

# A Study of Breast Cancer in Female Flight Attendants

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The National Institute for Occupational Safety and Health conducted this study to look at breast cancer among women who had worked as flight attendants at Pan Am. Previous studies have found that flight attendants are more likely to be diagnosed with breast cancer than the general population. It hasn't been clear why, but some scientists have thought it may be because of work-related exposure to cosmic radiation, circadian disruption (jet lag) from traveling across multiple time zones and working during normal sleep hours, or differences in risk factors for breast cancer in flight attendants, such as age at which they first gave birth, compared with the general population.

## Study goals

The main goals of this study were to learn if

1. Women who worked as flight attendants at Pan Am were more likely to be diagnosed with breast cancer than women in the general population, and if
2. Breast cancer is linked to exposure to cosmic radiation or circadian disruption.

## What we found

- On average, the women in the study were more likely to get breast cancer than women in the general population. We think this is because they began having children later in life and gave birth fewer times than women in the general population. Having fewer children and having children later in life are known risk factors for breast cancer.
- Exposure to cosmic radiation and circadian disruption from their work as a flight attendant didn't seem to play a role, except possibly in women who had given birth three or more times.

The frequency of breast cancer was 37% higher in female flight attendants than in women in the US general population. Of the 6093 women in the study, 344 were diagnosed with breast cancer. We expected about 250 based on statistics from the general population.

This finding could largely be due to very large differences in parity and age at first birth. Women in the study, on average, had given birth fewer times and were much older when they first gave birth compared with women in the US general population.

## Glossary

**Circadian disruption:** disruption in a person's internal biological clock that regulates the release of hormones and other changes in body function over a roughly 24-hour cycle. Aircrew may experience circadian disruption (specifically, jet lag) when they travel across time zones and work when others would normally be asleep. The International Agency for Research on Cancer (IARC) has determined that circadian disruption probably causes cancer.

**Cosmic radiation:** a form of ionizing radiation that comes from outer space. A very small amount of this radiation reaches the earth. At flight altitudes, passengers and aircrew are exposed to higher levels of cosmic radiation.

**milliGray (mGy):** a unit used to measure absorbed radiation dose. Absorbed dose is the amount of cosmic radiation absorbed by a person.

Glossary continues on next page.

- When we looked at all women in the study, breast cancer was not more frequent among women who had worked more years as a flight attendant compared with women who worked fewer years.
- When we looked at all women in the study, breast cancer was not more frequent among women who had more exposure to cosmic radiation or circadian disruption compared to women with less exposure.
- Among a group of 884 women in the study who had given birth three or more times, breast cancer was more frequent (42 diagnoses) when exposure to cosmic radiation or circadian disruption was higher. Among this group of women, the chance of being diagnosed with breast cancer increased with cosmic radiation dose, increased with the number of time zones crossed, and increased with the number of hours spent working during normal sleep hours. Women who were exposed to more cosmic radiation also crossed more time zones and spent more time working during normal sleep hours. Because of this, we could not assess
  - the link of breast cancer with cosmic radiation taking into account circadian disruption or
  - the link of breast cancer with circadian disruption taking into account cosmic radiation.
- On average, the women in this study worked for 7.7 years as a flight attendant and were exposed to 7 milliGray (mGy) of cosmic radiation, crossed 3600 time zones, and worked 1500 hours during normal sleep hours.

## Glossary (continued)

**Normal sleep hours:** between 10 pm and 8 am at the flight attendant's home base domicile

**Parity:** number of times a woman has given birth

## What does this mean?

The women in the study were more likely to be diagnosed with breast cancer than women in the general population. This seems to be because, on average, they had children later in life and gave birth to fewer infants than the general population. These are both known risk factors for breast cancer.

For most women, exposure to cosmic radiation and circadian disruption from working as a flight attendant did not increase the chance of being diagnosed with breast cancer. However, for the small percentage (15%) of women who had given birth three or more times, exposure to cosmic radiation and circadian disruption was linked to the chance of being diagnosed with breast cancer. These findings may be due to chance or true links of breast cancer with cosmic radiation or circadian disruption among women who have given birth several times. These findings could also be due to other factors we did not consider in our study, but we considered a wide range of other factors so this is less likely.

If the findings among women who had given birth several times are truly due to exposure to cosmic radiation or circadian disruption, we think they are more likely due to circadian disruption. We think this based on the findings of other studies.

Because the findings among women who have given birth several times could be due to chance, we have recommended further research studying the link between breast cancer, circadian disruption, and parity to see if our findings are confirmed.

## What should you do?

If you worked as a flight attendant, we recommend that you do these things:

1. Visit [www.cdc.gov/cancer/breast](http://www.cdc.gov/cancer/breast) to learn more about breast cancer and steps you can take to reduce your risk.
2. Talk to your doctor about what breast cancer screening tests, if any, might be right for you and when you should have them. Although breast cancer screening cannot prevent breast cancer, it can help find breast cancer early, when it is easier to treat.
3. If you have had breast cancer, visit [www.hopkinsmedicine.org/breast\\_center/treatments\\_services/survivor\\_care/reducing\\_recurrence](http://www.hopkinsmedicine.org/breast_center/treatments_services/survivor_care/reducing_recurrence) to learn more about steps you can take to reduce the chance of a recurrence.
4. If you currently work as a flight attendant, visit [www.cdc.gov/niosh/topics/aircrew/](http://www.cdc.gov/niosh/topics/aircrew/) to learn more about ways to reduce your exposure to cosmic radiation and circadian disruption.

## For more information

To learn more about this study, see the following publications:

Schubauer-Berigan, M. K., Anderson, J. L., Hein, M. J., Little, M. P., Sigurdson, A. J., & Pinkerton, L. E. (2015). Breast cancer incidence in a cohort of US flight attendants. *American journal of industrial medicine*, 58(3), 252-266. doi: 10.1002/ajim.22419  
Available at: [www.ncbi.nlm.nih.gov/pmc/articles/PMC4566958/](http://www.ncbi.nlm.nih.gov/pmc/articles/PMC4566958/)

Pinkerton, L. E., Hein, M. J., Anderson, J. L., Little, M. P., Sigurdson, A. J., & Schubauer-Berigan, M. K. (2016). Breast cancer incidence among female flight attendants: exposure–response analyses. *Scandinavian Journal of Work, Environment & Health*. doi:10.5271/sjweh.3586  
Available at: [www.sjweh.fi/](http://www.sjweh.fi/)

To learn more about aircrew safety and health and ways to stay healthy, visit the NIOSH Aircrew Safety & Health topic page at [www.cdc.gov/niosh/topics/aircrew/](http://www.cdc.gov/niosh/topics/aircrew/).