

Females, Fire, and Families: Understanding the Role of Health and Wellness

Maria Koeppel

Center for Fire, Rescue & EMS Health Research
NDRI-USA, Inc.



Overview

- Women in the fire service
- Reproductive health
- Physical health
- Discrimination & harassment
- Mental health
- Alcohol use
- Cancer



Women in Emergency Services

General population: 50.5%

Emergency Medical Services: 35.5%

Military: 18%

Police: 13%

Fire: 4%

Reproductive Health: The Concerns

- Chemical, biological, radiologic exposures
- Shift schedule
- Extreme physiological strain of emergency response
- High ambient temperature and noise



Reproductive Health: The Job



- Reporting pregnancy
 - At the end of 1st trimester
- Restricting duties
 - Do not restrict until 2nd or 3rd
 - 10% never restrict duties
- Department policies
 - 58% have pregnancy policy
 - 66% have maternity leave policy

Reproductive Health: The Impact



- Miscarriage rates
 - 2x national average
 - Volunteer > Career
 - Wildland/WUI > Career
 - Risk increases with subsequent pregnancies
- Preterm birth rates
 - Higher than national rate
- Other outcomes

Recently Released

SCAN CODE TO DOWNLOAD:



Reproductive Health & the Fire Service

DANGERS OF THE JOB

- Toxic products of combustion: CO, PAHs, PFAS, etc.
- Certain chemicals and metals may be absorbed faster by pregnant women
- Some toxins more dangerous to the fetus than to the mother
- Circulation unregulated during pregnancy so the fetus is at increased risk
- Intense thermal environment

Potential CONSEQUENCES

Potential	Consequences
Infertility/reduced fertility	<ul style="list-style-type: none"> Increased rate of infertility among women FFs (11% for first pregnancies vs. 5.0% for non-fire pregnancies) Reduced sperm count, reduced sperm motility, and sperm morphology Exposure to heat may lead to delayed conception Increased rates of infertility among FFs (26%) compared to national average (15%)
Menstrual/ovulatory cycle disorders	<ul style="list-style-type: none"> Different rates of the menstrual cycle and oral contraceptive use can impact fire service women's menstrual cycles Shift work (including evening, night, or irregular shifts) can result in altered menstrual cycle length, increased menstrual pain, and changes in duration and severity of menstrual bleeding, which can result in changes in hormone secretion
Sex-hormone imbalance	<ul style="list-style-type: none"> Non-smoking FFs were more likely to experience hormonal disturbances and respiratory illness than nonsmoking nonfirefighters Hormone <ul style="list-style-type: none"> Non-smoking FFs were 2.5 times higher compared to national average (21.9 vs. 15.4%) Exposure to smoke from cooking associated with elevated risk of miscarriage? These may also show an increased risk of heart attack among career FFs (deutanemic FFs had 42 times the risk of miscarriage?) Among white and WEL volunteers, 147 times more likely to have miscarriage than career FFs
Birth	<ul style="list-style-type: none"> Male genital anomalies associated with neural tube defects during pregnancy <ul style="list-style-type: none"> Exposure to carbon monoxide and high temperatures may increase the risk of birth defects
Child development disorders	<ul style="list-style-type: none"> Child development disorders <ul style="list-style-type: none"> Concerns about the long-term effects of environmental pollutants on child development
Birth defects	<ul style="list-style-type: none"> Male genital anomalies associated with neural tube defects during pregnancy <ul style="list-style-type: none"> Exposure to carbon monoxide and high temperatures may increase the risk of birth defects
Premature birth	<ul style="list-style-type: none"> Premature birth <ul style="list-style-type: none"> FFs have a higher rate of pre-term birth compared to national average (15.7% vs. 13.8%) Shift work has been connected to an increase in pre-term labor Among white and WEL volunteers, 147 times more likely to have preterm birth Among white and WEL, volunteers 2.6 times more likely to experience preterm birth Exposure to air pollution & non-occupational shift work during pregnancy associated with increased risk of pre-term birth
Low birth weight	<ul style="list-style-type: none"> Low birth weight <ul style="list-style-type: none"> Load noise may result in lower birth weight and increased risk of infant death
Work restrictions	<ul style="list-style-type: none"> Work restrictions <ul style="list-style-type: none"> Timing of when and how much to start shift work Women who started shift work during the 2nd trimester appeared to have a higher risk of preterm birth compared to women who did not work restriction in the 3rd trimester or who didn't restrict work at all

