



# Firefighters & Cervical Cancer

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## GENERAL EPIDEMIOLOGY: CERVICAL CANCER

In 2022, an estimated 14,100 new cases of invasive cervical cancer will be diagnosed in the United States. Additionally, almost 4,280 women will die from cervical cancer<sup>3</sup>. Once considered one of the most common causes of cancer deaths for American women, cervical cancer death rates have dropped significantly since the introduction and increased use of the Pap test. The Pap test is a screening procedure allowing for early detection of cancer and the reason why cervical pre-cancers are diagnosed more often than invasive cervical cancer.

## INTERNATIONAL AGENCY FOR RESEARCH ON CANCER (IARC)

In June 2022, IARC convened an international meeting of scientists to re-evaluate firefighting as an exposure related to cancer. They determined the literature supports reclassifying **firefighting to a Group 1 carcinogen (carcinogenic to humans) based on “sufficient” evidence**<sup>1</sup>. This is the **highest** classification of exposure only assigned when there is scientific certainty.

Their statement indicated:

***There was also “strong” mechanistic evidence that occupational exposure as a firefighter shows the following key characteristics of carcinogens in exposed humans: “is genotoxic”, “induces epigenetic alterations”, “induces oxidative stress”, “induces chronic inflammation”, and “modulates receptor-mediated effects”.***

It should be noted that IARC criteria and classifications are focused on *scientific levels of certainty* which are more stringent than those focused on the “weight of the evidence”<sup>2</sup> which is often used in cases of workers compensation.

## GENERAL RISK FACTORS FOR CERVICAL CANCER

Several personal and environmental factors have been identified as risks for increasing the chances of developing cervical cancer<sup>4,5</sup>.

- **Age:** While the average age of diagnosis of cervical cancer is 50 years, it is most frequently diagnosed in women between the ages of 35 and 44. Over 20% of cases are found in women over the age of 65. It rarely develops in women younger than 20 years.
- **Family History:** If cervical cancer exists in a family, daughters or sisters may have a higher chance of developing the disease than individuals who are not related to someone with cervical cancer. Although the genetic link is not fully understood, some researchers believe the familial link may be a result of an inherent condition that impacts a woman's ability to fight HPV infection.
- **Diethylstilbestrol (DES):** Between 1938 and 1971, DES was a hormonal drug that prevented miscarriages and was given to a large number of women. Offspring of these women may develop clear-cell adenocarcinoma of the vagina or cervix at a rate higher than expected. This type of cervix-related cancer is extremely rare in women who were not exposed to DES.
- **Human Papillomavirus (HPV):** High-risk types of HPV are strongly associated with cervical cancer, usually as a result of chronic infection. HPV can infect surface skin cells

and is spread from skin-to-skin contact. One common method of spreading is through sexual activity.

- **Sexual Health and History:** Having many sexual partners increases the likelihood of cervical cancer as exposure to HPV. Becoming sexually active at a young age and sexual partners who are considered high risk also leads to a higher risk of cancer development. Contracting sexually transmitted infections, such as chlamydia also leads to an increased risk of cervical cancer.
- **Birth Control:** Long term use (considered five or more years) of oral contraceptives has been linked to cervical cancer. The correlation is positive and bidirectional - the risk of cancer increases the longer a woman uses oral contraceptives and the risk goes back down once she stops taking them. The risk of cervical cancer returns to normal within several years after ceasing.
- **Reproductive History:** Age at first full-term pregnancy and number of full-term pregnancies is linked to an increased risk of cervical cancer. Women who were younger than 20 when they had their first full-term pregnancy are at a greater risk than those who were 25 years or older. Women who have had three or more full-term pregnancies are at an increased risk of cervical cancer, although this is often considered a relationship to exposure to HPV, a known cause of cervical cancer.
- **Smoking:** Women who smoke are twice as likely to develop cervical cancer compared to non-smokers. Tobacco by-products damage the DNA of cervix cells, leading to the development of cervical cancer. Smoking also decreases the immune system, making it more susceptible to HPV.

## OCCUPATIONAL EXPOSURES RELATED TO CERVICAL CANCER

Occupational exposures relating to firefighting are well documented and widely impactful. During emergency response, especially on the fireground, firefighters are exposed to a range of chemicals that are known carcinogens. While firefighters are largely protected from carcinogen exposure during firefighting due to the use of personal protective equipment (PPE), including a self-contained breathing apparatus (SCBA), risk for exposure remains even after the air appears to be clear of smoke and debris. The lack of visible smoke leads many firefighters to shed their PPE and SCBA resulting in inhalation and dermal absorption of carcinogens. Additional routes of exposure include off-gassing of gear and secondary exposure through contaminated dust and debris.

One example of a known carcinogen firefighters are exposed to on the fireground is phthalates. This group of chemicals is found in plastics, improving their durability, flexibility, and stability. Commonly used in home building materials, phthalates can also be found in home decor items, such as flooring and blinds. Exposure to phthalates can proliferate cancer cells, especially gynecologically related cancers<sup>6</sup>. More specifically, there has been a documented relationship between phthalate exposure and cervical cancer<sup>7</sup>.

## FIREFIGHTING AND CERVICAL CANCER

While the literature exploring the relationship between firefighting and cancer is continually growing, there continues to be a dearth of information pertaining to firefighting and cervical cancer. Large-scale studies on cancer in firefighters often exclude female-related cancers or women firefighters due to their relatively low numbers. Nationally, women make up 3-5% of career firefighters<sup>8</sup>.

A cohort study of more than 36,000 Florida firefighters included over 2,000 female firefighters in their sample and examined cervical cancer<sup>9</sup>. Consistent with existing cancer research on male firefighters, the overall cancer risk is significantly increased in female firefighters (SIR=1.63, 95% CI=1.22-2.14). ***More specifically, they found female firefighters were more than 500% more likely (SIR=5.24, 95% CI=2.93-8.65) to develop cervical cancer than non-firefighting females in the general population.***

While the data on cervical cancer among firefighters is limited, this is likely due to the small sample sizes of women in existing studies.



## References

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