document progress of request.
3. Provide an adequate amount of light at workstations. In order to soften fluorescent lights, consider installing glare shields on all computer screens in this area as well as additional lamps.
4. Investigate means to improve drainage from the roof including the location/pitch/function of roof drains.
5. Replace any gypsum wallboard around doorframes. Render exterior doors/frames watertight. Consider replacing with a more water-resistant cement board. Remediation should be done during unoccupied periods.
6. Operate supply and exhaust ventilation in all areas during occupied periods. This includes using the “fan-on” setting for mechanical ventilation to supply fresh air circulation and filtration even when the temperature is within comfort limits.
7. Ensure that all exhaust vents are functional and turned on when the building is occupied.
8. Have the HVAC system balanced every 5 years in accordance with SMACNA recommendations (SMACNA, 1994).
9. Use pleated MERV 8 filters in AHUs, which are adequate in filtering out pollen and mold spores (ASHRAE, 2012). Change 2-4 times a year or in accordance with the manufacture’s recommendations.
10. For buildings in New England, periods of low relative humidity during the winter are often unavoidable. Therefore, scrupulous cleaning practices should be adopted to minimize common indoor air contaminants whose irritant effects can be enhanced when the relative humidity is low. To control for dusts, a high efficiency particulate arrestance (HEPA) filter equipped vacuum cleaner in conjunction with wet wiping of all surfaces is recommended. Avoid the use of feather dusters. Drinking water during the day can help ease some symptoms associated with a dry environment (throat and sinus irritations).
11. Consider locating refrigerators and water dispensers in non-carpeted areas or place on a waterproof mat. Clean refrigerators out regularly to avoid odors and microbial growth. If moldy refrigerator gasket cannot be adequately cleaned, replace.
12. Avoid storing porous materials such as cardboard boxes directly on floors to prevent wetting/mold growth due to moisture/condensation.
13. Reduce use of products containing VOCs including eliminating air freshening products.
14. Clean carpeting in accordance with IICRC recommendations (IICRC, 2012).
15. Reduce accumulated materials on flat surfaces and store in an organized manner to allow for thorough cleaning.
16. Clean the blades of personal fans, supply, and exhaust vents periodically to avoid aerosolizing dusts.
17. Refer to resource manual and other related IAQ documents located on the MDPH’s website for further building-wide evaluations and advice on maintaining public buildings. These documents are available at: <http://mass.gov/dph/iaq>.

