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TRANSCRIPT OF PROCEEDINGS

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**The attached transcript, while an accurate recording of evidence given in the course of the hearing day, is not proofread prior to circulation and thus may contain minor errors.**

2015/16 HAZELWOOD MINE FIRE INQUIRY

MORWELL

THURSDAY, 3 SEPTEMBER 2015

THE HONOURABLE BERNARD TEAGUE AO - Chairman

MRS ANITA ROPER - Board Member

PROFESSOR JOHN CATFORD - Board Member

MR PETER ROZEN - Counsel Assisting

MS RUTH SHANN - Counsel Assisting

MR RICHARD ATTIWILL QC - State of Victoria

MR ANTHONY NEAL QC - GDF Suez

MS MARITA FOLEY - GDF Suez

MR CHRIS BLANDEN QC - Dr Rosemary Lester

MS KATE BURGESS - Dr Rosemary Lester

MS MELANIE SZYDZIK - Voices of the Valley

MS MEGAN FITZGERALD - Voices of the Valley

MR RAY TERNES - Voices of the Valley

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1 <BRUCE CONRAD ARMSTRONG, recalled:

2 <IAN ROBERT GORDON, recalled:

3 <ADRIAN GERARD BARNETT, recalled:

4 CHAIRMAN: Yes, Mr Rozen.

5 MR ROZEN: Mr Chairman and members of the board, good morning.

6 I apologise for the delay in starting this morning. We've  
7 had a few technical problems but they've been overcome now.

8 If I can just confirm the state of play. Everyone will  
9 have noticed that there are two experts in the hot tub,

10 where yesterday there were three. I understand the

11 position with Associate Professor Barnett is that he had to  
12 return home to Queensland to attend to a family difficulty

13 and he did that yesterday afternoon, but we've been able to  
14 contact him by phone. Can I just confirm, Associate

15 Professor Barnett, that you can hear me.

16 ASSOC. PROF BARNETT: I can hear you loud and clear.

17 MR ROZEN: Thank you very much. Dr Flander, you can also hear  
18 me from Melbourne?

19 DR FLANDER: Yes, thank you.

20 MR ROZEN: Thanks very much. Professor Armstrong, if I could  
21 commence by dealing with what is an administrative matter  
22 that I neglected to deal with yesterday and should just  
23 tidy up now. In the folder in front of you, behind tab 15  
24 - just while you're finding that, for the benefit of the  
25 parties, the document I'm going to refer the witness to is  
26 EXP.0008.001.0009. Do you see there, professor, a letter  
27 dated 25 August 2015 addressed to you from Ms Stansen, the  
28 principal legal adviser for the Inquiry?

29 PROF. ARMSTRONG: (indistinct)

30 MR ROZEN: There is a problem with hearing Professor Armstrong,  
31 apparently. Professor Armstrong, you've identified the

1 letter at - the final digit is 5, is that right?

2 PROF. ARMSTRONG: Yes.

3 MR ROZEN: Is that a letter that was sent to you, inviting you  
4 to the meeting of experts on 31 August 2015 and to give  
5 evidence in this public hearing?

6 PROF. ARMSTRONG: Yes, it is.

7 MR ROZEN: I tender that letter as part of Exhibit 30, if the  
8 board pleases. Professor Gordon, in the same folder there  
9 should be, behind tab 15, a letter to you of the same date,  
10 25 August 2015. Do you see that?

11 PROF. GORDON: Yes, I do.

12 MR ROZEN: Can you confirm for us that is a copy of a letter  
13 that was sent to you, also inviting you to the meeting and  
14 to give evidence at the public hearing?

15 PROF. GORDON: Yes, that's right.

16 MR ROZEN: I tender that letter also as part of Exhibit 30.

17 #EXHIBIT 30 - (Addition) Letter to Professor Gordon dated  
18 25/8/15.

19 MR ROZEN: Dr Flander, just for completeness - I know you don't  
20 have the letter in front of you - but have you been  
21 following the questions that I've just been asking your  
22 colleagues? Did you also receive a letter dated 25 August  
23 2015, inviting you to attend the meeting and to give  
24 evidence at the public hearing?

25 DR FLANDER: I do have the letter in front of me and I did  
26 receive it, thank you.

27 MR ROZEN: I'll ask that that be added to Exhibit 30, please.

28 #EXHIBIT 30 - (addition) Letter to Dr Flander dated 25/8/15

29 MR ROZEN: Finally, Associate Professor Barnett, I'm hoping you  
30 can still hear us.

31 ASSOC. PROF BARNETT: Yes.

1 MR ROZEN: Did you also receive a letter of that date, 25 August  
2 2015, with the same content?

3 ASSOC. PROF BARNETT: Yes.

4 MR ROZEN: I don't suppose you have got it in front of you, by  
5 any chance, do you, associate professor?

6 ASSOC. PROF BARNETT: Yes, "This letter confirms arrangements  
7 made recently" is how it starts.

8 MR ROZEN: If I could ask for that also to be added to  
9 Exhibit 30.

10 CHAIRMAN: Yes.

11 #EXHIBIT 30 - (Addition) Letter to Associate Professor Barnett  
12 dated 25/8/15.

13 MR ROZEN: The final tendering matter that I should deal with at  
14 this stage concerns correspondence that passed between the  
15 ABC and Voices of the Valley on the one hand and Associate  
16 Professor Barnett on the other. These emails have been  
17 produced overnight by Associate Professor Barnett, at the  
18 request of the legal representatives of GDF Suez, and what  
19 we have, although I don't physically have it in front of  
20 me, but the parties have been provided with copies of  
21 various emails. Associate Professor Barnett, can you  
22 confirm that you located and provided several emails of  
23 that description to the Inquiry since you gave your  
24 evidence yesterday?

25 ASSOC. PROF BARNETT: I did, yes.

26 MR ROZEN: I seek now to tender that as a bundle of emails of  
27 that description, if that could perhaps be the next  
28 exhibit.

29 CHAIRMAN: Yes.

30 #EXHIBIT 31 - Bundle of emails

31 MR ROZEN: With those matters being dealt with, if I could

1 address my first question to you, Professor Armstrong, and  
2 if I could do so by reference to the joint report, which is  
3 Exhibit 30, which you'll find also behind tab 15. If you  
4 could have that in front of you, please.

5 PROF. ARMSTRONG: Yes, I have it in front of me.

6 MR ROZEN: The questioning yesterday was really principally  
7 directed to what is identified in the joint report, and  
8 also in your individual report, as question 1, "Was there  
9 an increase in mortality in Latrobe Valley during the coal  
10 mine fire in 2014?", do you agree with that?

11 PROF. ARMSTRONG: Yes.

12 MR ROZEN: As you observed yesterday, so far as this Inquiry is  
13 concerned, that is really the first part of the question  
14 and that question is answered in the joint report by the  
15 general agreement of those who participated in the meeting  
16 in the conclusions that are listed under that question,  
17 would you agree with that?

18 PROF. ARMSTRONG: Yes.

19 MR ROZEN: If I could turn then to the second question, which is  
20 what environmental exposures might have increased mortality  
21 in Latrobe Valley during the coal mine fire in 2014. You,  
22 in your report, and the group of experts, in the joint  
23 report, have identified four possible exposures that might  
24 have had that result, is that right?

25 PROF. ARMSTRONG: Yes.

26 MR ROZEN: The four exposures you've identified are the  
27 associated bushfires, fine particle air pollution, carbon  
28 monoxide air pollution and high temperature.

29 PROF. ARMSTRONG: Yes.

30 MR ROZEN: I think I understood your evidence yesterday to be  
31 that in answering the second part of this question, that is

1 the environmental exposures, the statistical information  
2 provides part of the answer but not the whole answer.

3 PROF. ARMSTRONG: What the statistical information provides, and  
4 we discussed yesterday, really is an answer to the question  
5 as to whether or not there is an increase in mortality.  
6 There is additional statistical information provided that  
7 addresses each of the subquestions under what environmental  
8 exposures might have increased mortality in Latrobe Valley,  
9 but in addition to that, there will always be additional  
10 considerations to take into account in interpreting that  
11 statistical information in terms of a potential cause and  
12 effect relationship.

13 MR ROZEN: Could I ask you then, in light of that observation,  
14 to address yourself to 2.1 in the joint report, under the  
15 heading The Associated Bushfires. What the three of you,  
16 and I'll come to you about this in a moment, Associate  
17 Professor Barnett, but what Professors Armstrong, Gordon  
18 and Dr Flander agreed here is as follows, "Mortality from  
19 all causes in February to March and February to June 2014  
20 was closer to that in the corresponding periods of 2009  
21 than in those of 2009-'13. This observation may suggest  
22 that bushfires which occurred in Latrobe Valley in February  
23 in both 2014 and 2009 contributed to the probable increase  
24 in mortality from all causes in 2014. This was not evident  
25 for deaths from cardiovascular disease." Perhaps if I can  
26 address myself to Professor Gordon about this. This aspect  
27 of the joint report raises the question about those deaths  
28 specifically attributable to the fire in 2009, does it not?

29 PROF. GORDON: Yes, that is one of the things that is relevant.

30 MR ROZEN: I think I might have set some homework for you  
31 overnight in relation to that. Did you have the

1 opportunity to do that in the short time that was available  
2 to you?

3 PROF. GORDON: I did have the opportunity to do something  
4 relatively simplistic.

5 MR ROZEN: Can you convey that in summary in terms or would that  
6 not be doing the work justice?

7 PROF. GORDON: I think I can convey that in summary terms. May  
8 I comment about the content of 2.1 itself?

9 MR ROZEN: Yes, of course you can.

10 PROF. GORDON: The wording there is, I think, carefully chosen  
11 and certainly discussed by the three of us that agreed with  
12 it. You'll note that it says, "This observation may  
13 suggest that bushfires", so it is more or less, as it were,  
14 a logical possibility that occurs to one, it is by no  
15 means, certainly for my part, to indicate that "I  
16 definitely believe that bushfires..."; the "may suggest"  
17 words are quite important in my mind.

18 MR ROZEN: Can I just intervene there, if I may. Much would  
19 depend, of course, on the nature of the bushfires, the  
20 extent of the bushfires.

21 PROFESSOR GORDON: Yes.

22 MR ROZEN: We know that the bushfires that burnt in February  
23 2009 were amongst the worst ever experienced in the state,  
24 including in this region. The bushfires, leaving aside the  
25 mine fire, the bushfires in 2014 in this region were not of  
26 that magnitude.

27 PROF. GORDON: Yes, and that was my understanding from the  
28 investigation I did, including looking at the previous  
29 Inquiry's report, because I needed to educate myself about  
30 the bushfires in 2014 and as far as I can understand, both  
31 from my memory of them but also looking at the Inquiry's

1 report, they were relatively minor compared to the  
2 bushfires in 2009 and rather obviously, at least insofar as  
3 direct deaths, they did not cause deaths and the 2009 ones  
4 did and my understanding is the 2009 ones were much more  
5 extensive. That is relevant too.

6 MR ROZEN: Yes. I think I had stopped you. You were about to  
7 go on and tell us what you'd been able to do since you gave  
8 evidence yesterday.

9 PROF. GORDON: There is two places where I tried to address your  
10 question. I confess I did not have a lot of time. I had  
11 another engagement last night as well. Would it be  
12 appropriate to refer to the places where I've made the sort  
13 of modifications, if you like?

