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Particulate exposure, respiratory protection and ill-health following the Fort McMurray fire of May 2016

Abstract *

Background

On 3rd May 2016, fire engulfed the city of Fort McMurray, Alberta, Canada. Structural and wildland firefighters from throughout the province were deployed to the fire.

Methods

In weeks 2-16 after the fire started 355 firefighters from 13 services completed exposure and health questionnaires and underwent spirometry: all 3200 deployed firefighters are being contacted for follow-up through data linkage. In two forces (Strathcona and Fort McMurray) blood and urine samples were collected, at Strathcona close to return from engagement and again 4 months later. Serum from 247 samples was assessed for 41 inflammatory biomarkers. Alberta Environment provided estimates of ambient PM_{2.5} concentration by location for each day in May/June. Firefighters gave information on respiratory protective equipment (RPE), dates deployed, location in the city and hours worked. A cumulative PM_{2.5} index was estimated for each firefighter.

Results

Those heavily exposed on the cumulative index were found to have more respiratory symptoms and health complaints and lower FEV₁%. Principal component analysis of inflammatory markers produced one factor that proved to be closely related to exposure. This score was highest in the Fort McMurray firefighters who had experienced many deployments and was lower, suggesting recovery, when re-measured in Strathcona 4 months after deployment. Ongoing analysis is designed to assess whether use of RPE reduces scores on this biomarker, having allowed for external exposure and time since deployment.

Conclusion

Respiratory ill-health was related to high exposure. The study provides an unusual opportunity to assess the impact of RPE under extreme working conditions.

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