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**Picture 1**

**Location of exhaust vents (E)**



| Location | **Carbon****Dioxide****(ppm)** | **Carbon Monoxide****(ppm)** | **Temp****(°F)** | **Relative****Humidity****(%)** | **PM2.5****(µg/m3)** | **TVOCs****(ppm)** | **Occupants****in Room** | **Windows****Openable** | **Ventilation** | **Remarks** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Intake** | **Exhaust** |
| Background (outdoors) | 371 | ND | 66 | 66 | 6 | ND |  |  |  |  |  |
| 168 | 836 | ND | 71 | 61 | 4 | ND | 1 | No | Yes | No |  |
| 169 | 845 | ND | 71 | 60 | 4 | ND | 1 | No | Yes | No |  |
| 170 | 781 | ND | 71 | 59 | 5 | ND | 1 | No | Yes | No |  |
| 171 | 906 | ND | 71 | 61 | 5 | ND | 3 | No | Yes | No |  |
| 172 | 816 | ND | 71 | 59 | 5 | ND | 0 | No | Yes | No | 2 water-damaged ceiling tiles |
| 173 | 803 | ND | 71 | 59 | 5 | ND | 3 | No | Yes | Yes | Refrigerator |
| 176 storeroom | 755 | ND | 71 | 58 | 5 | ND | 0 | No | Yes | No |  |
| 175 | 762 | ND | 71 | 58 | 5 | ND | 1 | No | Yes | No |  |
| 161 | 804 | ND | 72 | 56 | 5 | ND | 0 | No | Yes | No | Microwave |
| 166 | 806 | ND | 72 | 57 | 5 | ND | 0 | No | Yes | Yes |  |
| 167 | 782 | ND | 72 | 58 | 5 | ND | 3 | No | Yes | No | Microwave |
| 165 | 757 | ND | 72 | 57 | 5 | ND | 1 | No | Yes | No |  |
| 163 | 761 | ND | 72 | 54 | 5 | ND | 0 | No | Yes | No |  |
| 160 | 784 | ND | 73 | 55 | 5 | ND | 0 | No | Yes | Yes | Air freshener |
| 159 | 775 | ND | 73 | 55 | 5 | ND | 0 | No | Yes | Yes |  |
| 151 | 734 | ND | 74 | 53 | 5 | ND | 0 | No | Yes | Yes |  |
| 152 | 785 | ND | 74 | 53 | 5 | ND | 3 | No | Yes | Yes | Refrigerator |
| 153 | 744 | ND | 74 | 54 | 5 | ND | 6 | No | Yes | No | Personal fan |
| 155 | 775 | ND | 74 | 54 | 5 | ND | 1 | No | Yes | No |  |
| 154 | 600 | ND | 74 | 54 | 5 | ND | 0 | No | Yes | Yes |  |
| 136 | 601 | ND | 73 | 53 | 4 | ND | 0 | No | Yes | Yes |  |
| 138 | 614 | ND | 74 | 54 | 4 | ND | 1 | No | Yes | Yes |  |
| 139 | 654 | ND | 74 | 56 | 4 | ND | 2 | No | Yes | No | 2 water-damaged ceiling tiles |
| 140 | 632 | ND | 74 | 53 | 5 | ND | 1 | No | Yes | No |  |
| 150 | 673 | ND | 74 | 54 | 4 | ND | 1 | No | Yes | No |  |
| 149 | 634 | ND | 74 | 54 | 5 | ND | 0 | No | Yes | No |  |
| 145 | 632 | ND | 74 | 54 | 4 | ND | 1 | No | Yes | No |  |
| 141 | 655 | ND | 74 | 54 | 4 | ND | 2 | No | Yes | No |  |
| 137 | 591 | ND | 74 | 54 | 4 | ND | 3 | No | Yes | No |  |
| 135 | 567 | ND | 73 | 54 | 4 | ND | 0 | No | Yes | No |  |
| 128 | 559 | ND | 73 | 54 | 4 | ND | 1 | No | Yes | No |  |
| 125 | 563 | ND | 72 | 54 | 4 | ND | 0 | No | Yes | No |  |
| 126 | 555 | ND | 73 | 55 | 4 | ND | 1 | No | Yes | No |  |
| 123 | 554 | ND | 72 | 55 | 4 | ND | 0 | No | Yes | No |  |
| 119 | 567 | ND | 72 | 56 | 4 | ND | 3 | No | Yes | Yes |  |
| 117 | 659 | ND | 72 | 56 | 4 | ND | 7 | No | Yes | Yes |  |
| 116 | 670 | ND | 72 | 55 | 4 | ND | 0 | No | Yes | No |  |
| 118 | 604 | ND | 72 | 55 | 4 | ND | 0 | No | Yes | No |  |
| 120 | 545 | ND | 72 | 57 | 5 | ND | 0 | No | Yes | Yes |  |
| 122 | 561 | ND | 72 | 56 | 5 | ND | 1 | No | Yes | No |  |
| 127 | 567 | ND | 72 | 56 | 4 | ND | 0 | No | Yes | No |  |
| 129 | 612 | ND | 72 | 57 | 6 | ND | 0 | No | Yes | No |  |
| 130 | 719 | ND | 72 | 56 | 6 | ND | 4 | No | Yes | No |  |
| 132 | 704 | ND | 72 | 55 | 6 | ND | 1 | No | Yes | No |  |
| 110 | 664 | ND | 71 | 52 | 6 | ND | 0 | No | Yes | No |  |
| 112 | 721 | ND | 70 | 51 | 4 | ND | 2 | No | Yes | No |  |
| 114 | 687 | ND | 70 | 52 | 5 | ND | 0 | No | Yes | No |  |
| 113 | 627 | ND | 68 | 51 | 4 | ND | 0 | No | Yes | No |  |
| 111 | 625 | ND | 68 | 56 | 4 | ND | 0 | No | Yes | No |  |
| 109 B | 655 | ND | 68 | 60 | 5 | ND | 0 | No | Yes | Yes |  |
| 109 A | 652 | ND | 71 | 59 | 6 | ND | 0 | No | Yes | Yes |  |
| 144 | 620 | ND | 71 | 66 | 11 | ND | 1 | No | Yes | No |  |
| 143 kitchen | 580 | ND | 71 | 63 | 21 | ND | 0 | No | Yes | Yes |  |
| 142 | 628 | ND | 72 | 60 | 6 | ND | 0 | No | Yes | Yes |  |
| 147 | 638 | ND | 72 | 59 | 6 | ND | 1 | No | Yes | Yes |  |
| 146 | 624 | ND | 72 | 58 | 4 | ND | 1 | No | Yes | Yes |  |
| 145 B | 594 | ND | 72 | 59 | 11 | ND | 0 | No | Yes | No |  |
| Reception | 871 | ND | 72 | 60 | 8 | ND | 1 | No | Yes | No | 2 water-damaged ceiling tiles |
| 102 | 685 | ND | 71 | 58 | 5 | ND | 0 | No | Yes | No |  |
| 106 | 647 | ND | 71 | 58 | 6 | ND | 0 | No | Yes | No |  |
| 101 | 739 | ND | 71 | 60 | 7 | ND | 3 | No | Yes | Yes |  |
| Waiting room | 722 | ND | 71 | 60 | 6 | ND | 6 | No | Yes | Yes |  |