14 MR ROZEN: Yes.

15 PROF. GORDON: One is table 1 of my own report.

16 MR ROZEN: If we can just, for everyone's benefit, identify  
17 that. That is Exhibit 29, which, in our hearing books, is  
18 behind tab 14, and table 1 is on page 4 of your report.

19 PROF. GORDON: Page 4, yes. You asked me about this matter  
20 yesterday and you referred me to paragraph 33 of my report,  
21 in which I noted that the Voices of the Valley document  
22 said that 11 people died in their homes in February. That  
23 is the number that I have operated with. I don't claim to  
24 have investigated carefully whether all 11 deaths were in  
25 the four relevant postcodes, I'm making the assumption that  
26 that is the case for the purposes of this argument, I have  
27 not checked that carefully and Dr Flander made some  
28 comments that may be relevant to that question yesterday,  
29 but assuming that that is the case, the effect in my  
30 table 1 would be to reduce the predicted number in February  
31 2014 because, as you may recall from answers I gave



1 yesterday, the figure of the predicted number in February  
2 2014, my table 1, essentially comes from averaging the  
3 numbers of deaths for 2009-2013 and it therefore logically  
4 follows arithmetically, so to speak, that if you reduce the  
5 numbers of deaths in 2009, which, in the data I had, for  
6 the whole of the Latrobe Valley, were 55, by 11, it comes  
7 to 44 and averaged across 2009-2013, there is a slight  
8 reduction therefore for that predicted number to 41.67.

9 MR ROZEN: That is down from 43.38?

10 PROF. GORDON: Yes. As a very minor matter but one which I need  
11 to mention for the removal of any doubt, I took the numbers  
12 in table 1 from the Flander and English report, the  
13 predicted numbers. I attempted to reproduce them according  
14 to how I thought they might have been produced and did not  
15 get exactly the same numbers - I got very close but not  
16 exactly the same - and as I comment at paragraph 10, I'm  
17 not exactly sure what they did in that first report  
18 because, from my perspective, it is not clearly documented,  
19 so I can't say how they arrived at the numbers that they  
20 did, but they are the ones that I used. That difference,  
21 however, is not material. I think I had 43.5 instead of  
22 43.38, so that is not a big issue, but I just wanted to  
23 make that point.

24 MR ROZEN: Yes, thank you.

25 PROF. GORDON: So it goes down from 43.38 to 41.67. That, of  
26 course, affects the February ratio because now we're  
27 dividing 50 by 41.67 and not 43.38 and it consequentially  
28 affects all the other ratios in that table, except for  
29 March, because all the other ratios include the month of  
30 February. As you go down the table, the effect is lesser,  
31 simply because - February is just February, but once you're

1 talking about February to March, there is two months  
2 involved and it is only February which is affected and so  
3 on, right down to February and June, it is only February  
4 which is affected, but you have got a whole lot of other  
5 months in there. So with all that explanation, let me say  
6 what the effect is on the ratios and the P-values, if I may  
7 do that.

8 MR ROZEN: Yes, please.

9 PROF. GORDON: The ratio for February changes from 1.15 to 1.20  
10 and the corresponding P-value changes to 0.115. The March  
11 one is unchanged. The February to March figure changes  
12 from 1.16 to 1.18. The P-value changes to 0.044. The  
13 February to April figure changes from 1.13 to 1.15 and the  
14 P-value becomes 0.043. The February to May figure changes  
15 from 1.14 to 1.15.

16 MR ROZEN: And the P-value?

17 PROF. GORDON: 0.018. And the last figure changes from 1.14  
18 again to 1.15 and the P-value is 0.011.

19 MR ROZEN: Thank you very much for doing that for us.

20 PROF. GORDON: And you'll note, as I said, the effect on the  
21 ratios diminishes. The change diminishes as you go down  
22 because there is a dilution of the February effect on the  
23 period.

24 MR ROZEN: Yes, I understand.

25 PROF. GORDON: I said that there's another way that one can look  
26 at it in relation to the work of Dr Flander. I don't know  
27 whether I'm allowed to say what I think the modification  
28 would be to some of her results that directly relate to the  
29 2014 to 2009 comparison, but I can explain what my  
30 perspective is, if I may.

31 MR ROZEN: Please do.

1 PROF. GORDON: I'm now looking at the third - she may have her  
2 own comments about this, I don't know - the third report,  
3 dated 4 June.

4 MR ROZEN: This is the report which in our materials appears  
5 behind tab 12 and is Exhibit 23.

6 PROF. GORDON: Yes.

7 MR ROZEN: What page, please, professor?

8 PROF. GORDON: Page 10, table 5. You'll note that her table 5  
9 has a comparison, which we did discuss a little bit  
10 yesterday because it is the basis of a derived analysis  
11 that Professor Armstrong makes in his own report.

12 MR ROZEN: Yes.

13 PROF. GORDON: And it has comparisons of 2014 with each of the  
14 other years separately.

15 MR ROZEN: Rather than comparing 2014 with an average of the  
16 other years?

17 PROF. GORDON: Correct. So clearly if we're talking about a  
18 modification to 2009, it only affects the ratio for 2014  
19 relative to 2009 in that table.

20 MR ROZEN: Yes.

21 PROF. GORDON: I only received the data that is the basis for  
22 table 5 yesterday. I don't know the full reasons why  
23 that's the case, but anyway, that is the case, I personally  
24 have not seen the data that is the basis for table 5 until  
25 yesterday, so I was not in a position to replicate the  
26 whole analysis and I did not do so. However, I consider  
27 that the ratios, the rate ratios comparing 2014 to 2009,  
28 are sort of affected in quite a direct way, as you would  
29 expect, by the counts of deaths in the two years. I mean,  
30 that is rather obviously the case. This analysis adjusts  
31 for temperature and PM 10, so it is not as straightforward

1 as the comparison that I was previously describing. There  
2 is a statistical model involved here. Nonetheless, the  
3 rate ratios will be substantially, in my view, driven by  
4 those numbers of deaths. So therefore it is possible, if  
5 you make a modification to the numbers of deaths in 2009,  
6 to at least approximate what the effect would be on the  
7 rate ratios comparing 2014 to 2009 in both the cases  
8 February to June and February to March. Essentially, you  
9 are dividing by a different number in the denominator to  
10 affect that rate ratio.

11 MR ROZEN: And you would expect to see a greater effect on the  
12 February to March figure than the February to June figure?

13 PROF. GORDON: Correct, that's right, and that's what you do  
14 see. For the reason that I mentioned yesterday, I would  
15 prefer to invert those rate ratios when we're talking about  
16 them because it makes more natural sense to me to think of  
17 2014 relative to 2009, and that's what I did. So before we  
18 modify the table, I have in mind for February to June that  
19 we're talking about a rate ratio for 2014 compared to 2009  
20 of 1.08, which is simply the reciprocal of .93 - 1 divided  
21 by .93.

22 MR ROZEN: At present we're looking at the second column in the  
23 table under the heading Rate Ratio?

24 PROF. GORDON: That's right.

25 MR ROZEN: And, as you've observed, the methodology that's been  
26 employed here is to call 2014 1 and then consider each  
27 other year as a ratio of 1 and what you're saying is that  
28 you prefer to invert it and you've explained to us why and  
29 you draw our attention to the figure 0.93 at the bottom of  
30 that column.

31 PROF. GORDON: Yes.

1 MR ROZEN: And you say when you invert it, it becomes - - -

2 PROF. GORDON: 1.08. 1 divided by .93 becomes 1.08. I'm not  
3 saying that there is an error in the analysis the way it is  
4 done, it is just that in terms of meaning, I find it is  
5 more natural to - - -

6 MR ROZEN: It is another way of presenting the data.

7 PROF. GORDON: Yes, absolutely. So when that is done, that  
8 becomes 1.08 and the other figure, which you can probably  
9 see because it is so close to 1, the figure of 1.01 - this  
10 is for February to March, the last figure there, 1.01 -  
11 becomes 0.99.

12 MR ROZEN: Yes. Thank you.

13 PROF. GORDON: Just the other side of 1. And those figures that  
14 I've mentioned, 1.08 and .99, are the ones which I'm now  
15 modifying according to the approach that I've taken by  
16 reducing the number of deaths by 11 in 2009. When I do  
17 that, the February to June rate ratio changes from 1.08 to  
18 1.13.

19 MR ROZEN: Yes.

20 PROF. GORDON: And the 2014 to 2009 figure changes from .99 to  
21 1.09.

22 MR ROZEN: Just so that I understand that 1.09 figure, that is  
23 allocating to the 2009 figure a value of 1, am I following  
24 that?

25 PROF. GORDON: That's right.

26 MR ROZEN: And then the 2014 ratio is 1.09 to that 1?

27 PROF. GORDON: Yes, that's right. I'm not in a position at all  
28 to say what the effect would be on the confidence levels  
29 and P-values, for the reason I mentioned before, I'm not in  
30 a position to actually replicate the analysis and I don't  
31 make any stronger claim that this is approximately what the

1 effect would be if you reduce the number of deaths in  
2 February in the Latrobe Valley by 11 in that analysis of  
3 Dr Flander's.

4 MR ROZEN: Thank you, professor. Dr Flander, I trust that  
5 you've been following the evidence that's now just been  
6 given by Professor Gordon. Is there anything that you  
7 would like to say about that, any comment you'd like to  
8 make about that?

9 DR FLANDER: Can you hear me?

10 MR ROZEN: Yes.

11 DR FLANDER: I hear an echo. Okay. I'll go anyway. I can  
12 appreciate the attention to this analysis and it makes very  
13 good sense to me. Given the difficulty of comparing  
14 Professor Gordon's results with ours and the fact that we  
15 have modelled on temperature and PM 10, that might affect  
16 the result, it might not. I can't say. I think it should  
17 be taken into consideration and it is part of the ongoing  
18 analysis of these data that we recommend.

19 MR ROZEN: Thank you, doctor. Professor Armstrong, can I come  
20 back to you, please, and ask you some questions about 2.3  
21 of the joint report - that is Exhibit 30. At least at  
22 first blush, it is not - without a proper understanding of  
23 the conclusion that it is based on in your report, it can  
24 perhaps be a little bit difficult to follow. I'll just try  
25 and see if I can get you to explain it. We need to look at  
26 firstly the conclusion in your report that it is based on,  
27 do we not, to understand what 2.3 refers to? Specifically  
28 what I mean by that is if you look at conclusion 3 on  
29 page 25 of your report - that is Exhibit 28.

30 PROF. ARMSTRONG: Yes.

31 MR ROZEN: The wording that was used in 2.3 in the joint report

1 is based on conclusion 3 that you reached in your report,  
2 but the reference to the rapid health risk assessment that  
3 was done by Monash University in March of 2014 has been  
4 removed from the paragraph that is the subject of the joint  
5 report, is that right?

