



## **2023 Urban Fire Forum (UFF) Position Statement**

### **Support for Research on Firefighter Reproductive Health**

Firefighters, the brave individuals who selflessly protect our communities, already besieged by inherent occupational hazards, now face unique and worrying risks related to their reproductive well-being. They are at increased risk for adverse reproductive health outcomes, which span from increased sperm abnormalities, and infertility for male firefighters, to increased birth defects in their children. Female firefighters are experiencing decreased ovarian reserve (a measurement of fertility), and increased utilization of infertility treatments, miscarriages, and pre-term births.<sup>1-7</sup> In non-firefighters, mental health conditions are associated with adverse reproductive outcomes.<sup>8-11</sup> In preliminary research with female firefighters, post-traumatic stress disorder (PTSD) is associated with a two-thirds reduction in ovarian reserve. However, very little is known about the specific exposures and mechanisms leading to these outcomes, let alone effective interventions to reduce reproductive risks.

Male firefighters exhibit sperm abnormalities compared to the reference values established by the World Health Organization, based on a small study in Australia.<sup>1</sup> Additionally, increased exposure to fire-related conditions has been associated with reductions in sperm volume, concentration, and sperm count. Notably, comprehensive research conducted in Denmark found that Male firefighters have increased rates of infertility compared to the general population. <sup>2</sup> For full-time firefighters, the risk of male-factor infertility was significantly increased by 1.46 to 1.53-fold compared with the general population, whereas the risk in volunteer firefighters was not significantly increased. Furthermore, a large study in the United States underscores the concerning trend of the increased rate of birth defects in the children of male firefighters.<sup>3</sup> This elevated risk encompasses a 3.1 times greater risk of total anomalous pulmonary venous return, a 2.2-fold increased risk of cleft lip, a 1.8-fold increased risk of cleft palate, and a 2.2-fold increased risk of transverse limb deficiency.

In the United States, female firefighters encounter heightened reliance on fertility treatments to achieve pregnancy compared with the general population.<sup>4</sup> When compared to non-firefighters on average they experience a 33% lower serum anti-müllerian hormone (AMH) level, indicative of a decreased number of remaining oocytes in the ovaries.<sup>5</sup> Firefighters have a 2.3-fold higher overall risk of miscarriage compared to US nurses, with an increased rate among volunteers compared with career structural firefighters.<sup>6</sup> Compared with non-firefighters, firefighters have a 1.41-fold higher increased risk of pre-term birth, with an increased rate among wildland and combination wildland/structural volunteer firefighters when compared to career firefighters.<sup>7</sup>

Firefighters exhibit elevated rates of PTSD compared to the general population, with a notably higher rate among female firefighters.<sup>12</sup> In a study supported by the Federal Emergency Management Agency (FEMA) involving over 300 recruit and incumbent female firefighters enrolled in the Fire Fighter Cancer Cohort Study (FFCCS) uncovered alarming figures. Among participants, a clinical diagnosis of depression, anxiety, and PTSD was self-reported in

15.0%, 18.2%, and 8.7% of study participants, respectively, with 11% of incumbents reporting PTSD. Notably, female firefighters with PTSD had a statistically significant 66% reduction in serum AMH compared to participants without PTSD. This disparity was even greater in firefighters 35 to 45 years of age, with an 82.5% reduction in AMH levels. While the mechanisms leading to these effects are not known, they may be linked to chronic inflammation in non-firefighters which is associated with PTSD and correlated with lower AMH levels<sup>13,14</sup>.

Firefighters are at increased risk of cancer, as determined by the International Agency for Research on Cancer (IARC),<sup>15</sup> the specialized cancer agency of the World Health Organization (WHO), which is part of the United Nations. Toxic chemicals that are known to increase the risk of cancer can also have other effects on firefighters, including adverse reproductive outcomes, which emphasizes the need for overall exposure reduction.<sup>16</sup>

Protecting the health and safety of our dedicated firefighters is one of a fire chief's most important responsibilities. Within this context, the Metropolitan Fire Chiefs Association and the NFPA's Urban Fire Forum recognize that additional research funding is required for the evaluation of reproductive health in firefighters, the interplay between behavioral health and reproductive health, and to identify effective interventions and policies to both improve mental health and maintain reproductive health. The NFPA's Urban Fire Forum firmly anticipates that research on reproductive and behavioral health in firefighters will yield essential information to guide fire departments and other fire service organizations in the implementation of effective preventative steps.

The Metropolitan Fire Chiefs Association expresses its general support for additional research on reproductive and behavioral health in firefighters and encourages all fire chiefs to take the following steps:

- **Support the communication and messaging strategies that underscore the importance of research on reproductive health in firefighters, including the effect of mental health conditions on reproductive health.**
- **Express political support for firefighter reproductive health in funding venues for medical research, with a focus on identifying effective preventive steps and policies.**
- **Encourage the participation of your fire departments and your individual members when the opportunity for research on reproductive health is available.**
- **Support the dissemination of educational tools for OB/GYN providers to increase awareness of reproductive health risks for those in the fire service.**
- **Encourage fire departments to build evidence-informed policies to support firefighters during pregnancy, maternity leave, return to work, and breastfeeding.**

## Sources

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# OB/Gyn Health Resource Guide for Firefighters

**Firefighters are required to work in extreme conditions that may impact their health. Below are considerations for OB/Gyns when making decisions about clearance for duty.**

The NFPA has determined essential job tasks for firefighters to be:

