

EPH51: The Health and Economic Burden of Bushfires in Australia Between 2021 and 2030: A Modelling Study

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1 Background

- Bushfires are a natural part of Australia's ecosystem, but the frequency and severity of bushfires in Australia has been increasing, due in part to climate change (1).
- The health and environmental impacts of bushfires results in substantial economic costs to society.

Aims

- The present analysis sought to estimate the burden of bushfires in Australia over ten years from 2021 to 2030 inclusive.

2 Methods

- A dynamic life table modelling with yearly cycles was used to simulate follow-up of the entire Australian population over ten years from 2021 to 2030.
- Model followed the number of deaths occurring in each of the ten years, as well as the total years of life lived by the whole cohort. As the model was dynamic in nature we assumed that deaths occurred half-way through a cycle. The population in the model was updated each year by considering births, deaths and net inward migration.

Table 1. Input parameters used for the model and their respective variation and distribution.

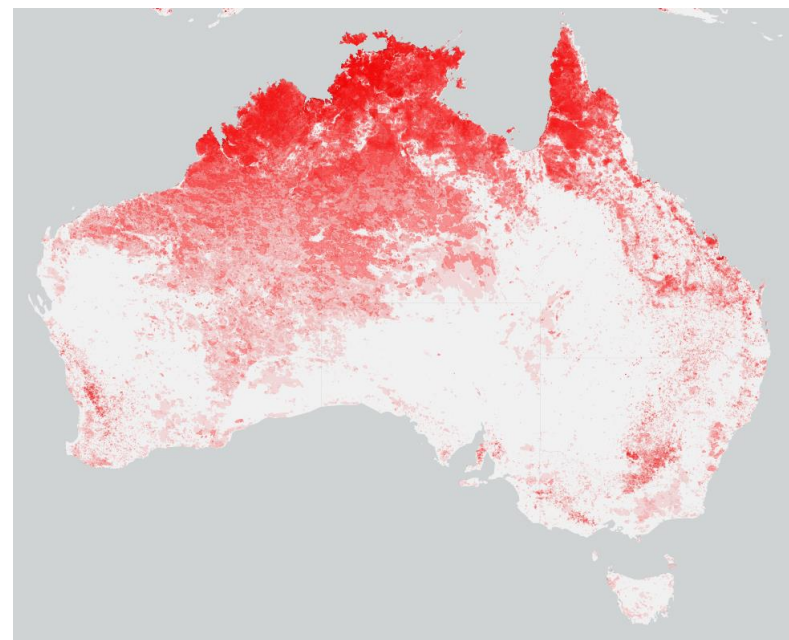
Parameters	Base Case	Lower limit†	Upper limit†	Distribution for PSA	Source
Health burden†					
Deaths directly due to bushfires	34	24	44	Lognormal	Biddle et al, Australian National University
Excess deaths (any cause)	417	153	680	Lognormal	Borchers-Arriagada(1)
Respiratory hospital admissions	1124	211	2047	Gamma	Borchers-Arriagada
Cardiovascular hospital admissions	2027	0	4252	Gamma	Borchers-Arriagada
Asthma ED attendances	1305	705	1908	Gamma	Borchers-Arriagada
Healthcare costs					
Deaths directly due to bushfires	\$0	\$0	\$0		
Excess deaths (any cause)	\$6,973	\$4,881	\$9,065	Gamma	AR-DRG
Respiratory hospital admissions	\$6,679	\$4,675	\$8,682	Gamma	AR-DRG
Cardiovascular hospital admissions	\$7,175	\$5,022	\$9,327	Gamma	AR-DRG
Asthma ED attendances	\$501	\$351	\$651	Gamma	Asthma Australia
VSLY	\$222,000	\$155,400	\$288,600	Gamma	Dept of the Prime Minister and Cabinet

- The analysis considered both a healthcare and a societal perspective. A 5% annual discount rate was applied to all costs incurred and outcomes from 2022 onwards.
- Years of life lost to bushfire-related deaths were calculated by creating a cohort of individuals who died, and simulating their follow-up as if they had not died due to bushfires. Rather, they experienced sex-and-age specific mortality as per the general population. The value of statistical life lost was derived from multiplying each year of life lost by the value of statistical life year (\$222,000).
- Number of sensitivity, scenario, and probabilistic sensitivity analysis were undertaken.

3 Results

- Over the ten years from 2021 to 2030 inclusive, the modelled analysis predicted that 2418 [95% Confidence interval (CI) 2412 - 2422] lives would be lost to bushfires (Table 2).
- Healthcare costs arising from deaths for smoke-related conditions, hospitalisations for cardiovascular and respiratory conditions, and emergency department presentations with asthma amounted to \$110 million [95% CI 91 - 129 million] (discounted).
- The impact on Gross Domestic Product totalled \$17,214,949 million [95% CI 17,214,948 - 17,214,951 million].
- Value of statistical life, \$1.9 billion [95% CI: 1.5-2.2] (discounted) was lost (Table 2).
- If a hypothetical intervention or prevention strategy were able to reduce the impact of future bushfires by 10%, there would be savings of over \$11 million in healthcare costs and \$1.7 billion in GDP.

NASA MODIS burned area detections from June 2001 to May 2019 showing regions affected by fires in Australia in red



Data captured from <https://firms.modaps.eosdis.nasa.gov/map/>

Table 2. Predicted future health and economic burden of bushfires in Australia.

Year	Deaths	YLL	Healthcare costs	Impact on GDP	VSL lost
2021	225	113	\$12,790,036	\$1,995,428,826	\$32,531,675
2022	229	323	\$12,379,178	\$1,931,329,080	\$93,229,045
2023	233	515	\$11,975,593	\$1,868,363,970	\$148,595,206
2024	237	689	\$11,579,812	\$1,806,616,448	\$198,946,685
2025	240	847	\$11,191,478	\$1,746,030,802	\$244,581,388
2026	244	990	\$10,811,060	\$1,686,680,240	\$285,781,587
2027	247	1119	\$10,438,169	\$1,628,503,856	\$322,813,479
2028	251	1233	\$10,075,360	\$1,571,900,372	\$355,929,921
2029	254	1335	\$9,722,376	\$1,516,829,837	\$385,376,384
2030	257	1425	\$9,379,051	\$1,463,266,235	\$411,391,010
Total	2418	8590	\$110,342,112	\$17,214,949,665	\$1,907,058,754
Lower 95% CI	2,412	8,573	\$91,878,771	\$17,214,948,303	\$1,553,090,000
Upper 95% CI	2,422	8,606	\$129,622,440	\$17,214,951,077	\$2,297,050,000

4 Conclusion

- The health and economic burden of bushfires in Australia looms large even if based on a conservative estimation. This underscores the importance of actions to mitigate bushfire risk.
- This model provides a tool for budget allocation and prevention activities directed to suppress bushfires in Australia.