| Location | **Carbon****Dioxide****(ppm)** | **Carbon Monoxide****(ppm)** | **Temp****(°F)** | **Relative****Humidity****(%)** | **PM2.5****(µg/m3)** | **TVOCs****(ppm)** | **Occupants****in Room** | **Windows****Openable** | **Ventilation** | **Remarks** |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Intake** | **Exhaust** |
| Background (Outdoors) | 384 | ND |  |  | 11 | ND |  |  |  |  |  |
| 154 | 979 | ND | 73 | 30 | 8 | ND | 2 | N | Y | Y |  |
| 153 | 984 | ND | 73 | 32 | 6 | ND | 2 | N | Y | N |  |
| 152 | 972 | ND | 74 | 32 | 5 | ND | 3 | N | Y | Y |  |
| 150 | 853 | ND | 74 | 27 | 5 | ND | 0 | N | Y | N |  |
| 149 | 829 | ND | 73 | 29 | 6 | ND | 0 | N | Y | Y |  |
| 140 | 830 | ND | 73 | 30 | 7 | ND | 3 | N | Y | Y |  |
| 139 | 804 | ND | 73 | 32 | 6 | ND | 2 | N | Y | N | 1 water-damaged ceiling tile |
| 183 | 862 | ND | 73 | 32 | 7 | ND | 0 | N | Y | Y |  |
| 136 | 870 | ND | 72 | 21 | 8 | ND | 0 | N | Y | Y |  |
| 134 | 887 | ND | 72 | 21 | 8 | ND | 0 | N | Y | Y |  |
| 33 | 895 | ND | 72 | 32 | 8 | ND | 0 | N | Y | N |  |
| 155 | 957 | ND | 73 | 34 | 8 | ND | 2 | N | Y | N |  |
| 128 | 935 | ND | 72 | 32 | 5 | ND | 2 | N | Y | N |  |
| 125 | 846 | ND | 72 | 31 | 6 | ND | 0 | N | Y | N |  |
| 135 | 903 | ND | 72 | 33 | 11 | ND | 3 | N | Y | N |  |
| 137 | 888 | ND | 72 | 32 | 10 | ND | 0 | N | Y | N |  |
| 148 | 774 | ND | 72 | 31 | 6 | ND | 0 | N | Y | N |  |
| 141 | 781 | ND | 72 | 31 | 7 | ND | 3 | N | Y | N |  |
| 147 | 811 | ND | 72 | 31 | 7 | ND | 1 | N | Y | Y |  |
| 146 | 820 | ND | 73 | 31 | 6 | ND | 4 | N | Y | Y |  |
| 168 | 904 | ND | 72 | 34 | 3 | ND | 1 | N | Y | N |  |
| 169 | 939 | ND | 72 | 33 | 3 | ND | 1 | N | Y | N | Ammonia cleaner |
| 171 | 950 | ND | 72 | 33 | 3 | ND | 1 | N | Y | N |  |
| 172 | 911 | ND | 72 | 32 | 3 | ND | 0 | Y | Y | N |  |
| 177 | 881 | ND | 71 | 31 | 3 | ND | 0 | N | Y | N |  |
| 178 | 853 | ND | 70 | 32 | 3 | ND | 0 | Y | Y | N |  |
| 176 | 849 | ND | 70 | 33 | 4 | ND | 0 | N | Y | N |  |
| 174 | 951 | ND | 71 | 34 | 4 | ND | 4 | N | Y | Y |  |
| 170 | 923 | ND | 75 | 34 | 4 | ND | 2 | N | Y | N |  |
| 167 | 884 | ND | 76 | 30 | 3 | ND | 0 | N | Y | N |  |
| 166 | 900 | ND | 74 | 31 | 3 | ND | 2 | N | Y | N |  |