1. **Wearing personal protective gear (weighing on average 50 lbs.) and self-contained breathing apparatus (SCBA)(an additional 15-20 pounds)** while conducting firefighting tasks such as lifting and carrying heavy objects, advancing hoselines, using power tools, forcing entry through doors and/or windows, and making rescues in extreme temperatures for prolonged periods of time.
2. Wearing SCBAs with a positive pressure facepiece or HEPA filter that requires **increased respiratory workload**.
3. **Exposure to known and expected carcinogens** (e.g. benzene, PAHs, arsenic, asbestos) through inhalation and/or dermal absorption.
4. Potentially **climbing 6 or more flights of stairs** in full PPE carrying tools of approximately **20-40 lbs.**
5. Wearing encapsulating and insulated PPE that leads to **significant fluid loss** and can **elevate core temperature** to 102.2°F.
6. Wearing PPE during search and rescues **dragging a person (up to >200 lbs)** to safety.
7. Wearing PPE while **advancing hoseline approximately 150ft.** often upstairs or ladders.
8. Wearing PPE while **performing strenuous tasks** such as climbing ladders, crawling in dark, narrow or uneven services that may be icy or wet – and in instances that might include downed power lines and other hazards.
9. Performing tasks over a long period in an unpredictable environment that **may not have scheduled rest periods, meals, or hydration.**
10. **Operating fire trucks/other vehicles** with emergency lights and sirens.
11. Conducting critical, time sensitive work in **stressful and hazardous environments.**
12. **Communicating while wearing full PPE** in the presence of high background noise and poor visibility.
13. **Functioning as a team** where sudden incapacitation can result in mission failure, risk of injury or death.
14. **Working in shifts.** Career firefighters typically work in 24 or 48 hours shifts and volunteer firefighters typically are on call 24 hours a day, 7 days a week. The known implications of shift work (e.g. increased risk of cancer, cardiovascular disease, fertility issues, and miscarriage) are of concern.



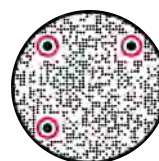
## PREGNANCY OUTCOMES

### Miscarriage

Firefighters were **2.3 times more likely to miscarry** than general population <sup>[1,2]</sup>. **Volunteer firefighters experienced higher risk of miscarriage** compared to career firefighters.

### Pre-term Labor

Approximately 12% of livebirths to female firefighters were < 37 weeks gestation. <sup>[3]</sup> Compared to the general US population, **female firefighters had 2.8 times the risk of pre-term birth.** Going to **light duty during the first trimester**, compared to the third trimester was associated with **37% reduction in risk of preterm birth** although the result was not statistically significant.



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## GYNECOLOGIC HEALTH & FERTILITY

**There has been limited research on the influence of firefighting on fertility and gynecologic health, but emerging research suggests that:**

- Female firefighters have **30% lower age-adjusted anti-müllerian hormone levels** compared to the general population<sup>[4]</sup>, which may influence fertility and age at menopause.
  - Self-reported **infertility and fertility treatment utilization is also high** among female firefighters, based on self-report<sup>[2]</sup>. Approximately 16% of female firefighters reported experiencing infertility, and 81% who experienced infertility utilized fertility treatment, which may be a marker of infertility severity.
- Male firefighters have been found to be 46% more likely to access IVF than their peers<sup>[25]</sup>.*

### Labor and Delivery Complications

Research has suggested that female firefighters are at elevated risk (RR:1.55) of labor and delivery complications.<sup>[6]</sup>

### Breastmilk

While initial data from a pilot study suggested an increase in carcinogens up until 72 hours post fire, a larger follow-up study by Jung et al. that measured polybrominated diphenyl ethers (PBDEs) and aryl hydrocarbon receptors (AhRs) found there was **not a difference in PBDEs or AhRs between pre-fire and 24, 48, or 72 hours post incident breastmilk<sup>[7]</sup>**. Further, there was not a statistically significant difference between the levels of PBDEs or AhRs among firefighters and non-firefighters. It should be noted that this study was limited to only these classifications of chemicals. PFAS - a concern for firefighters - has been found to be of concern in breastmilk.

## Child Health Outcomes

Preliminary evidence suggests offspring of male firefighter are at increased risk for birth defects<sup>[9]</sup>. They were 3 times more likely to have total anomalous pulmonary venous return, 80% more likely to be born with cleft palate, 2.2 times more likely to have cleft lip, and 2.2 times more likely to have transverse limb deficiency than non-firefighters.

These associations have not been studied in female firefighters.

## Cancer

**Firefighting has been classified as a Group 1 Carcinogen by the International Agency for Research on Cancer<sup>[9]</sup>**. Cancers with sufficient evidence for elevated risk in firefighters include bladder and mesothelioma. Cancers with limited evidence for elevated risk in firefighters include colon, melanoma, and non-Hodgkins lymphoma.

While data is limited due to small sample sizes, there is **some evidence that women firefighters may be at increased risk for breast, cervical, and ovarian cancer** due to the risks of the job.

## Risk Considerations During Pregnancy





	Trauma	Chemicals	Other Risks
<b>First Trimester</b> 	fetal trauma is <b>mitigated</b> due to the location of the uterus	Avoid exposure to heavy metals, hydrocarbons, carbon monoxide	Heat, noise, radiation, shift work, infections
<b>Second Trimester</b> 	fetal trauma is <b>increased</b> due to the intra-abdominal position after 13 weeks	Avoid exposure to heavy metals, hydrocarbons, carbon monoxide	Heat, noise, radiation, shift work, infections
<b>Third Trimester</b> 	fetal trauma is <b>increased</b> due to the intra-abdominal position after 13 weeks	Avoid exposure to heavy metals, hydrocarbons, carbon monoxide	Heat, noise, radiation, shift work, infections
<b>Lactation</b> 	No additional risk	Avoid exposure to heavy metals, hydrocarbons, carbon monoxide	Pumping and dumping considerations post-fire

Table adapted from NFPA 1582, Appendix C, Table C.7