Solutions & Next Steps

- Check out NFPA 1832, Section 9.12, 2020 ed.
- Limit exposures with appropriate decontamination (see NFPA 1838)
- Take this guide and discuss options with your physician
- Know your department's policy or suggest adding one if there isn't one already

FOR MORE INFORMATION & REFERENCES,
Scan the QR code with
your phone ➔ 

Physical Health: Obesity

Career women: 15.6%
Volunteer women: 31.6%

Career men: 33.5%
Volunteer men: 43.2%

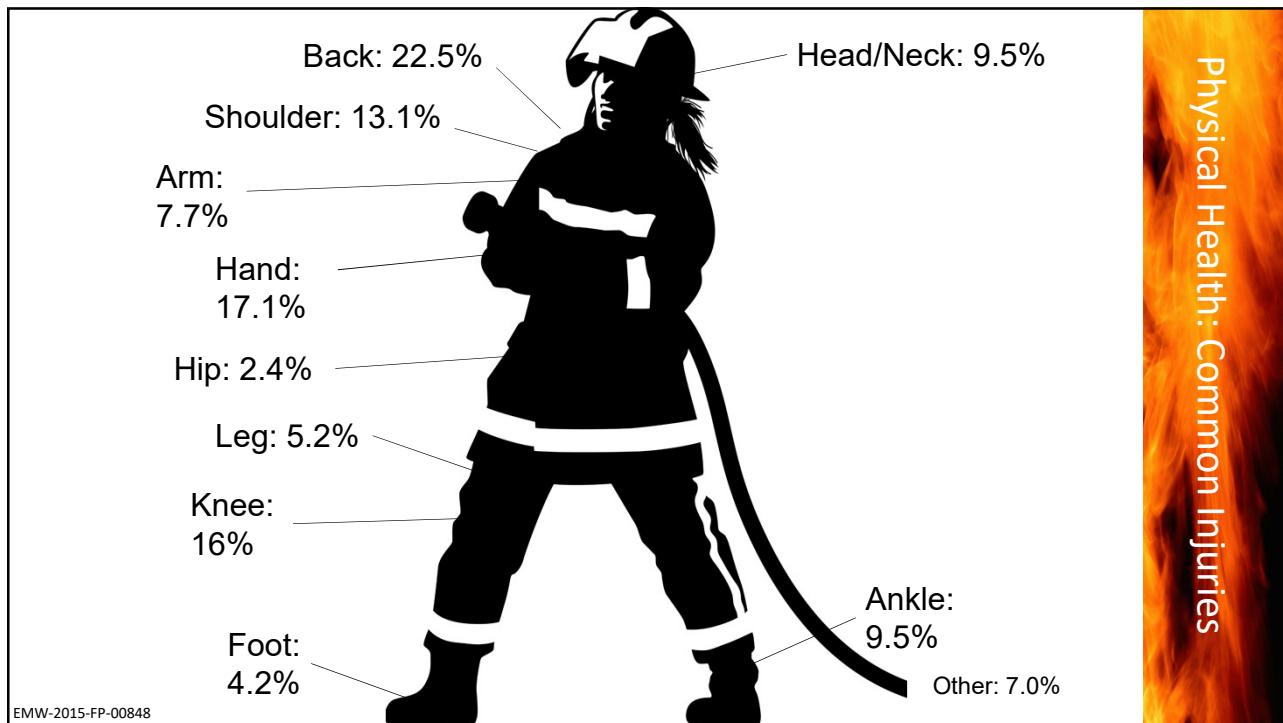
General population: 41.1%



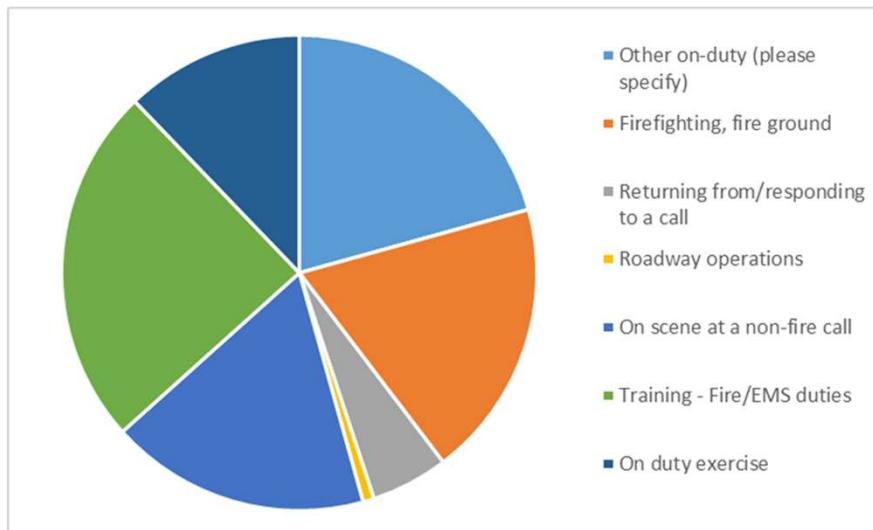
Physical Health: Predictors of Obesity

- **Age:** those in their 40's & 50's **TWICE** as likely to be obese compared to those <29
- **Years of Service:** those with >31 years **FOUR TIMES** as likely to be obese than <10 years experience
- **Race:** Minorities **42%** more likely to be obese than Caucasian FFs
- **Rank:** Chiefs & Company Officers **more likely** to be obese than FF/Medics
- **PTSD & Depression:** **significantly related** to obesity

Physical Health: Common Injuries



Physical Health: Type of Duty



Physical Health: Injuries