| 165 | 874 | ND | 74 | 31 | 3 | ND | 1 | N | Y | N |  |
| 163 | 1050 | ND | 74 | 32 | 5 | ND | 0 | N | Y | Y |  |
| 162 | 1064 | ND | 74 | 34 | 4 | ND | 0 | N | Y | Y |  |
| 151 | 995 | ND | 73 | 33 | 4 | ND | 2 | N | Y | Y |  |
| 175 | 953 | ND | 73 | 30 | 4 | ND | 0 | N | Y | N |  |
| 16 | 1081 | ND | 73 | 33 | 5 | ND | 3 | N | Y | N |  |
| 160 | 1028 | ND | 74 | 32 | 5 | ND | 0 | N | Y | Y |  |
| 159 | 1001 | ND | 74 | 32 | 6 | ND | 0 | N | Y | Y |  |
| 158 | 972 | ND | 73 | 32 | 5 | ND | 0 | N | Y | Y |  |
| 142 | 894 | ND | 73 | 32 | 7 | ND | 0 | N | Y | N |  |
| 143 | 1009 | ND | 73 | 34 | 8 | ND | 0 | N | Y | N |  |
| 144 | 958 | ND | 73 | 34 | 10 | ND | 0 | N | Y | N |  |
| 145A | 940 | ND | 73 | 32 | 7 | ND | 0 | N | Y | Y |  |
| 129 | 1069 | ND | 72 | 34 | 11 | ND | 2 | N | Y | Y |  |
| 130 | 984 | ND | 72 | 34 | 12 | ND | 4 | N | Y | N |  |
| 131 | 908 | ND | 72 | 33 | 8 | ND | 0 | N | Y | N |  |
| 132 | 959 | ND | 72 | 34 | 7 | ND | 2 | N | Y | N |  |
| 110 | 947 | ND | 72 | 34 | 6 | ND | 1 | N | Y | N |  |
| 109A | 944 | ND | 72 | 34 | 6 | ND | 1 | Y | Y | N |  |
| 109B | 894 | ND | 72 | 33 | 5 | ND | 0 | Y | Y | N |  |
| 112 | 934 | ND | 72 | 33 | 4 | ND | 1 | Y | Y | N |  |
| 111 | 919 | ND | 72 | 34 | 5 | ND | 0 | Y | Y | N |  |
| 114 | 928 | ND | 72 | 34 | 5 | ND | 1 | Y | Y | N |  |
| 113 | 886 | ND | 72 | 33 | 5 | ND | 0 | Y | Y | N |  |
| 116 | 831 | ND | 72 | 32 | 5 | ND | 1 | N | Y | N |  |
| 115 | 811 | ND | 72 | 33 | 5 | ND | 1 | Y | Y | N |  |
| 117 | 805 | ND | 72 | 32 | 5 | ND | 0 | N | Y | N |  |
| 118 | 885 | ND | 72 | 34 | 6 | ND | 2 | N | Y | N |  |
| 120 | 855 | ND | 72 | 33 | 5 | ND | 0 | N | Y | N |  |
| 122 | 881 | ND | 72 | 33 | 6 | ND | 2 | N | Y | N |  |
| 119 | 856 | ND | 72 | 33 | 5 | ND | 0 | N | Y | Y |  |
| 121 | 866 | ND | 71 | 34 | 5 | ND | 5 | N | Y | Y |  |
| 124 | 926 | ND | 71 | 34 | 6 | ND | 1 | N | Y | N |  |
| 126 | 857 | ND | 71 | 33 | 6 | ND | 0 | N | Y | N |  |
| 123 | 873 | ND | 72 | 33 | 6 | ND | 6 | N | Y | Y |  |
| Reception | 908 | ND | 73 | 33 | 6 | ND | 1 | N | Y | N |  |
| Waiting room | 843 | ND | 72 | 32 | 6 | ND | 4 | N | Y | Y |  |
| 101 | 847 | ND | 73 | 31 | 5 | ND | 0 | N | Y | Y |  |
| 102 | 805 | ND | 71 | 30 | 5 | ND | 0 | N | Y | Y |  |