6 PROF. ARMSTRONG: Yes, correct.

7 MR ROZEN: So that is the asterisk that we see in line 6 of 2.3  
8 in the joint report?

9 PROF. ARMSTRONG: Yes.

10 MR ROZEN: Perhaps by further explanation of that, if we read  
11 what appears in the joint report, it says, "There was no  
12 evidence that deaths from all causes or from cardiovascular  
13 disease alone during the period of the mine fire were more  
14 frequent on days with higher PM 2.5 levels than on days  
15 with lower PM 2.5 levels. This observation appears not to  
16 be consistent with the work of Flander and others 2015" -  
17 that is the third report of Dr Flander and her colleagues -  
18 "who found that mortality from all causes over the whole  
19 period 2009-'14 was approximately twofold higher in Latrobe  
20 Valley people exposed to PM 10 at levels of 50 micrograms  
21 per cubic metre or more on the day of the death than in  
22 people not so exposed." What you're essentially saying  
23 there is based on your research, there was no evidence of  
24 that link but you note that that is inconsistent with the  
25 work that was done by Dr Flander and her colleagues, am I  
26 understanding that?

27 PROF. ARMSTRONG: That's correct.

28 MR ROZEN: You then go on and accept that work as the basis for  
29 your final conclusion in your report, that, "It is very  
30 likely that particulate air pollution during the mine fire  
31 caused an increase in mortality, realised perhaps more

1 after the period of the fire than during it."

2 PROF. ARMSTRONG: Yes.

3 MR ROZEN: So what the joint report excises from the conclusion  
4 you reached was the reference to the work of Professor  
5 Abramson and his colleagues in the risk assessment, for the  
6 reason that is explained in the note at the top of page 3  
7 of the joint report, is that right?

8 PROF. ARMSTRONG: Yes.

9 MR ROZEN: I want to ask you a couple of questions about that,  
10 and in particular if we can do this by reference to the  
11 joint report to 2.3, what is the meaning of the final words  
12 to the final paragraph, "realised perhaps more after the  
13 period of fire than during it", what is the basis for that  
14 conclusion?

15 PROF. ARMSTRONG: Let me say I think that was something we  
16 should have discussed in more detail at the time because it  
17 is a little bit of a carry over from the time to a  
18 reference to Abramson and others in that they found a  
19 relatively small number of deaths in excess during the  
20 period of the fire increasing over time.

21 MR ROZEN: That was their prediction.

22 PROF. ARMSTRONG: That was their prediction, sorry, and the  
23 reason we removed that was we agreed that the data on which  
24 their prediction was based was not the data most  
25 appropriate to the circumstances because it did not take  
26 account of the known increase in risk of death that occurs  
27 very shortly after commencement of exposure to an increase  
28 in the small particle measurements.

29 MR ROZEN: Yes.

30 PROF. ARMSTRONG: So it was essentially as I say dealing with a  
31 different kind of prediction, one that would look at the



1 effect of that exposure compounding over time compared with  
2 the immediate effect, ultimately the compounding over time  
3 one is greater but you do have a not insignificant increase  
4 in the first few days after the exposure.

5 MR ROZEN: Thank you. Associate Professor Barnett, can I check  
6 whether you're still hearing us? That is not the silence I  
7 was hoping to hear, we will see if we can restore the link  
8 to Professor Barnett.

9 PROF. GORDON: May I make a comment completely unrelated to the  
10 questioning, I apologise if I was responsible for the delay  
11 in starting this morning, the Princes Highway was  
12 completely blocked and there was a delay of half an hour  
13 and that's why I was not here at 9.30 and I apologise for  
14 that.

15 CHAIRMAN: Thank you.

16 MR ROZEN: Dr Flander, can I just ask you a question whilst  
17 we're attending to that, Dr Flander, can you hear me?

18 DR FLANDER: I can, thank you.

19 MR ROZEN: I want to clarify, I understand you may have a time  
20 difficulty this morning, is that correct?

21 DR FLANDER: Apologies yes, I have a medical appointment but  
22 can stay for one more hour if that is useful.

23 MR ROZEN: It certainly is and we will make a note of that and  
24 try our best to accommodate that.

25 Associate Professor Barnett, can you hear us?

26 ASSOC PROF. BARNETT: Sorry, my phone packed in, I think I  
27 missed about two minutes.

28 MR ROZEN: I don't think you missed too much although I'm not  
29 sure. I think we got to a point, Professor Armstrong,  
30 where you were explaining 2.3 in the report, was there  
31 anything further you wanted to say about that and

1 particularly the use of the rapid health risk assessment  
2 report?

3 PROF. ARMSTRONG: No, I said everything I thought was relevant.

4 MR ROZEN: Thank you, I think that brings us to a point where I  
5 would like to pose the key question to each of you and ask  
6 you to respond to it. So we have examined the statistical  
7 information, the joint report identifies four possible  
8 explanations, environmental that might have led to the  
9 increase in mortality, perhaps if I can start with  
10 Professor Armstrong, is there a straightforward answer you  
11 can give to the question the board has to grapple with and  
12 that is did the mine fire in 2014, February to March,  
13 contribute to an increase in deaths in the Latrobe Valley?

14 PROF. ARMSTRONG: I will answer that in two short parts.

15 Firstly, I think we have as described moderate evidence for  
16 an increase in deaths during that period so anything I say  
17 about the cause of it has to take into account the fact  
18 that the evidence for the increase itself is not strong.

19 MR ROZEN: Yes.

20 PROF. ARMSTRONG: But given that evidence I think of the  
21 various explanations that one can put forward, the most  
22 likely is that an increase, if one occurred, was due to the  
23 increase in the particulate pollution of the air during  
24 that period of time, most likely due to the mine fire but  
25 possibly added to by bushfires that occurred at the same  
26 time, and I base that principally on two things. Firstly,  
27 the evidence that there is a relationship between  
28 particulate pollution and risk of death in the Latrobe  
29 Valley as observed by Dr Flander and her colleagues, and  
30 secondly, there is a large body of evidence to indicate  
31 that short-term increases in particulate pollution are

1 associated with short-term increases in deaths as well as  
2 long-term exposure being associated with longer term  
3 increase in death. So the background evidence is very  
4 strong, the evidence in these circumstances is not as  
5 strong but I would argue that the inconsistency identified  
6 between the observation I made and Dr Flander made is  
7 appropriately resolved in favour of the results of  
8 Dr Flander and not what I consider to be results which if  
9 they were positive and showed an association would be quite  
10 strongly persuasive, but when negative cannot be taken to  
11 be stronger evidence than that existing evidence that I  
12 spoke about.

13 MR ROZEN: Thank you. Two questions arising from that, the  
14 first is what relevance if any do you attach to the data  
15 about increased hospital admissions that you referred to in  
16 your report in the relevant period, that is what's been  
17 referred to in the evidence as evidence of an increase in  
18 morbidity.

19 PROF. ARMSTRONG: I think that would provide supportive evidence  
20 to the proposition that there was also an increase in  
21 mortality during that period, it addresses itself fairly  
22 specifically to the proposition of mortality in general  
23 rather than necessarily mortality specifically related to  
24 the mine fire, but I think it strengthens that evidence and  
25 then the same inference that I have just made would apply.

26 MR ROZEN: The other matter I would specifically wish to ask  
27 you about is what significance do you attach to the decline  
28 in deaths specifically in Morwell as opposed to the Latrobe  
29 Valley in general, a matter you discuss in your report.

30 PROF. ARMSTRONG: That is certainly an inconsistency that needs  
31 to be taken into consideration, as I think we made clear in

1 the joint report, the statistical evidence supporting that  
2 difference between Morwell and the other locations is not  
3 strong so it's not strongly supported by the statistics but  
4 it's obvious when you look at it but it's possible  
5 considering that uncertainty or chance, if you like, as I  
6 think was elicited very well by what Professor Gordon said  
7 about P-values yesterday, it's possible just by chance  
8 other factors came into play which reduced mortality in  
9 Morwell during that period, which then obscured an effect  
10 of the mine fire and the numbers being such that that's a  
11 plausible possibility, so I think that would discount that  
12 inconsistency in reaching a conclusion.

13 MR ROZEN: Thank you. Professor Gordon, can I turn to you and  
14 posit the same question please, that is what is your answer  
15 to the question facing the board, did the Hazelwood Coal  
16 Mine fire contribute to an increase in deaths in 2014  
17 compared to the years 2009, 2013.

18 PROF. GORDON: I'm in substantial agreement with the way  
19 Professor Armstrong expressed his conclusion I have to say,  
20 I mean as statisticians we are notoriously careful about  
21 this sort of thing or at least I hope we are.

22 MR ROZEN: We're grateful for that care. And attributable  
23 causation?

24 PROF. GORDON: And we are in a situation here where causation  
25 cannot be attributed on the basis of the gold standard  
26 paradigm in science of a randomised controlled - we're  
27 nowhere near that, nonetheless there are plenty of very  
28 important situations in research and in life where we have  
29 to think about this question of causation without the  
30 paradigm and epidemiologists and statisticians have thought  
31 about that issue a lot and have addressed their minds to

1 the criteria one might apply to draw a conclusion of  
2 various strengths, I suppose, about causation, and in this  
3 circumstance as I said, I agree with Professor Armstrong,  
4 taking into totality the statistical evidence, the other  
5 factors that were looked at that might partly explain the  
6 results such as temperature which in my view do partly  
7 explain it but not nearly enough to remove the apparent  
8 effect of the coal mine fire. Things which are  
9 inconsistent need explaining and the possible issue about  
10 Morwell comes into that which I will comment on in a second  
11 but there are all sorts of other standard things like  
12 biological plausibility, analogy with other situations,  
13 past data about the affected air pollution and so on,  
14 Professor Armstrong has spoken about these things and they  
15 apply to this case in favour of the causal conclusion. So  
16 as I said agree substantially with Professor Armstrong's  
17 characterisation at the conclusion. I would like to say a  
18 little bit more about the Morwell issue if I may.

19 MR ROZEN: Yes, please.

20 PROF. GORDON: Professor Armstrong's already spoken about the  
21 variation you see and that's right, you do see variation  
22 particularly in small numbers, so whilst you might say it  
23 must be higher and should have been higher in Morwell  
24 because the exposure was greatest there, it is not  
25 necessarily going to follow in terms of the observed rate  
26 ratios that very small numbers will play out that way just  
27 due to natural variation, that the first point. The second  
28 point is when I wrote my report I had no direct evidence  
29 about the air pollution in the Latrobe Valley during the  
30 relevant period and I was only provided with the data on  
31 that, this is the PM 2.5 data that Professor Armstrong

1 analysed in the middle of last week, and there has been  
2 some discussion about that already. But I note, for  
3 example, one of the things I noticed about that is while  
4 there was certainly very high PM 2.5 readings on some days  
5 in Morwell south and they were the highest in the whole  
6 data set, if we consider Morwell east where it's my  
7 understanding many people live in Morwell, the Morwell east  
8 readings were not that different from the readings in  
9 Traralgon on days when they could be sensibly compared  
10 which is not to say they were lower than Morwell east but  
11 they were also high in Traralgon is my point, and indeed  
12 the measurements in Traralgon that were taken before there  
13 were any measurements taken in Morwell east, namely on the  
14 9th to 13th February just after the start of the coal mine  
15 fire, included readings of 48, 28 and 66 on three of the  
16 five days which are over the sort of starting threshold of  
17 a concern of 25, and if we compare Morwell east with  
18 Traralgon for the 40 days on which there was comparable  
19 data on the data provided to me, in 19 of those 40 days,  
20 that's almost exactly half of them, the Traralgon reading  
21 was greater than the Morwell east reading, and in 21,  
22 around the other way, Morwell east reading was higher than  
23 Traralgon. The differences in the direction overall of the  
24 average of being higher than Morwell east, and I'm not  
25 suggesting it was worse in Traralgon than Morwell east but  
26 not by a huge amount, I'm just suggesting that part of the  
27 explanation is actually it was bad elsewhere in the Latrobe  
28 Valley as well as in Morwell and perhaps a simplistic  
29 assumption is well, it was terrible in Morwell so we should  
30 see it worst here is mitigated a bit about the evidence  
31 about what the particulate material was elsewhere in the

1 Latrobe Valley during the period.

2 MR ROZEN: Professor Armstrong, I think you made the  
3 observation a moment another there may be other factors  
4 that may have come into play to explain the Morwell figure,  
5 did you have any particular other factors in mind?