- Impact of PPE
- Training differences
- Fitting in
- Predictors: race, health, BMI, substance use, mental health

Discrimination and Harassment



69% experienced differential treatment based on gender

24% said their gender created barriers to career advancement



20% said "I have seen my supervisor's authority challenged because of their gender"



23% said promotions are not decided upon fairly



20% said the hiring process does not fairly select & hire applicants

15% said staff in their dept are treated differently based on their sexual orientation

Discrimination and Harassment

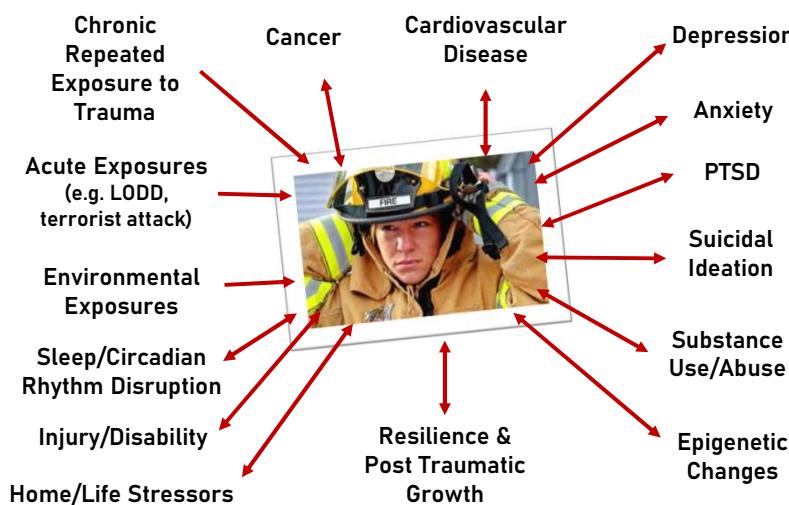
I have experienced incidents because of my gender involving:	Current Study % Yes
Shunning/isolation	40.8
Privacy in showers, dormitory, or when changing clothes	29.3
Verbal harassment	37.4
Pornography	25.4
Sexual advances	36.9
Dormitory accommodations	33.4
Training denial or differences	20.8
Station assignments	24.4
Hazing	16.8
Hostile notes, cartoon, or other written material	12.9
Meal-time related difficulties	11.0
Assault	5.2
These incidents continue in the present	20.5