| Location | **Temp****(°F)** | **Relative****Humidity****(%)** | **Dew Point****(°F)** | **Exterior Wall Moisture (%)** |
| --- | --- | --- | --- | --- |
|
| 162 | 72 | 42 | 47 | 7 |
| 113 | 72 | 42 | 47 | 8 |
| 113 exit door | 72 | 43 | 48 | Saturated |
| 115 | 72 | 42 | 47 | 7-9 |
| 117 | 72 | 43 | 48 | 7-9 |
| 119 | 72 | 42 | 47 | 7-9 |
| 121 | 72 | 42 | 47 | 7-9 |
| 121 exit door | 73 | 44 | 50 | Saturated |
| 171 exit door | 72 | 42 | 47 | 7-8 |
| 156 exit door | 71 | 43 | 47 | 6-7 |

| Location | **Light (ft/candles)** | **Ceiling Lights on?** | **Floor lamp on?** | **Window?** |
| --- | --- | --- | --- | --- |
| 123 | 1 | N | Y |  |
| 140 | 1 | N |  |  |
| 166 | 1 | N |  |  |
| 119 | 2 | N | Y |  |
| 121 | 2 | N | N |  |
| 125 | 2 | N | Y |  |
| 128 | 2 | N | Y |  |
| 136 | 2 | N | Y |  |
| 138 | 2 | N | Y |  |
| 159 | 2 | N |  |  |
| 173 | 2 | Y |  |  |
| 113 | 3 | N | N | Y |
| 115 | 3 | N | Y | Y |
| 118 | 3 | N | Y |  |
| 129 | 3 | N | Y |  |
| 134 | 3 | N | Y |  |
| 137 | 3 | N | Y |  |
| 154 | 3 | N |  |  |
| 155 | 3 | N |  |  |
| 117 | 4 | N | Y |  |
| 130 | 4 | N | Y |  |
| 135 | 4 | N | Y |  |
| 139 | 4 | N | Y |  |
| 167 | 4 | N |  | Y |
| 111 | 5 | N | N |  |
| 114 | 5 | N | Y |  |
| 132 | 5 | N | Y |  |
| 151 | 5 | N |  | Y |
| 152 | 5 | N |  |  |
| 153 | 5 | N |  |  |
| 141 | 6 | N | Y |  |
| 171 | 9 | N |  | Y |
| 160 | 13 | Y |  |  |
| 110 | 16 | Y | N |  |
| 109A | 26 | Y | N | Y |
| 109B | 26 | Y | N |  |
| 150 | 29 | Y |  |  |
| 124 | 30 | Y | N |  |
| 131 | 31 | Y | N |  |
| 116 | 33 | Y | N |  |
| 175 | 33 | Y |  |  |
| 165 | 34 | Y |  |  |
| 122 | 35 | Y | N |  |
| 120 | 36 | Y | N |  |
| 146 | 36 | Y | N | Y |
| 148 | 36 | Y | N | Y |
| 147 | 37 | Y | N | Y |
| Reception | 38 | Y | N | Y |
| 158 | 39 | Y |  |  |
| 169 | 39 | Y |  |  |
| 172 | 40 | Y |  |  |
| 126 | 45 | Y | Y |  |
| 168 | 47 | Y |  | Y |
| 127 | 48 | Y | N |  |
| 142 | 49 | Y | N |  |
| 162 | 49 | Y |  |  |
| 112 | 50 | Y | N |  |
| 144 | 50 | Y | N |  |
| 145 | 63 | Y | N |  |
| 176 | 63 | Y |  |  |
| 163 | 72 | Y |  | Y |