6 PROF. ARMSTRONG: Well, the other factor that I understand has  
7 been advanced and for which I think there is rather little  
8 solid information in terms as to the likely effect is that  
9 people were advised particularly for younger children and  
10 for older people who were already unwell to leave  
11 essentially the valley and get away from the smoke  
12 pollution. Now, that could have reduced the population at  
13 risk in Morwell, that is the people who are likely to  
14 suffer death during that period by a material number. As I  
15 have indicated there isn't much evidence around that was  
16 the case although I think it's interesting to note in the  
17 information on emergency admissions to hospitals two  
18 things; firstly, while the numbers are very small there is  
19 an unusually large reduction in the number of admissions  
20 for cancer during that period which may suggest that people  
21 who were already ill with cancer left the area and that's  
22 why that happened, and secondly, if one looks at the  
23 detailed information which is not in my report but I had a  
24 look at recently as to the hospitals to which people went,  
25 because this wasn't just hospitalisations of people who  
26 lived in the valley in the Latrobe Valley hospital, it was  
27 to public hospitals anywhere else in Victoria, and there  
28 was about a 3 per cent public increase in the proportion  
29 going to the hospitals outside the valley and a  
30 corresponding 3 per cent decrease in people admitted on  
31 emergency basis to the hospitals in the valley which again

1 would suggest that the population likely to be admitted to  
2 hospital had shifted somewhat, not to a very large degree  
3 on that reading away from the valley.

4 MR ROZEN: Professor Gordon, is another factor that may be  
5 relevant here the matter you refer to at paragraph 36 of  
6 your report, that is the question of relocation and we do  
7 have some evidence of people from the first Inquiry report,  
8 a significant proportion of Morwell residents obtaining a  
9 respite or relocation payment, what we don't have is the  
10 precise figure that actually relocated but you point to  
11 that being a relevant matter there, don't you?

12 PROF. GORDON: I do, exactly, and I would add to that also  
13 there is uncertainty presumably about the actual exposure  
14 of the people we're talking about to perhaps a considerable  
15 extent, we don't know, people may I assume may live in Moe  
16 and work in Morwell and vice versa or live in Traralgon and  
17 work in Morwell, that increases the difficulty of nailing  
18 down a very cogent concern about the Morwell result.

19 MR ROZEN: I think the other matter I should raise with you is  
20 that the evidence in the first Inquiry was that when the  
21 warning from the chief health officer came to leave Morwell  
22 it was actually directed at the people in south Morwell.

23 PROF. GORDON: Okay.

24 MR ROZEN: They were the ones advised to leave, particularly the  
25 vulnerable groups in the south Morwell area, that would  
26 perhaps be relevant to your observations about those very  
27 high exposure levels in south Morwell overlapping with the  
28 population that may be perhaps left.

29 PROF. GORDON: Indeed.

30 MR ROZEN: Professor Barnett, can I posit the same question,  
31 did the coal mine fire contribute to an excess of deaths in



1 the Latrobe Valley in the relevant period compared to 2009  
2 to 2013?

3 ASSOC PROF. BARNETT: So I would like to start with some  
4 evidence from other groups so three groups, the US  
5 Environmental Protection Agency engaged a panel of expert  
6 scientists called the Clean Air Scientific Advisory  
7 Committee and they were charged with looking at the current  
8 evidence for the effects for particulate matter pollution  
9 and they concluded: "Particulate matter pollution caused  
10 multiple serious threats to health including causing early  
11 deaths by short-term or long-term exposure, that it causes  
12 cardiovascular harm including heart attacks/heart disease  
13 and congested heart failure." Then in 2010 the American  
14 Heart Association said: "The overall evidence for  
15 particulate matter pollution is consistent with a causal  
16 relationship between exposure and cardiovascular morbidity  
17 and mortality." Then the World Health Organisation said:  
18 "There is a close quantitative relationship between  
19 exposure to high concentrations of small particulates of PM  
20 10 and PM 2.5 and increased mortality and morbidity both  
21 daily and over time." So really when we have these very  
22 big, very well respected groups all saying there is a  
23 causative association between exposure to these pollutants  
24 and deaths, it really feels from my point of view there  
25 would have to be something very surprising going on in  
26 Morwell not to see that increase. Then when we look at the  
27 evidence we see an increase in deaths of a relative risk  
28 between about 10 and 15 per cent depending what you adjust  
29 for which is around the size we would expect. We see an  
30 increase in emergency hospital admissions and again, it  
31 would be extremely surprising to see an increase in

1 emergency hospital admissions and not an increase in  
2 deaths. And then lastly, just to talk about the Morwell  
3 issue, I did actually do an extra analysis where I kind of  
4 assumed an increasing proportion of evacuated people from  
5 Morwell. If you assume that around 20 per cent of people  
6 evacuated then the mean relative risk goes to about 1. So  
7 there is no effect of the fire, so it starts out, you know,  
8 at the moment there is an unusual result where the deaths  
9 appeared to decrease. So if you get to 20 per cent of  
10 people evacuating, that effect has completely gone away.  
11 Then if you assume about 30 per cent of people evacuated  
12 then the relative risk starts to become very similar to  
13 those relative risks in any other postcodes. So that is  
14 not the most accurate analysis we could do and it would be  
15 better to get much more detailed information on who was  
16 evacuated and who was around.

17 MR ROZEN: Particularly if they were in high risk groups, do  
18 you agree?

19 ASSOC PROF. BARNETT: Most definitely yes, yes, the more  
20 information we can get on people and who they were and what  
21 they were doing and what protective measures they took,  
22 that would certainly be more useful but I think even a  
23 simplistic analysis does show that the relatively small  
24 amount of people who evacuated can actually explain that  
25 result in Morwell.

26 MR ROZEN: Was there anything further you wanted to say  
27 particularly having regard to what you have heard from  
28 Professors Armstrong and Gordon about the answer to the  
29 central question the board is grappling with?

30 ASSOC. PROF. BARNETT: I think both Professors Gordon and  
31 Armstrong made some interesting observations that I agree

1 with.

2 MR ROZEN: Thank you, Associate Professor Barnett. Which  
3 brings us to Dr Flander, do you want me to repeat the  
4 question or have I said it often enough for you?

5 DR FLANDER: I understand the question, and I would like to  
6 refer to the comments of my fellow experts on the panel. I  
7 have no fundamental disagreement with information that  
8 Professor Armstrong put forward for the reasons that those  
9 were our number and our conclusions and I have no objection  
10 to the further analyses done by Associate Professor Barnett  
11 or Professor Gordon. I'm struck by the similarity in our  
12 results, the wide uncertainty around our estimates albeit  
13 we used very different methods. It's clear to me there is  
14 an effect even though PM 10 is not a threshold value as  
15 used by the EPA in this country, it's clear there is an  
16 effect on mortality with exposure to PM 10 above the level  
17 that we used at different times. So my answer to the first  
18 question is yes, there is moderate evidence of an increase,  
19 these data do show that. Do I have a feeling or opinion or  
20 judgment about the effect of exposure to PM 10? Yes, I do,  
21 I think we do show that. I think I concluded - and I won't  
22 rifle through my pages now - that there is uncertainty  
23 around these estimates, this kind of an experiment by its  
24 nature looks at all the possible data that we can use and  
25 tries to make an estimate. We recommend much further  
26 enquiry including the longitudinal study I believe has  
27 already been initiated headed up by Monash University and I  
28 guess as a final caveat I would just like to say that we  
29 make our best estimate and we use different methods and we  
30 have different judgments and assumptions, and in the case  
31 of the small numbers we're dealing with here we all have

1           been taught well that we do not want to conclude there is  
2           an effect if there is none, nor do we want to miss an  
3           effect if there is one, I'm not sure I have gotten all my  
4           double negatives right in that statement.

5 MR ROZEN:    I think we follow you.

6 DR FLANDER:   I read from the bottom of my first report in the  
7           footnote the medical statisticians, shall I read it again  
8           or do you get my sense?

9 MR ROZEN:    I certainly understand it, I'm not sure I can speak  
10           for everybody in the room.  Just one matter, Dr Flander,  
11           the point you make about the longitudinal study is an  
12           important one for us, you would no doubt draw our attention  
13           to what you say about that, in your third report at exhibit  
14           23 at the foot of page 17, perhaps for completeness if I  
15           can read that out, you say:  "The proposed prospective  
16           study that will track Latrobe Valley residents who were  
17           exposed during the Hazelwood fire may contribute useful  
18           information about the association of exposure to brown coal  
19           particulate matter with cardiovascular health."  Am I right  
20           that's the observation you refer to?

21 DR FLANDER:   That is one of my observations.  We have some  
22           information in these data about some of the exposures, we  
23           don't have complete information as we discussed in our  
24           first meeting on Monday, we don't have complete information  
25           about exposures for individuals for the different  
26           constituent of the degraded air quality.  So we have in a  
27           sense what in epidemiology we call a natural experiment, we  
28           know that people who live there who are currently living  
29           there, we know where they were on the dates of fire and we  
30           can follow them longitudinally.  We don't know now but we  
31           will know by tracking them over time whether the specific

1 exposure to the specific constituents of the degraded air  
2 quality have affected their health, that's the value of  
3 longitudinal study, and it yields more robust information,  
4 information we could not hope to get from the kind of study  
5 we did.

6 MR ROZEN: Yes, I understand that, thank you, doctor. They are  
7 the questions I have for the panel. I note the time and  
8 given Dr Flander's situation can I make the suggestion if  
9 there are specific questions for Dr Flander perhaps they be  
10 addressed to her while she's available to us.

11 CHAIRMAN: I agree that's a sensible course.

12 MR NEAL: Dr Flander, my name is Neal and I appear as counsel  
13 for GDF Suez.

14 DR FLANDER: G'day.

15 MR NEAL: In relation to what we might say was the ultimate  
16 question you were last speaking about, did I understand you  
17 to say a number of things, that at least ideally we would  
18 be considering these ultimate questions in a more  
19 longitudinal sense.

20 DR FLANDER: Absent complete information on the location of the  
21 individual deaths that we looked at, where they were, the  
22 days leading up and on the day of death, absent complete  
23 information on their exposure, where they were and what  
24 kinds of exposure to degraded air quality or excess  
25 temperature, absent that kind of information, a  
26 longitudinal study is a better model.

27 MR NEAL: In terms of the data we presently have as opposed to  
28 what would be data to improve the analysis, can I suggest  
29 to you that the absence of specific cause of death is an  
30 unhappy factor.