Discrimination and Harassment: The Impact

Women who experienced high severity of harassment and discrimination:

- **300% more likely to suffer from depression**
 - **150% more likely to suffer from PTSD**
 - **2 times more likely to have driven while intoxicated**
 - **40% increased number of poor health days**
 - **120% more likely to report one injury in the last 12 months**
 - Report higher rates of work stress
 - Less likely to recommend becoming a firefighter
- ...compared to women who experienced little or no harassment or discrimination

Mental Health: The Job Stress



Mental Health: The Outcomes

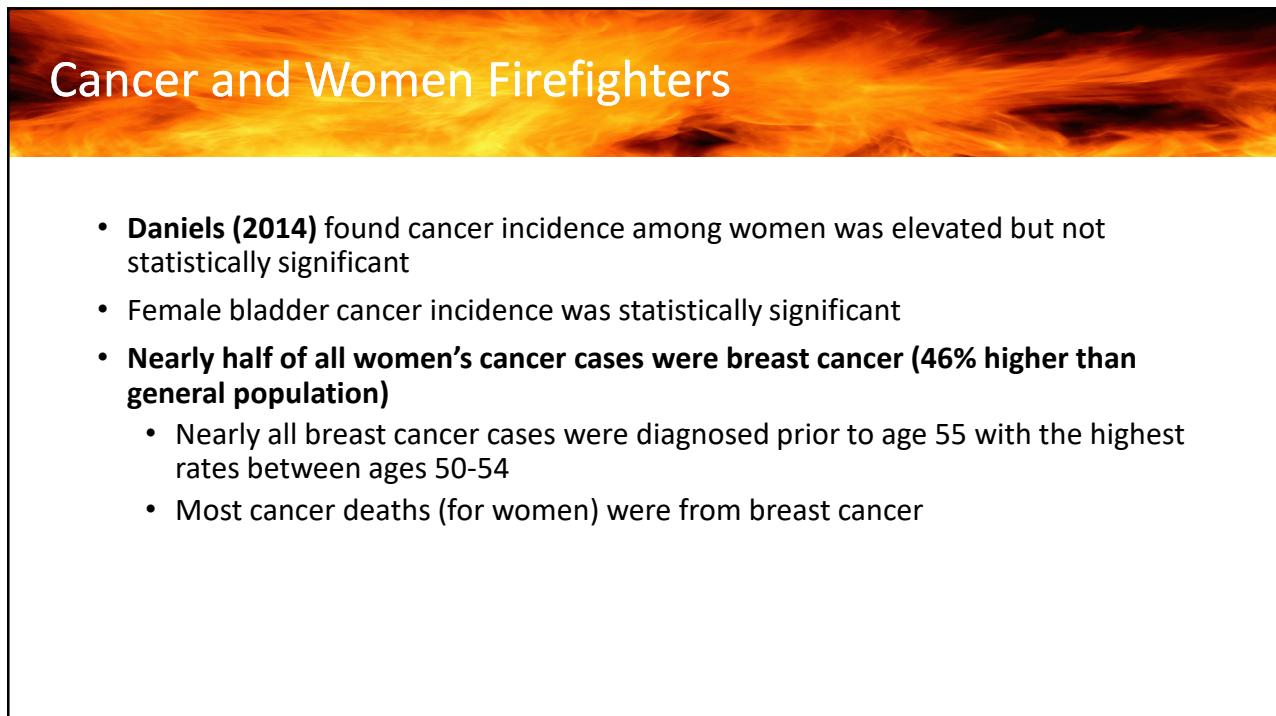
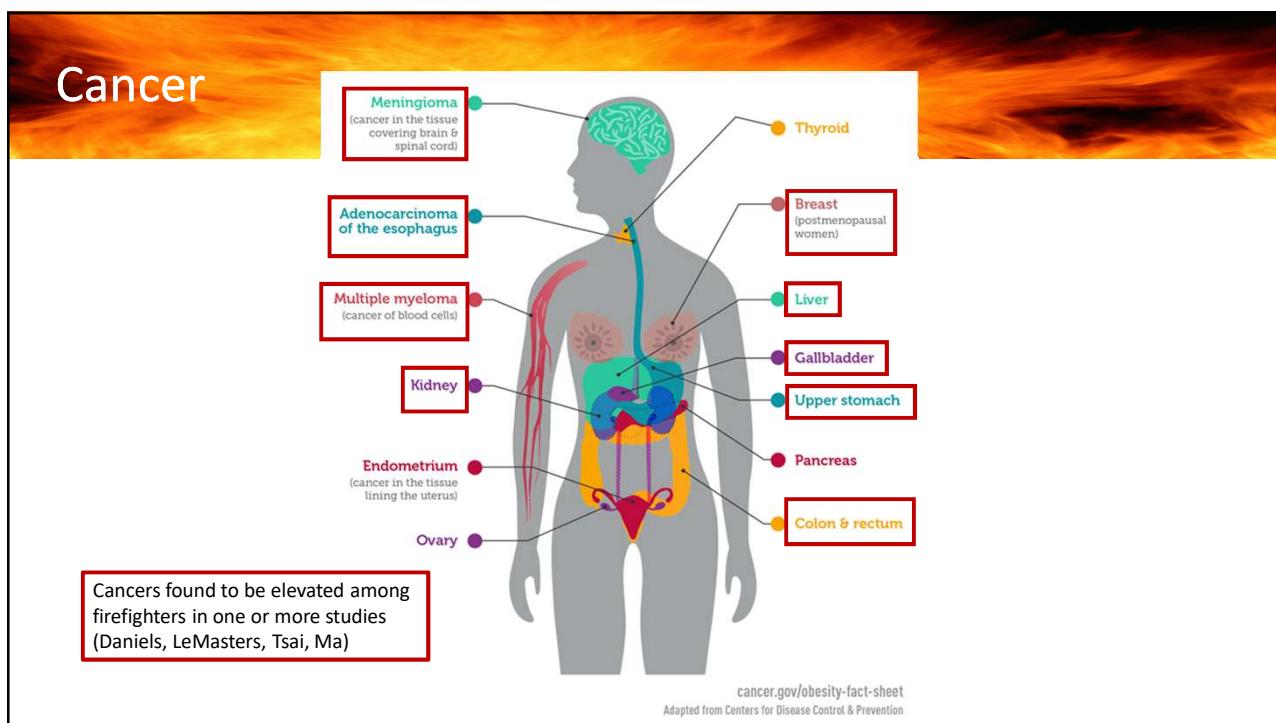