**Appendix A**

**Risk Factor Information for Breast Cancer**

**How to Use this Factsheet**

This risk factor summary was developed to serve as a general fact sheet. It is an overview and should not be considered exhaustive. For more information on other possible risk factors and health effects being researched, please see the References section.

A risk factor is anything that increases a person’s chance of developing cancer. Some risk factors can be controlled while others cannot. Risk factors can include *hereditary conditions*, *medical conditions or treatments*, *infections*, *lifestyle factors*, or *environmental exposures*. Although risk factors can influence the development of cancer, most do not directly cause cancer. An individual’s risk for developing cancer may change over time due to many factors, and it is likely that multiple risk factors influence the development of most cancers. Knowing the risk factors that apply to specific concerns and discussing them with your health care provider can help to make more informed lifestyle and health care decisions.

For those cancer types with environmentally-related risk factors, an important factor in evaluating cancer risk is the route of exposure. This is particularly relevant when considering exposures to chemicals in the environment. For example, a particular chemical may have the potential to cause cancer if it is inhaled, but that same chemical may not increase the risk of cancer through skin contact. In addition, the dose and duration of time one might be exposed to an environmental agent is important in considering whether an adverse health effect could occur.

Gene-environment interactions are another important area of cancer research. An individual’s risk of developing cancer may depend on a complex interaction between their genetic makeup and exposure to an environmental agent (for example, a virus or a chemical contaminant). This may explain why some individuals have a fairly low risk of developing cancer as a result of an environmental factor or exposure, while others may be more vulnerable.

**Key Statistics**

Breast cancer is the most frequently diagnosed cancer among women in the United States, except for skin cancers. The American Cancer Society estimates that in 2015, approximately 231,840 women in the U.S. and 5,890 women in Massachusetts will be diagnosed with breast cancer. The disease is expected to account for approximately 29% of all new cancer diagnoses in females.1 Between 2007 and 2011, invasive breast cancer accounted for 29.0% of cancer diagnoses in females in Massachusetts.11

In the United States, breast cancer rates stabilized in the early 1990s, increased in the latter half of the 1990s, and dropped sharply between 2002 and 2003. The sharp drop has been attributed to decreased use of menopausal hormones following the 2002 publication of the Women’s Health Initiative study results. This study linked the use of hormone therapy to an increased risk of breast cancer.2 In Massachusetts, the incidence of invasive breast cancer in females remained stable over the years 2007-2011.11

The chance of developing invasive breast cancer at some time in a woman's life is about 1 in 8. Women are 100 times more likely than men to develop this disease.2 Men can also develop breast cancer, but male breast cancer is rare, accounting for 1% of all breast cancer cases.1, 9 For more information on breast cancer in men, visit the American Cancer Society website at www.cancer.org.5

A woman’s risk of developing breast cancer increases with age. About 12-13% of invasive breast cancers are found in women younger than 45, while about 66% are found in women age 55 or older. White women are slightly more likely to develop breast cancer than women of other races and ethnicities.2

**Types of Breast Cancer**

The term "cancer" is used to describe a variety of diseases associated with abnormal cell and tissue growth. Cancers are classified by the location in the body where the disease originated (the primary site) and the tissue or cell type of the cancer (histology).