31 DR FLANDER: We do have text associated with each individual

1 death record taken from the death certificate for all of  
2 the deaths in this data set, so we do have some information  
3 about the cause of death as it was recorded and registered  
4 by the state, that's what we have, we do not have complete  
5 medical records on these individuals.

6 MR NEAL: Perhaps I could turn to that question given the death  
7 statistics we're dealing with are deaths in relation to  
8 postcodes and those postcodes are within a certain physical  
9 bound of the site of the fire, it would be of great utility  
10 to know whether or not those who died were actually  
11 resident in the postcode at any relevant time, that is at  
12 the time of the fire and exposure to the fire.

13 DR FLANDER: That is absolutely correct, we do not have  
14 information about their exposure, we only have the death  
15 certificate in the postcode of their residence, you're  
16 correct.

17 MR NEAL: There are other questions about data that I think  
18 perhaps are dealt with in the report, so in view of the  
19 time I won't take you to all of these but it's fair to say  
20 as a general principle, is it not, we could qualitatively  
21 improve the data quite a lot.

22 DR FLANDER: I think I don't understand your question.

23 MR NEAL: In order to improve the analysis and to address the  
24 questions which the Board of Inquiry has to address I'm  
25 suggesting to you that information such as what we have  
26 just discussed, the question of exposure of people who are  
27 said to have died is one example of the way in which  
28 qualitatively it's a bit of a frustration to be analysing  
29 this at this point in time.

30 DR FLANDER: I won't speak to other people's frustrations but  
31 certainly we are limited to the analysis we have, and as we

1 have been discussing amongst ourselves and in this forum  
2 there are many different analytic approaches apart from  
3 issues around the data themselves. So I guess are you  
4 asking me in a perfect world could we do better and I think  
5 my answer to that would be absolutely yes. If we had  
6 complete information on every single individual we would be  
7 able to tell a lot more of this story.

8 MR NEAL: In terms of the questions that have been raised with  
9 the panel, there are really two logical ones as I  
10 understand it: "Is there evidence in relation to an  
11 increase in mortality in the relevant areas at the relevant  
12 time?", one, and depending on the answer to that can we  
13 look at the question of, "Is there a causal association",  
14 if we frame the question that way. Do I understand you to  
15 take the view that there is perhaps some evidence of an  
16 increase although there are countervailing considerations  
17 to that position?

18 DR FLANDER: Yes, there is moderate evidence of an increase.

19 MR NEAL: And as to the second proposition would you be happy  
20 with the idea that if you accept the moderate evidence as  
21 demonstrating some sort of increase, would it be a fair  
22 position to say as a scientist at that point we should not  
23 exclude the hypothesis that there is a causal correlation  
24 between the excess we think may exist and the defined  
25 event, we shouldn't exclude that as an hypothesis.

26 DR FLANDER: I'm pausing to make sure I address the exact  
27 statement, we're not excluding, given this evidence, a  
28 causal relationship between exposure to particulate matter  
29 and the mortality? I think that is correct.

30 MR NEAL: And indeed could I put it to you in terms of a normal  
31 scientific approach that might be the desirable way to

1 state a response to the second and that is at this point on  
2 the basis of the information we have we are not entitled to  
3 exclude the hypothesis there is a causal relationship  
4 between the two events but we shouldn't say it is  
5 substantiated.

6 DR FLANDER: Yes, there is a concept in observations and  
7 evidence around epidemiology which speaks to the under  
8 determination of observations and evidence and I think we  
9 have that case here. There are not sufficient observations  
10 for us to choose between alternative explanations or in  
11 this statement that you have made, alternative hypothesis,  
12 the data are undetermined, there are not enough  
13 observations for us to choose between these different  
14 hypotheses and that means we, in your language, can't  
15 exclude a given hypothesis.

16 MR NEAL: Is it also perhaps fair to say that what we have  
17 managed to do - or what may be said to be demonstrated by  
18 the various analyses that there is some evidence for what I  
19 would call a temporal coincidence between an increase in  
20 mortality and a fire event?

21 DR FLANDER: I think I don't understand the question.

22 MR NEAL: I'm saying at the moment there may be some evidence  
23 that there is a coincidence in time, a correlation in time  
24 between a supposed increase in mortality and a fire event,  
25 I think you're nodding?

26 DR FLANDER: That is correct, yes, these things do coincide.

27 MR NEAL: I think it is a truism of your profession that that  
28 sort of correlation is not causation?

29 DR FLANDER: Yes, I refer to the statement in answer to the  
30 question from Mr Rozen: "We know results in the case of  
31 small sample sizes are prone to misinterpretation leading



1 to the conclusion of an effect where there is none, or the  
2 conclusion of no effect where there is one", and my  
3 position is that we don't really have enough observations  
4 to choose between those two points; does that answer your  
5 question?

6 MR NEAL: It does and perhaps brings me back to the proposition  
7 I was putting to you, that's perhaps why the formulation I  
8 suggested to you is a happy one, we should not exclude the  
9 hypothesis of the causal correlation.

10 DR FLANDER: Correct.

11 MR NEAL: Thank you, I have no other questions.

12 MR BLANDEN: Professor Flander, just a couple of quick  
13 questions, and really I think you have said this already  
14 but essentially is the analytical process, whatever  
15 analytical process is undertaken, dependent on the quality  
16 of data that's used in that process?

17 DR FLANDER: For the record I'm not a professor.

18 MR BLANDEN: I beg your pardon.

19 DR FLANDER: That's okay, thank you, and to whom am I speaking?

20 MR BLANDEN: I'm Chris Blanden, counsel for Dr Lester.

21 DR FLANDER: So the question is whether the analysis depends on  
22 the quality of the data?

23 MR BLANDEN: Or the outcome of the analysis.

24 DR FLANDER: The outcome of the analysis depends upon the  
25 quality of the data and it also depends as we have  
26 discussed at length, the outcome depends on what kinds of  
27 analysis you use and what your starting assumptions are,  
28 these also affect the outcome but certainly the quality of  
29 the data is crucial, yes.

30 MR BLANDEN: The data you used and indeed everyone's used in  
31 terms of the analytical process is data that relies on

1 death from all causes, is that correct?

2 DR FLANDER: Well, we use text information copied from death  
3 certificates that were linked to each individual case, so  
4 partly what we looked at was all cause of mortality and  
5 then as you can see from my report we went through the  
6 entire data set for all deaths in Victoria for the period  
7 under consideration, 2009 through the middle of 2014. And  
8 we then coded each individual text statement into a  
9 category that would be useful for our analysis. The most  
10 useful one of course would be cardiovascular or respiratory  
11 pulmonary for our purposes yes, so it's not simply all  
12 cause mortality.

13 MR BLANDEN: Would that be most useful for your purpose for  
14 trying to undertake the analytical process because it's the  
15 cardiovascular data which relates to the risk posed by  
16 particular matter?

17 DR FLANDER: Yes, among other effects, yes.

18 MR BLANDEN: And that's the primary problem caused by - - -

19 DR FLANDER: That's my understanding of the literature on  
20 exposure to degraded air quality and I will say again at  
21 this point this is not an area of my expertise.

22 MR BLANDEN: But insofar as data relevant to the question we're  
23 trying to address here, if such data was addressed to  
24 cardiovascular related causes that would be a more focused  
25 set of data for our purpose?

26 DR FLANDER: That's correct.

27 MR BLANDEN: Thank you.

28 MS SZYDZIK: Some additional questions, Dr Flander. My name is  
29 Melanie Szydzik, I'm the counsel representing Voices of the  
30 Valley.

31 DR FLANDER: Good day.

1 MS SZYDZIK: In relation to the questions asked by my friend,  
2 Mr Blanden, if I could direct you to the joint expert  
3 report, do you have a copy of that in front of you?  
4 DR FLANDER: Could you just read the number you want while I  
5 try and find it, I'm sorry I don't have that one on top.  
6 MS SZYDZIK: Do you mean - - -  
7 DR FLANDER: This is the joint statement we produced earlier  
8 this week?  
9 MS SZYDZIK: Precisely.  
10 DR FLANDER: I don't have it on top, while I'm looking it could  
11 you ask me the question.  
12 MS SZYDZIK: Certainly, just in relation to the first question  
13 addressed by the group of experts.  
14 DR FLANDER: Yes.  
15 MS SZYDZIK: So the question was, was there an increase in  
16 mortality in the Latrobe Valley during the coal mine fire  
17 in 2014, so the first conclusion is 1.1, it's agreed by all  
18 of you - it looks like you have that now, am I right?  
19 DR FLANDER: No, sorry.  
20 MS SZYDZIK: Not a problem, so 1.1 states: "There is moderate  
21 evidence for a higher mortality from all causes and from  
22 cardiovascular disease in Latrobe Valley in February to  
23 June 2014 than in the same period during 2009 to 2013";  
24 that's that first statement, I assume you agree with that  
25 and you agreed up to that.  
26 DR FLANDER: I do agree.  
27 MS SZYDZIK: The reason for that is because not only did you  
28 have data as you were just telling Mr Blanden from all  
29 causes but you also have data available specific to the  
30 individual effects people died from including specifically  
31 cardiovascular disease.

1 DR FLANDER: Yes, I point out again here that with reference to  
2 the problem of outcome of analysis, we have the text  
3 information copied from the death certificate.

4 MS SZYDZIK: Yes.

5 DR FLANDER: And we have to assume that's as good information  
6 as we can have.

7 MS SZYDZIK: Of course, and we have heard some evidence about  
8 which you haven't, I don't think, but how it is that  
9 information is obtained. If I could just on the second  
10 issue, now again, it's going to be a matter arising from  
11 the joint report so if you don't have that I will read that  
12 out to you.

13 DR FLANDER: Yes.

14 MS SZYDZIK: It's on the second page under the heading, "Fine  
15 particulate (smoke) air pollution from the coal mine fire  
16 or the bushfires", the conclusion is set out at paragraph  
17 2.3, it's quite long but for your benefit I will read it  
18 all: "There was no evidence that deaths from all causes or  
19 from cardiovascular disease alone during the period of the  
20 mine fire were more frequent on days with high PM 2.5  
21 levels than on days with lower PM 2.5 levels. This  
22 observation appears not to be consistent with the work of  
23 Flander and others who found that mortality from all causes  
24 over the whole period of 2009 to 2014 was approximately  
25 two-fold higher in the Latrobe Valley people exposed to  
26 PM 10 at levels of 50 microgram per cubic metre or more on  
27 the day of death than in people not so exposed. However,  
28 on the evidence of Flander, it is very likely that  
29 particulate air pollution during the mine fire caused an  
30 increase in mortality, realised perhaps more after the  
31 period of the fire than during it", and stated below that

1 is the agreement of both yourself and Professor Armstrong,  
2 based significantly, as is clear from that paragraph, or  
3 that conclusion, on your evidence. Has your position  
4 changed from that at all?

5 DR FLANDER: No.

6 MS SZYDZIK: That was the agreed statement in that joint report.  
7 So just to clarify, you don't change your position in  
8 relation to that?

9 DR FLANDER: No, my position has not changed since signing that  
10 statement on Monday.

11 MS SZYDZIK: Thank you, Dr Flander. No further questions.

12 MR ROZEN: If that concludes the specific questions for  
13 Dr Flander, given that she is under summons, I would ask  
14 that she be excused and then, Dr Flander, you'll be free to  
15 go if you want to or stay if you want to.