- Depression: 20% vs 27%
 - Repeated exposure to trauma
 - Sleep
 - Natural disasters
- PTSD: 6x higher than general pop
 - Women > men
 - Sleep and depression
- Suicide:
 - Suicidal ideations 13.5% vs. 46.8%
 - Plans: 3.9% vs. 19.2%
 - Attempts: 4.6% vs 15.5%

Alcohol Use and Women Firefighters

- 40% reported binge drinking in the past 30 days
- 4.3% reported driving while intoxicated
- 16.5% screened positive for problem drinking
- Problem drinkers were 2.5x more likely to experience depression or PTSD
- Risk of injury increased 40%

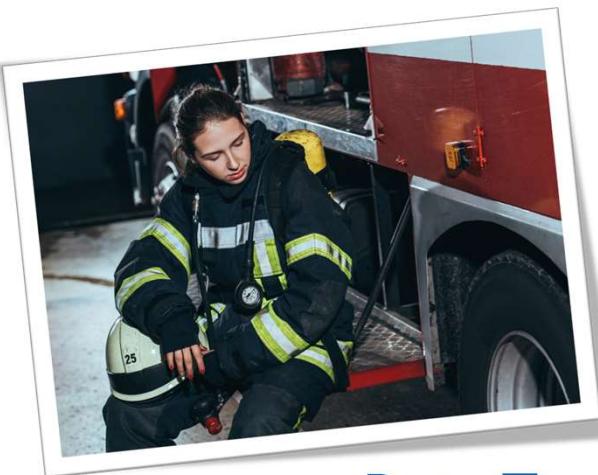




Cancer and Women Firefighters

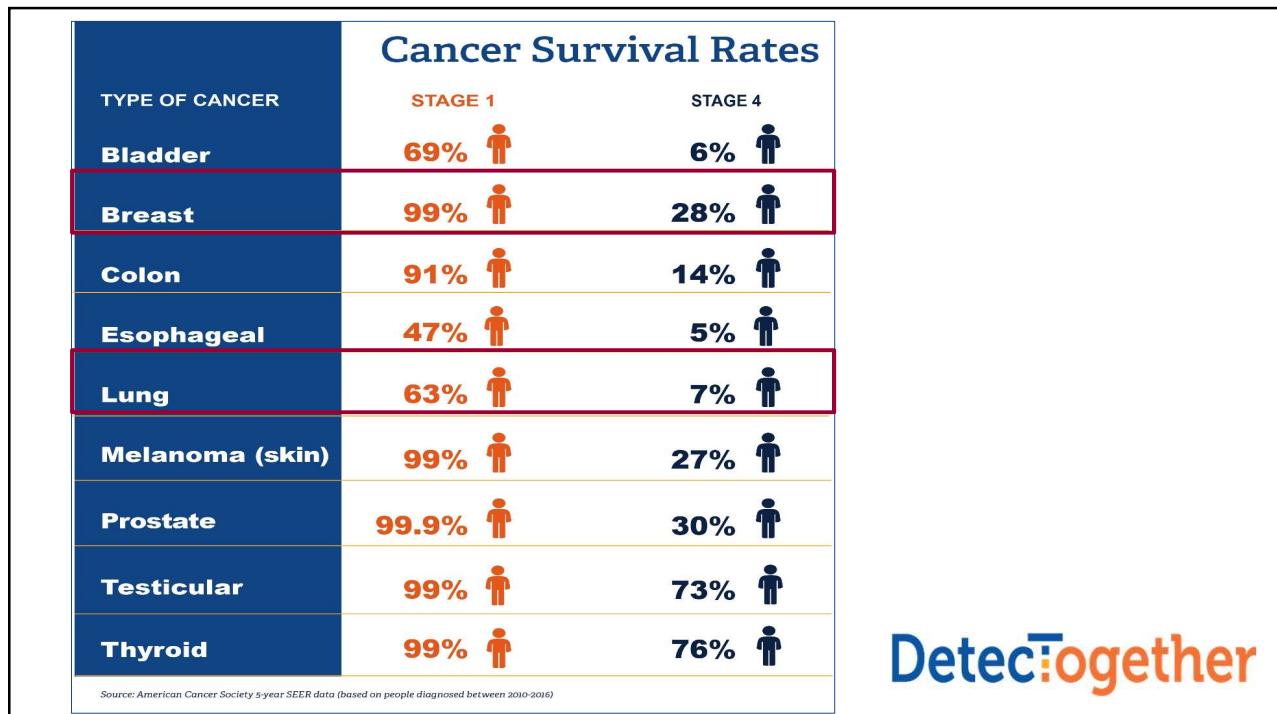
- Lee (2019) found female FFs had an elevated risk of **brain and thyroid cancers and melanoma**
- Ma and colleagues (2006) found female FFs had significantly increased incidence rates of **overall cancer, cervical and thyroid cancers and Hodgkin's disease**

Most Common Cancer Symptoms



A **subtle AND persistent** health change lasting 2 weeks or more

DetectTogether



Females, Fire, and Families: Understanding the Role of Health and Wellness

Maria Koeppel

Email: Koeppel@ndri-usa.org