There are several types of breast cancer, although some of them are quite rare. In some cases a single breast tumor can have a combination of these types or have a mixture of invasive and *in situ* cancer.

*In situ* breast cancers are considered the earliest stage of cancer, when it is confined to the layer of cells where it began. They have not invaded into deeper tissues in the breast or spread to other organs in the body, and are sometimes referred to as non-invasive breast cancers.2 The remainder of this risk factor summary pertains to invasive breast cancers. Additional information on *in situ* breast cancers and other benign breast conditions can be found at www.cancer.org (American Cancer Society).3

An invasive, or infiltrating, cancer is one that has already grown beyond the layer of cells where it started (as opposed to carcinoma *in situ*). Most breast cancers are invasive carcinomas – either invasive ductal carcinoma or invasive lobular carcinoma.2

Breast cancer most commonly involves either the milk-producing lobules or the tubular ducts that connect the lobules to the nipple.6 Roughly 80% of all breast cancers originate in the ducts, and are known as invasive ductal carcinoma (IDC). An additional 10% begin in the lobules, and are known as invasive lobular carcinoma (ILC). Invasive lobular carcinoma may be harder to detect by a mammogram than invasive ductal carcinoma. Both types of cancer can spread (metastasize) from the original site to other parts of the body.2, 6

Other less common types of invasive breast cancer2 include:

* inflammatory breast cancer
* triple-negative breast cancer
* medullary carcinoma
* metaplastic carcinoma
* mucinous carcinoma
* Paget’s disease
* tubular carcinoma
* papillary carcinoma
* Phyllodes tumor
* adenoid cystic carcinoma or adenocystic carcinoma
* angiosarcoma

**Established Risk Factors**

*Hereditary Conditions*

Having a family history of breast cancer increases a woman’s risk of developing the disease. Women who have a first-degree relative (i.e., mother, sister) with breast cancer have about twice the risk of developing breast cancer themselves. Having two first-degree relatives with this disease increases a woman’s risk by three- to five-fold.2, 6 The risk is also elevated if several close relatives from either side of the family have been diagnosed with breast or ovarian cancer, especially before age 50.6, 13 Overall, less than 15% of women with breast cancer have a family member with the same disease. Therefore, over 85% of women who have breast cancer have no familial link to the disease.2

About 5-10% of breast cancer diagnoses are thought to be due to an inherited genetic mutation.2, 15 Most of these mutations occur in the *BRCA1* and *BRCA2* genes. Other genes that may lead to an increased risk for developing breast cancer include *ATM*, *CHEK2*, *TP53* and *PTEN*. Women who inherit these gene mutations have up to an 80% chance of developing breast cancer during their lifetime.2

*Medical Conditions and Treatments*

Certain benign breast conditions may increase one’s risk for breast cancer. Women with proliferative lesions without atypia (i.e., abnormal or unusual cells), which have excessive growth of cells in the ducts or lobules of breast tissue, are 1.5 to 2 times more likely to develop breast cancer compared with women who have non-proliferative lesions.15 Proliferative lesions with atypia, when the cells are excessively growing and no longer appear normal, raise one’s risk by 3.5 to 5 times. Women with denser breast tissue (as seen on a mammogram) have more glandular tissue and less fatty tissue, and have a higher risk of breast cancer.2

A woman with cancer in one breast is 3 to 4 times more likely to develop a new cancer in the other breast or in another part of the same breast. In addition, a previous diagnosis of an *in situ* breast cancer puts a woman at increased risk for an invasive breast cancer.2

Cumulative exposure of the breast tissue to estrogen is associated with breast cancer risk. Several factors can influence estrogen levels. Women who started menstruating at an early age (before age 12) and/or went through menopause at a later age (after age 55) have a slightly higher risk of breast cancer. Also, women who have had no children or those whose first pregnancy occurred when they were over the age of 30 have an increased risk for developing breast cancer.2 Women who have had more children and those who have breast-fed seem to be at lower risk.15