16 CHAIRMAN: It is a matter for you.

17 DR FLANDER: Is that a question? I have 15 more minutes and if  
18 it is okay with you, I'll stay for 15 minutes and then I'll  
19 just sign off.

20 CHAIRMAN: Yes, that's fine.

21 DR FLANDER: Okay. Thank you very much.

22 MR ROZEN: Can we take it, sir, that Dr Flander is excused?

23 CHAIRMAN: Yes.

24 <(THE WITNESS WITHDREW)

25 (Witness excused.)

26 MR ROZEN: We can now return to the ordinary course of  
27 cross-examination of the panel.

28 CHAIRMAN: Did you want it extended to Associate Professor  
29 Barnett, on the basis that we may run into trouble, or do  
30 we assume that the link will be maintained?

31 MR ROZEN: (a), I think we do assume the link will be maintained

1 but, (b), more importantly, he is not under summons, so the  
2 same issue does not arise.

3 CHAIRMAN: Okay.

4 MR ROZEN: Thank you, sir.

5 CHAIRMAN: Mr Attiwill.

6 MR ATTIWILL: No questions.

7 CHAIRMAN: Mr Neal?

8 MR NEAL: Is it convenient to the Inquiry that we take a very  
9 short break at this point? It may not be convenient, but  
10 may we do that?

11 CHAIRMAN: Okay. We'll make it a very short break, so we'll be  
12 on call, ready to move, when we come back.

13 (Short adjournment.)

14 CHAIRMAN: Yes.

15 MR NEAL: Associate Professor Barnett, can you hear me?

16 ASSOC. PROF BARNETT: Yes.

17 MR NEAL: A couple of formal matters - perhaps before I do that,  
18 might I say, not to associate professor but to the board,  
19 for the sake of the record, that in his evidence this  
20 morning already, Associate Professor Barnett referred to  
21 some studies and an analysis of, I think, evacuation ratio  
22 effects that, to the best of our knowledge, don't appear in  
23 any documents that we've received to date. Now, this is  
24 perhaps a cause and effect statement, it is not anything  
25 else. That causes difficulties. Obviously we haven't seen  
26 the documents to which he's referred and I'm not sure that  
27 we've seen the studies on which he has relied. It puts us  
28 at some disadvantage clearly enough in the  
29 cross-examination context. Whether that can be recovered  
30 in submissions or otherwise, I can't say and I really ask  
31 the board to note that. (To witness): Associate

1 professor, back to you. Some formal matters. Your  
2 discipline is statistics?

3 ASSOC. PROF BARNETT: That's right.

4 MR NEAL: It is not clear to me. Do you regard yourself as an  
5 epidemiologist?

6 ASSOC. PROF BARNETT: There is a huge overlap. I'm on the  
7 editorial board of the Journal of Epidemiology, I go to  
8 epidemiological conferences, I do a lot of epidemiological  
9 work, but my major qualifications are my - I mean, when  
10 people ask me what I am, I say I'm a statistician.

11 MR NEAL: So can I take it that in terms - you are not medically  
12 qualified otherwise?

13 ASSOC. PROF BARNETT: No.

14 MR NEAL: And in terms of what I might call the mechanics of  
15 disease, particularly cardiovascular and respiratory, you'd  
16 defer to those who are medically qualified, I take it?

17 ASSOC. PROF BARNETT: I would.

18 MR NEAL: I think we know generally that your first involvement  
19 in this matter was via a contact with an ABC journalist, is  
20 that correct?

21 ASSOC. PROF BARNETT: That's right.

22 MR NEAL: Overnight we've been provided with emails that seem to  
23 track and contextualise your involvement up to the present  
24 moment, and that came from you.

25 ASSOC. PROF BARNETT: Yes.

26 MR NEAL: Do you have that same bundle that you provided?

27 ASSOC. PROF BARNETT: I do. I'll just have to turn to my  
28 computer here, but I can see them all.

29 MR NEAL: I take it the board has been provided with that same  
30 bundle.

31 CHAIRMAN: Theoretically.

1 MR NEAL: I need to operate at a level beyond theory at the  
2 moment, Mr Chairman. I do want to take associate  
3 professor - - -

4 CHAIRMAN: That may be on the iPad.

5 MR NEAL: I should make it clear that by prior arrangement, we  
6 have been given a significant bundle which seems to track  
7 the history and, at the request of counsel assisting, we  
8 have tried to identify a couple of documents which we think  
9 have some particular relevance, which I understand might be  
10 viewable on the screen.

11 CHAIRMAN: If that's the case, that is the easiest way.

12 MR NEAL: Associate professor, what I have got in my hand  
13 endeavours to be a chronological sequence. Do you have it  
14 in something like that, so starting at the earliest date  
15 and going to the latest?

16 ASSOC. PROF BARNETT: I should be able to find them easily if  
17 you point me towards which ones you're particularly  
18 interested in.

19 MR NEAL: Perhaps just to identify the starting point, the first  
20 one that I was looking at was an email of 4 September 2014  
21 from Madeline Morris to yourself.

22 ASSOC. PROF BARNETT: Yes.

23 MR NEAL: I think it is appropriate at this stage that we  
24 identify the cast of characters. Madeline Morris is an ABC  
25 journalist.

26 ASSOC. PROF BARNETT: Yes.

27 MR NEAL: And she, in this instance, seems to have been passing  
28 on to you some death data that had been provided to her by  
29 Wendy Farmer.

30 ASSOC. PROF BARNETT: Yes.

31 MR NEAL: Wendy Farmer is a person who is associated with the



1 organisation Voices of the Valley.

2 ASSOC. PROF BARNETT: Yes.

3 MR NEAL: The fact that Ms Morris had provided that information  
4 to you, I assume that wasn't a random event, that she and  
5 you had some reason to know each other?

6 ASSOC. PROF BARNETT: She phoned me earlier in the day - that is  
7 the first time that I have ever spoken to her - because  
8 there was some concern about an increase in deaths and she  
9 was following up the story and she had the data but wasn't  
10 able to make a sort of sophisticated analysis of it, so I  
11 presume she contacted me because I've had some experience  
12 in this area and then after that phone call, we decided  
13 that I would have a look at the data and so she passed it  
14 on to me.

15 MR NEAL: Is it fair to say that - you just described it as  
16 having some experience in the area - you also have some  
17 profile in the area, media profile I mean?

18 ASSOC. PROF BARNETT: I can't really answer that. I've had a  
19 number of stories on air pollution. I don't know when that  
20 becomes a profile. I have written about it and I've  
21 engaged the media on it and spoken to the media about it.  
22 I'm always happy to speak to the media about this.

23 MR NEAL: It is a fair assumption that if you hadn't had prior  
24 contact with her, that she probably knew about you from  
25 your media commentary.

26 ASSOC. PROF BARNETT: I had never had prior contact with  
27 Madeline Morris. I've had contact with other journalists  
28 at the ABC, but I'm fairly sure I've never had - I'm almost  
29 certain I had never had contact with Madeline Morris until  
30 that day.

31 MR NEAL: All I'm saying to you is it seems likely that she got

1 your name because you had a media profile.

2 ASSOC. PROF BARNETT: Yes, I think that is fair to say.

3 MR NEAL: So that starts the context for this. It has not been  
4 clear from the evidence that we've been privy to whether or  
5 not this was a professional or other engagement for you.

6 ASSOC. PROF BARNETT: I did it pro bono, just out of interest  
7 really. There was no money changing hands. It is  
8 something I'm interested in, something I had experience in,  
9 so I was happy to do it.

10 MR NEAL: So a labour of love.

11 ASSOC. PROF BARNETT: Most definitely, as well as contributing  
12 to my - I mean, it does directly contribute to my career  
13 and my scientific interest too.

14 MR NEAL: Can I take you on in that email chain to the next  
15 document that I'm interested in, which is from you to  
16 Madeline Morris of 5 September. Do you have that?

17 ASSOC. PROF BARNETT: I don't, actually, but if I just search  
18 all my emails to Madeline Morris - just one second - I  
19 should be able to get that one. 5 September?

20 MR NEAL: Yes.

21 ASSOC. PROF BARNETT: I think I have that one, yes.

22 MR NEAL: It is a document in which you're saying, "Hi,  
23 Madeline. I have now thoroughly checked my code".

24 ASSOC. PROF BARNETT: Yes.

25 MR NEAL: And that is referring to a formula or a code in some  
26 sort of document or analysis that you've already done?

27 ASSOC. PROF BARNETT: Yes.

28 MR NEAL: And it goes on to say there is an 89 per cent  
29 probability of an increased risk of death during February  
30 and March, so a 15 per cent - I'm paraphrasing - increase  
31 in the typical death rate and then you say at that stage

1 "they don't adjust", that is the figures, "don't adjust for  
2 high temperatures, which we know can also increase deaths".

3 ASSOC. PROF BARNETT: Yes.

4 MR NEAL: So the analysis at this stage excludes the cause that  
5 might be related to high temperature and I take it that the  
6 effect of that is to increase the number of deaths that  
7 you're looking at?

8 ASSOC. PROF BARNETT: Yes. Generally hotter temperatures - both  
9 hot and cold temperatures, actually, in Australia increases  
10 the risk of death.

11 MR NEAL: Okay. The point I'm pointing out to you there is  
12 really that not excluding factors such as extremes of  
13 temperature shows you a higher death number.

14 ASSOC. PROF BARNETT: First of all I'll just say it is not  
15 actually just extreme temperatures that are dangerous.  
16 Actually, surprisingly, moderate temperatures can actually  
17 be dangerous. But I don't quite follow. Could you  
18 rephrase?

19 MR NEAL: We're dealing with, I suppose, gross numbers of death  
20 not filtering for any factors, in this case not filtering  
21 for temperature effect.

22 ASSOC. PROF BARNETT: That's right. The first analysis did not  
23 adjust for temperature.

24 MR NEAL: If we could move forward, please, to an email of  
25 14 September 2014 coming from Michael Gunter to yourself.

26 ASSOC. PROF BARNETT: Yes.

27 MR NEAL: Perhaps I should distinguish. There are several  
28 possibilities here. Can I take you back to an email from  
29 Shaun Murray sent on 12 September 2014 to you, headed Media  
30 Release.

31 ASSOC. PROF BARNETT: What date was that, sorry?

1 MR NEAL: That is 12 September, at 2.23 p.m.

2 ASSOC. PROF BARNETT: I can't find that exact one, but I'll  
3 search for it and you can carry on.

4 MR NEAL: In terms of the text, it is very short and perhaps the  
5 point can be shortly made. It starts, "Hi, Adrian. Here  
6 is our media release. Any questions/issues?", and then  
7 what seems to follow is a draft media release. Is that  
8 something you're familiar with now?

9 ASSOC. PROF BARNETT: Yes.

10 MR NEAL: On its face, this is apparently - perhaps I should  
11 have asked you to identify Shaun Murray, the sender.

12 ASSOC. PROF BARNETT: Shaun Murray, I believe, works for Friends  
13 of the Earth. I have never met him personally, only on the  
14 phone and via email.

15 MR NEAL: "Our media release", under that subject heading of  
16 12 September, "media release" and one sees, "Media release  
17 Voices of the Valley", so it is apparent it is a media  
18 release for that organisation. That is consistent with  
19 your recollection in any event, is it?

