

## Preliminary Assessment: Project Brief 160914 – 19 September 2014

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### Review of Birth Deaths & Marriages Victoria (BDMV) mortality data for the Latrobe Valley and the time of the Hazelwood coal mine fire in Morwell

Our review of the BDMV mortality data (2009-14) for the Latrobe Valley shows that an excess number of deaths occurred in the period January to June 2014, compared to the period January to June 2009-13, but that no conclusion can be drawn from these data as to the reason for this excess mortality. There are large uncertainties around the estimates, due to the small population size under review, and the fact that we have no information about the underlying age or sex distribution or population movements over time within the postcodes concerned. We have shown these results using the following analyses, looking at deaths per month/per postcode, deaths per month/all postcodes, and annual deaths/all postcodes:

The **standard mortality ratios** and associated confidence intervals show that 2014 mortality exceeded the period 2009-13 by 15% extra deaths, that is an extra 1.87 deaths, per month per postcode (see Table 1). The comparison of the period February-March 2014 with February-March 2009-13 reveals 20% extra deaths, that is an extra 2.3 deaths, per month per postcode. However, these data cannot be interpreted without considering the associated wide confidence intervals, which reflect the uncertainty of these estimates.

The **graphic representation** of deaths by month and associated exact confidence intervals around these observations over the period 2009-14 shows that 2014 deaths are within the range observed for the previous five years, with postcode data combined for analysis (Figure 1).

The monthly number of deaths was approximately normally distributed, so the data were analysed using **linear regression**. There was no evidence of serial autocorrelation of the residuals. 'Exposure' for this analysis was defined in three ways:

1. All of 2014 versus all other years;
2. February and March 2014 versus all other months;
3. Feb/March 2014, Jan/April/May/June 2014 versus all other months.

The data are consistent with increased numbers of deaths in 2014, but the evidence is weak and the confidence intervals very wide (see Table 2).

The 2009-13 data were modelled in addition using **Poisson regression** (for categorical data) and the 2014 period deaths were predicted using this model (see Figure 2). This model shows that there are 37 excess deaths overall in the 2014 period (339 observed for 2014, over the 302 annual average predicted by the model). The excess deaths observed occurred in March and May of 2014.

### Limitations

We cannot conclude that the excess 2014 mortality is due to any single cause, or whether it has occurred by chance alone. We did not take external factors such as local weather conditions into account in the analysis. Analysis of the cause of deaths for this period would be required to explore common risk factors. We have no information on the underlying age/sex distribution of these localities, or of the recent demographic changes in these communities, both trends that could underlie the excess mortality seen in 2014.

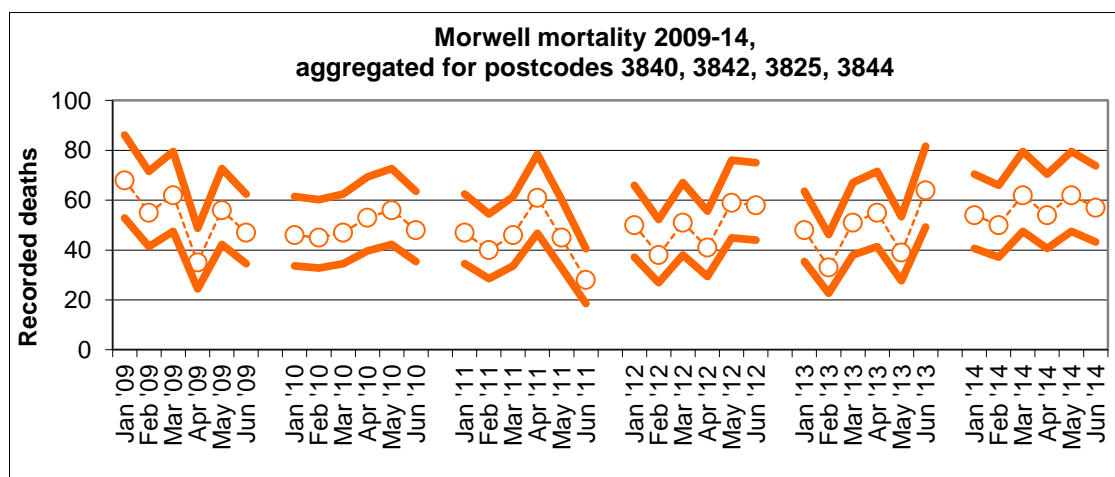
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**Table 1. Standardised Mortality Ratios (SMR) and associated 90% confidence intervals for Morwell mortality 2009-13 compared to 2014<sup>1</sup>**

	Average Deaths per month/postcode 2009-13	Average Deaths per month/postcode 2014	SMR	90% confidence interval
<b>January-June</b>	12.27	14.13	115.15	57.69 to 1877.59
<b>February-March</b>	11.7	14.0	119.65	78.16 to 267.59

**Figure 1. Monthly mortality and 95% associated confidence intervals for aggregated Morwell postcodes, 2009-14**



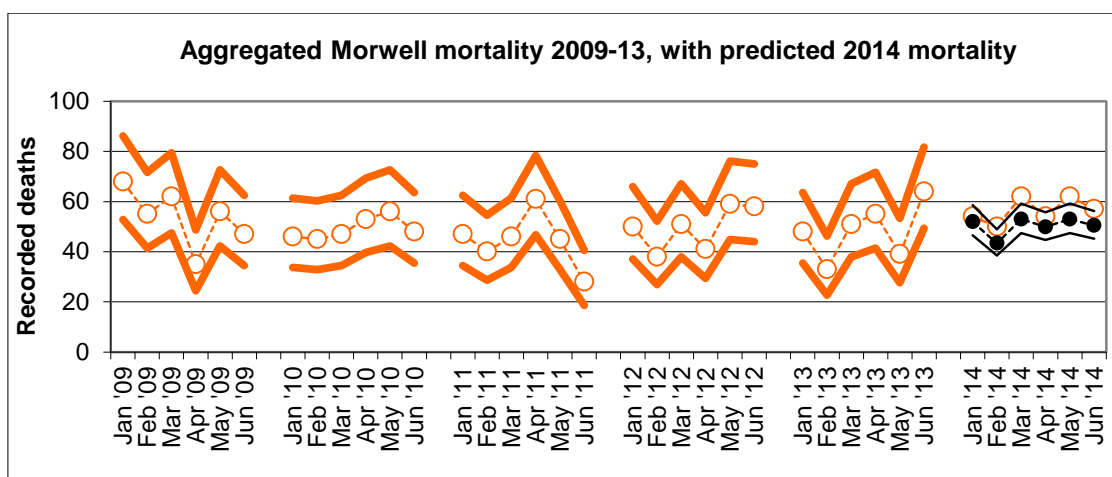
<sup>1</sup> Confidence interval of SMR from H.J. Motulsky, Intuitive Biostatistics, 3<sup>rd</sup> ed., Oxford University Press, 2014; following the method of E.C. Fieller, Suppl to J R Stat Soc, 7:1-64, 1940.

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**Table 2. Predicted additional monthly deaths during 2014 from linear regression analysis, for aggregated postcodes**

Time period	Predicted additional deaths per month, all postcodes		p-value	R <sup>2</sup>
	Number	95% confidence interval		
Jan-June 2014 vs Jan-June 2009-13	7.4	-0.69, 15.55	0.07	0.09
Feb-Mar 2014 vs Feb-Mar 2009-13	9.2	-5.48, 23.88	0.19	0.16

**Figure 2. Monthly mortality and 95% associated confidence intervals for Morwell postcodes, 2009-13, with Poisson regression predicted values for 2014**



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