Use of hormone replacement therapy is another factor that may affect breast cancer risk. Long-term use (several years or more) of combined post-menopausal hormone therapy (PHT) increases the risk of breast cancer. The increased risk from combined PHT appears to apply only to current and recent users. A woman's breast cancer risk seems to return to that of the general population within 5 years of stopping combined PHT. The use of estrogen-only replacement therapy (ERT) does not appear to increase the risk of breast cancer significantly but when used long-term (for more than 10 years), ERT has been found to increase the risk of ovarian cancer in some studies.2, 15

Women who had radiation therapy to the chest area as treatment for another cancer (i.e., ionizing radiation for Hodgkin disease) are at significantly increased risk for breast cancer.15 This risk appears to be highest if the radiation is given during adolescence or puberty, when the individual’s breasts are developing.2

From the 1940s through the 1960s some pregnant women were given the drug diethylstilbestrol (DES) because it was thought to lower their chances of miscarriage. These women have a slightly increased risk of developing breast cancer. A woman whose mother took DES while pregnant may also have a slightly higher risk of breast cancer.2

*Lifestyle Factors*

Alcohol consumption has also been associated with increased risk for breast cancer. Compared with non-drinkers, women who consume one alcoholic drink a day have a very small increase in risk whereas those who have 2 to 5 drinks daily have about 1½ times the risk of women who drink no alcohol.2

**Possible Risk Factors**

*Environmental Exposures*

A great deal of research has been reported and more is being done to understand possible environmental influences on breast cancer risk. Of special interest are compounds in the environment that have been found in animal studies to have estrogen-like properties, which could in theory affect breast cancer risk. For example, substances found in some plastics, certain cosmetics and personal care products, pesticides (such as DDE), and PCBs (polychlorinated biphenyls) seem to have such properties. To date, however, there is not a clear link between breast cancer risk and exposure to these substances.2

*Lifestyle Factors*

For a long time, the role of cigarette smoking in the development of breast cancer was unclear. Recent research, however, supports a consistent association between smoking and an increased risk of breast cancer, with long-term heavy smokers at highest risk.16, 2

Some studies suggest a relationship between secondhand smoking and an increased risk for breast cancer; however, confirming this relationship has been difficult and is still the subject of active research.2, 15, 16

Recent studies have indicated that being overweight or obese after menopause may put a woman at increased risk of breast cancer.2, 6, 15  Similarly, women who are physically inactive throughout life may have an increased risk of breast cancer.2

Studies have found that women using oral contraceptives (birth control pills) have a slightly greater risk of breast cancer than women who have never used them, but this risk seems to decline once their use is stopped. Women who stopped using oral contraceptives for more than 10 years do not appear to have any increased breast cancer risk. When thinking about using oral contraceptives, women should discuss their other risk factors for breast cancer with their physician.2

Lifetime risk of breast cancer is increased in women of higher socioeconomic status (SES) (e.g. income, education). Research suggests that this may be due to reproductive and lifestyle factors (age at first full-term birth, physical activity, diet, cultural practices, etc.).6, 15

Several recent studies have also suggested that working the night shift may be associated with an increased risk of breast cancer. The light-sensitive hormone melatonin may play a role in this link, and further research is being conducted in this area.2, 10

**Other Risk Factors That Have Been Investigated**

*Lifestyle Factors*

Though links have been suggested, antiperspirants, bras, and breast implants have all been investigated as possible risk factors for breast cancer but no associations have been found.2, 15

Dietary fat intake is another factor that has been suggested to increase a woman’s risk for breast cancer. Though studies have found decreased breast cancer rates in countries with a diet typically lower in fat, studies in the U.S. have not shown an association between the amount of fat in the diet and increased risk of breast cancer.2, 15

**References/For More Information**

*Much of the information contained in this summary has been taken directly from the following sources. This material is provided for informational purposes only and should not be considered as medical advice. Persons with questions regarding a specific medical problem or condition should consult their physician.*

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