20 ASSOC. PROF BARNETT: No. I thought the media release was from  
21 Voices of the Valley.

22 MR NEAL: I think we're in furious agreement about that. Even  
23 though Shaun Murray is from Friends of the Earth, the media  
24 release is intended to be from Voices of the Valley, yes?

25 ASSOC. PROF BARNETT: That is my understanding.

26 MR NEAL: And you're being asked to check the media release.

27 ASSOC. PROF BARNETT: Yes.

28 MR NEAL: Perhaps two things I should clarify with you. You  
29 were comfortable with being involved in the media release  
30 on behalf of Voices of the Valley?

31 ASSOC. PROF BARNETT: Yes.

1 MR NEAL: And presumably you were asked to check for its  
2 accuracy insofar as it was making attributions to you?  
3 ASSOC. PROF BARNETT: Yes, and any science they had in there.  
4 MR NEAL: Could we go forward in time, please, to an email from  
5 you of December 18 to Wendy Farmer. The subject heading is  
6 "re Voices of the Valley data".  
7 ASSOC. PROF BARNETT: Yes, I think I've got that one.  
8 MR NEAL: It simply says, "Hi Wendy", it starts that way.  
9 ASSOC. PROF BARNETT: Yes.  
10 MR NEAL: This is December 18 of 2014, so after your first  
11 report and prior to your second.  
12 ASSOC. PROF BARNETT: That sounds right.  
13 MR NEAL: In your second report, amongst other things, what you  
14 do is to increase the number of postcodes you're taking  
15 into consideration from four to six.  
16 ASSOC. PROF BARNETT: Yes.  
17 MR NEAL: And in the email to which I'm drawing attention now,  
18 you say, "Hi Wendy. Do you expect an increase in deaths in  
19 all six postcodes?"  
20 ASSOC. PROF BARNETT: Yes.  
21 MR NEAL: Why are you asking that question?  
22 ASSOC. PROF BARNETT: Because I didn't know what the exposure  
23 was like down there, I wasn't down there during the fire,  
24 so a priori it was interesting to know whether we'd expect  
25 the death risk to increase in every suburb.  
26 MR NEAL: Can I suggest to you that, just on reading it, it is  
27 susceptible to the understanding that if the answer were  
28 "no", that those postcodes might not have all been  
29 included?  
30 ASSOC. PROF BARNETT: No, not at all.  
31 MR NEAL: In any event, the next document in the chain says,

1 from Ms Farmer, "I would be surprised if there wasn't.  
2 What are you seeing?" And I think you say, "Not run  
3 anything yet. Just doing some preparation."

4 ASSOC. PROF BARNETT: Yes.

5 MR NEAL: In any event, all six went in, didn't they, to the  
6 subsequent report?

7 ASSOC. PROF BARNETT: They did.

8 MR NEAL: Can I take you then forward quickly to Thursday,  
9 22 January and an email from Wendy Farmer to you of that  
10 date with the subject heading, "The Voices of the Valley  
11 data". Do you have that?

12 ASSOC. PROF BARNETT: Again, I think so.

13 MR NEAL: It starts, "We're thinking the anniversary of the  
14 Hazelwood Mine Fire would be a good time to come out with  
15 the new data, February 9th. We could have it ready brief  
16 media if needed. What are your thoughts?" And there is  
17 also a paragraph saying are you happy for your information  
18 to be passed on to Tom Doig, in relation to a book he was  
19 publishing.

20 ASSOC. PROF BARNETT: Yes.

21 MR NEAL: That is all familiar to you, I take it?

22 ASSOC. PROF BARNETT: Yes.

23 MR NEAL: And your answer I think we find at an email from you  
24 of 22 January to - I think it must be to Wendy Farmer,  
25 which simply says, "Hi Wendy. A great idea to use the  
26 anniversary and I'm happy to share the latest results with  
27 Tom." Do you have that?

28 ASSOC. PROF BARNETT: Yes.

29 MR NEAL: So that is obviously you saying it is a good idea to  
30 have a release date of data that you're producing that  
31 coincides with the fire.

1 ASSOC. PROF BARNETT: The fire anniversary, yes.

2 MR NEAL: The fire anniversary I should say, yes. Is it fair to  
3 say to you at this point, irrespective of how you started  
4 off this relationship, that you seem, at this point, to  
5 become somewhat embedded in a campaign?

6 ASSOC. PROF BARNETT: No, I wouldn't say that. I would say that  
7 me saying "a great idea" is based on my experience of  
8 engaging the media and specifically an example where I ran  
9 a study showing that stillbirth increased in Brisbane  
10 during hot weather and I felt that was worthy of media  
11 attention and tried to get a lot of media attention for it  
12 and got nowhere and spoke to journalists and they said,  
13 "Because it wasn't a hot day when you tried to get this  
14 media release out", and I've also been on courses with  
15 journalists and they're told - I think the word is to  
16 provide a hook, that there has to be some hook for the  
17 media. So that statement was just simply saying it is a  
18 good idea to do that because you have the anniversary and  
19 therefore it will be in people's minds.

20 MR NEAL: I'm not disagreeing with anything you just said, I  
21 think what I am saying to you is this is fairly interpreted  
22 as being you giving strategic advice about how to get media  
23 impact on behalf of Voices of the Valley.

24 ASSOC. PROF BARNETT: I would agree, yes, I gave them strategic  
25 advice - well, they came up with the idea, I simply said it  
26 was a good idea.

27 MR NEAL: Okay. In saying that, I want to put to you again that  
28 at this stage, irrespective of what the relationship might  
29 have been, that you are starting to be drawn into the fold,  
30 starting to be part of the campaign.

31 ASSOC. PROF BARNETT: No, I wouldn't say that at all. I'd say

1 as a scientist I have a reputation that I need to protect  
2 and as a bioscientist you're likely to have a very short  
3 career. I'm very protective of my reputation. I did work  
4 for them for free because I thought this was something of  
5 interest and I thought it was of national interest and a  
6 worthy investigation.

7 MR NEAL: You also knew, did you not, that the Voices of the  
8 Valley had a pretty clear position, which was that there  
9 had been an adverse mortality effect as a result of the  
10 fire?

11 ASSOC. PROF BARNETT: Yes.

12 MR NEAL: Can I take you on to the email of 1 February from you  
13 to Wendy Farmer which starts, "Hi Wendy. I strongly agree  
14 with the health study", et cetera.

15 ASSOC. PROF BARNETT: Yes.

16 MR NEAL: It goes on to say, "In terms of the analysis, we think  
17 we should stick with the current one, that uses all the  
18 data." So do I understand that to be a reference to  
19 keeping on using all the six postcodes?

20 ASSOC. PROF BARNETT: Yes.

21 MR NEAL: And then it goes on to say, "We can still pick out the  
22 results for the three postcodes", and I'm not taking you to  
23 everything in the chain, but the three postcodes are the  
24 three postcodes thought to have the highest mortality  
25 rates, are they not?

26 ASSOC. PROF BARNETT: Yes.

27 MR NEAL: Then you go on to say, "Merging postcodes loses  
28 information and also opens up the question of why those  
29 postcodes and not other combinations." So I take you to be  
30 saying really two things: that keeping a greater number in  
31 might give it more statistical strength.



1 ASSOC. PROF BARNETT: Yes, I think. The idea also there is as  
2 soon as you start to exclude data, you have to have a  
3 reason for it, so once we've got this extra data, I saw no  
4 reason to exclude it, so the best scientific thing to do is  
5 to keep it all in.

6 MR NEAL: Your comment, "We can still pick out the results for  
7 the three postcodes" is a comment which is effectively  
8 saying we will still give prominence to those postcodes  
9 which have the greatest mortality effect, apparently?

10 ASSOC. PROF BARNETT: No. I plotted the relative risks for all  
11 the six postcodes together in one plot so they could all be  
12 compared and then you can compare those ones and you can  
13 look at the ones that are above the line and below the  
14 line.

15 MR NEAL: That is not a contradiction of the idea, we can still  
16 pick out the results for the three postcodes. "Pick out"  
17 means give prominence to those three postcodes said to have  
18 the greatest mortality effect.

19 ASSOC. PROF BARNETT: I would say I was presenting all the data  
20 for all the postcodes and any postcode could be picked out  
21 from the results in the way I presented it.

22 MR NEAL: Your words are, "We can still pick out the results for  
23 the three postcodes." Isn't that - just hear me out -  
24 isn't that by way of saying if we lay out six postcodes  
25 don't worry, we'll still give prominence to the three that  
26 have the greatest mortality effect?

27 ASSOC. PROF BARNETT: No, that is not the way I would interpret  
28 that, or that is not the way I intended it to be at all.

29 MR NEAL: Is it open to that interpretation, do you think?

30 ASSOC. PROF BARNETT: Possibly. I can't really answer that.

31 MR NEAL: Can we go on to an email from you of 5 February to

1 Shaun Murray and Wendy Farmer. "Hi Shaun. I could say",  
2 that is the way it starts.

3 ASSOC. PROF BARNETT: Okay, yes.

4 MR NEAL: This is, as I understand it, volunteering a form of  
5 wording that might go into a press release.

6 ASSOC. PROF BARNETT: Yes.

7 MR NEAL: In the body of the text you say, "The most important  
8 missing information is the cause of death. If the majority  
9 of deaths were due to respiratory and cardiovascular  
10 disease, then that would provide further evidence that the  
11 pollution from the fire was responsible." Can I  
12 characterise that particular document there as saying at  
13 the moment, without the information about cause of death,  
14 the cogency of the data or analysis you're going to produce  
15 is diminished?

16 ASSOC. PROF BARNETT: No, I wouldn't present it that way. I'd  
17 say that we have good evidence at the moment but there are  
18 ways to refine it and if you could increase that  
19 information, we'd obviously have a better picture.

20 MR NEAL: Cause of death would be a critical one, wouldn't it?

21 ASSOC. PROF BARNETT: I'm not sure I'd call it critical. I  
22 think there are plenty of studies in the area that use  
23 all-cause mortality and given that most deaths come from  
24 cardiovascular and respiratory mortality, there might not  
25 actually be that huge a difference between all-cause  
26 mortality and these separate causes.

27 MR NEAL: Can we move ahead, please, to an email to you from  
28 Cathy Coote, who is from Enviro Justice Org - or whose  
29 email address is envirojusticeorg.au. Can you identify  
30 her?

31 ASSOC. PROF BARNETT: No. I can't - well, I obviously did email

1 her. I presume she works for the Environmental Justice  
2 Office.

3 MR NEAL: There is at this point, I think, a media release being  
4 considered and you're given a media release for some  
5 comment and on 5 February you email, amongst others, Cathy  
6 Coote, "My comments attached", which I'm taking to be the  
7 media release as you would suggest it might be seen, is  
8 that right?

9 ASSOC. PROF BARNETT: Yes.

10 MR NEAL: In the physical documents that we've been provided  
11 with, there is a document that seems to be attached which  
12 says, "Summary of Associate Professor Adrian Barnett's  
13 statistical analysis of deaths relating to the Hazelwood  
14 Mine Fire." Do you have that?

15 ASSOC. PROF BARNETT: Yes.

16 MR NEAL: If you drop down the page to the second-last bullet  
17 point.

18 ASSOC. PROF BARNETT: Yes.

19 MR NEAL: Is that a proposed amendment to a draft that you've  
20 inserted?

21 ASSOC. PROF BARNETT: Where it says "comment AB-1"?

22 MR NEAL: I hadn't seen it in that form until that moment. Yes,  
23 the bullet point starting, "The analysis found".

24 ASSOC. PROF BARNETT: Yes.

25 MR NEAL: "that the biggest impact was in Traralgon, where there  
26 was a 94 per cent probability that deaths increased in that  
27 suburb during the fire." Just stopping there for a moment,  
28 Traralgon not being Morwell, nearest or most proximate to  
29 the site of the fire, it might be thought that that is a  
30 little counter-intuitive, that Traralgon is showing the  
31 greatest effect, would you agree with me that far?

1 ASSOC. PROF BARNETT: Well, I - sorry, I'm conscious that I  
2 should strictly answer the question.

3 MR NEAL: Please do.

4 ASSOC. PROF BARNETT: So I suppose I have to say yes.

5 MR NEAL: In brackets what comes after that is the fact of that  
6 being the highest number, you say "which could be because  
7 very few Traralgon residents evacuated during the fire and  
8 the wind direction was towards Traralgon for a number of  
9 days", yes?

10 ASSOC. PROF BARNETT: Yes.

11 MR NEAL: What was the basis for that information that you had  
12 on Traralgon?

13 ASSOC. PROF BARNETT: I didn't write that statement, but I  
14 presume maybe the data from the EPA. I mean, in terms of  
15 the wider issue, we know that people who can see flames are  
16 often much more likely to evacuate, whereas - from my  
17 dealings with the Australian public and talking about this  
18 with journalists, I think there is an underappreciation  
19 that outdoor smoke can actually kill, so it wouldn't  
20 surprise me if people who were further away, and maybe not  
21 exposed to such high doses of smoke, chose not to evacuate.

22 MR NEAL: Is it fair to characterise the paragraph here that I  
23 understand you inserted as saying effectively this: we've  
24 got a high figure in Traralgon. If that is contrary to the  
25 expectation that there will be a greater mortality effect  
26 in Morwell, what we can do is to explain that by referring  
27 to the possibility of because very few people in Traralgon  
28 evacuated?

29 ASSOC. PROF BARNETT: I think that's a potentially plausible  
30 argument for the difference between Morwell and Traralgon,  
31 yes, I think evacuations are - - -

1 MR NEAL: This is a press release, so you're advancing reasons  
2 why, if you like, Traralgon results, which might be a  
3 little counter-hypothetical, can in fact be maintained as  
4 valid results?

5 MR ROZEN: Before you answer that, Associate Professor Barnett,  
6 I just want to raise a matter about this. It is being put  
7 to the witness that he inserted this paragraph. What is  
8 not clear from the evidence is what part of it is his and  
9 what part of it was in the draft that was sent to him and I  
10 think in fairness to him, that ought be clarified.

11 MR NEAL: I accept the point. I thought we had, but perhaps we  
12 need to clarify it again. Associate professor, you heard  
13 the point that was raised by Mr Rozen?

14 ASSOC. PROF BARNETT: Yes. I didn't write that paragraph, I  
15 merely commented on it.

16 MR NEAL: Perhaps you need to identify for us which are your  
17 comments then.

18 ASSOC. PROF BARNETT: In the version I have, I can see a little  
19 comment box from me and it says, "Is Moe 3825, I would say  
20 that 3844 had the next largest increase".

21 MR NEAL: Can I ask you, perhaps at that point in this draft  
22 that we're looking at, do you have any other substantial  
23 contributions to it, other than what you have just pointed  
24 out?

25 ASSOC. PROF BARNETT: And then I think I have crossed through  
26 the second half of the last sentence, "where it is likely  
27 that eight more people died during the fire than on  
28 average".

29 MR NEAL: Can I take you forward then from that document to an  
30 email from you of 5 February 2015 at 9.52 am to Wendy  
31 Farmer. Do you have that?

1 ASSOC. PROF BARNETT: I can't find that, but again I read them  
2 all just last night, so I'm sure if you tell me about it,  
3 it will jog my memory.

4 MR NEAL: "Hi all. My comments attached", so I assume this is,  
5 in the chain that we're talking about, the draft release,  
6 your comments, here they come?

7 ASSOC. PROF BARNETT: That sounds right.

8 MR NEAL: You say in the text, "The constant problem we have in  
9 terms of statistics is that this is a relatively small  
10 study because of the small population exposed. Obviously  
11 this was good news in terms of the disaster, but it does  
12 make it harder to make conclusive statements. One way to  
13 bolster the arguments is to cite the very many larger  
14 studies that have consistently shown an increased risk of  
15 death after exposure to pollution. Why would the Hazelwood  
16 fire be any different?"

17 ASSOC. PROF BARNETT: Yes.

18 MR NEAL: Can I just pause there and particularly addressing the  
19 sentence, "One way to bolster the arguments" and just  
20 suggest to you, so that you're clear, that again, if we  
21 consider the role of an expert as being someone impartial  
22 and independent, that you're crossing the line here and  
23 you're advocating for a cause, you're advising people about  
24 how they bolster their arguments.

25 ASSOC. PROF BARNETT: I'm not really sure I agree with that and  
26 I would say when I was asked earlier I gave exactly the  
27 same answer, when I was asked the key question of whether  
28 the deaths were increased by the mine fire, I started with  
29 the previous evidence and then I moved on to the current  
30 evidence.

31 MR NEAL: I'm not so much talking about what the evidence may or

1           may not say, I'm talking about the role that you're  
2           occupying here, which seems to be a role of expert  
3           adviser-cum-consultant-cum-advocate.

4   ASSOC. PROF BARNETT:  No, it never felt like that to me, I've  
5           always felt very straight down the line with the science, I  
6           have never changed any scientific decision that I have felt  
7           was important, I never changed any of my analysis in  
8           reaction to anybody else.

9   MR NEAL:  Does the sentiment that you express here, "The  
10           constant problem we have in terms of the statistics is that  
11           this is a relatively small study because of the small  
12           population exposed", that sentiment, does that reflect  
13           itself in the two analyses that you published?

14   ASSOC. PROF BARNETT:  Absolutely not.  I mean, for example, the  
15           first analysis I did within 24 hours of speaking with  
16           Madeline Morris and hadn't, at that point, had any contact  
17           with Voices of the Valley, and the second analysis was  
18           actually almost entirely the same as the first analysis.

19   MR NEAL:  Let's be clear with each other because I'm not sure if  
20           we are.  What I'm drawing your attention to is the candid  
21           comment we see in this email:  "The constant problem we  
22           have in terms of these statistics is that this is a  
23           relatively small study because of the small population  
24           exposed.  Obviously this is good news in terms of the  
25           disaster but it does make it harder to make conclusive  
26           statements", stopping there.  What I asked you then was  
27           does this candid comment about the limitations, does it  
28           find reflection in the words of your two analyses?---Yes, I  
29           would say exactly.

30   We will come to that.  Earlier in your evidence I was asking you  
31           about the exchange which was do you know if there were more

1 deaths in all the six postcodes and the answer was, and I'm  
2 paraphrasing, you would be surprised if there wasn't or  
3 something like that?

4 ASSOC PROF. BARNETT: Yes.

5 MR NEAL: Does that identification of where let's call it  
6 positive data might come from, does that accord with what  
7 you would call a rigorous approach to this exercise?

8 ASSOC PROF. BARNETT: I'm not sure what your question is, I  
9 think from my point of view getting more data would always  
10 be a good thing.

11 MR NEAL: That's a slightly different proposition, asking the  
12 Voices of the Valley representative do you expect higher  
13 numbers in the all six, so you know the numbers in four but  
14 do you expect them higher in all six? To perhaps a cynical  
15 reader there is perhaps an element of looking for - having  
16 an outcome and looking for data in support of it.

17 ASSOC PROF. BARNETT: No, absolutely not, I think I needed to  
18 rely on local knowledge and it is always best to work from  
19 a priori a hypothesis, what do you expect, (indistinct) by  
20 data and you then see what happens. I mean, I think I  
21 would add the two suburbs that actually were included  
22 actually weakened the overall argument because the death  
23 rate wasn't so high, you can see I did not exclude those  
24 and I kept them in my final analysis.

25 MR NEAL: And there was a sort of tension there, was there not,  
26 because by putting them in you were getting a broader  
27 statistical population to look at?

28 ASSOC PROF. BARNETT: Yes, as I said increasing the sample size  
29 in general would be a good thing, the more data we can get  
30 the better study we have.

31 MR NEAL: You can put that document to one side for at the



1 moment. What I wanted to say to you as a result of walking  
2 through that correspondence is - and I say this in fairness  
3 because it is a view that will be put, if we were to think  
4 about the relative independence of the experts that are  
5 before the Board of Inquiry you should not be regarded as  
6 being at arm's length from the matters you're  
7 investigating.

8 ASSOC PROF. BARNETT: I completely disagree with that, I have  
9 analysed these as someone who is an expert in air pollution  
10 has done multiple studies in this area and I have purely  
11 let the data do the talking and presenting the best  
12 analysis I could.

13 MR NEAL: So you don't accept the suggestion that it's unusual  
14 for an independent non aligned expert to have the degree of  
15 involvement we see manifested from this email?

16 ASSOC PROF. BARNETT: In my experience no, if people ask me for  
17 help from the public I'm paid by public money, I'm very  
18 happy to help them with my expertise in any way I can.

19 MR NEAL: Including strategic advice about how best to get their  
20 campaign in the media.

21 ASSOC PROF. BARNETT: Yes, I did do that.

22 MR NEAL: I will leave the point but what I'm suggesting to you  
23 is - and I don't want to embarrass anybody here but if we  
24 take Professor Armstrong over there, in terms of your arm's  
25 length non partisan role you're a different proposition to  
26 him.

27 ASSOC PROF. BARNETT: I don't feel that at all, no, I feel as  
28 if my evidence has been presented in the same scientific  
29 way Professor Armstrong would have approached his, he did  
30 an analysis to the best of his abilities and presented it  
31 and that's exactly what I would have done and what I did.

1 MR NEAL: Can I ask you about the September 2014 report, the  
2 actual analysis you did. That is exhibit 26.

3 ASSOC PROF. BARNETT: Yes.

4 MR NEAL: Just a matter of technicality, I think you describe  
5 the second of your two analyses as being a working paper,  
6 do you regard the first one as being a working paper as  
7 well?

8 ASSOC PROF. BARNETT: I think you're referring to the fact - so  
9 it's on the E-print system as a working paper, is that what  
10 you're referring to?

11 MR NEAL: Yes.

12 ASSOC PROF. BARNETT: The only reason it's under that category  
13 is there is no other category it can go into, if there was  
14 a category called completed paper I would have put it in  
15 there but that was the only one I could post it in to.

16 MR NEAL: I think you were asked a question yesterday about  
17 whether or not there has been a published document and you  
18 said no but largely because you didn't think there would be  
19 an audience of a specific status, publication of a specific  
20 status to get it published, is that right?

21 ASSOC PROF. BARNETT: That's right.

22 MR NEAL: Do you say that the state in which we see the two  
23 documents that they are of the academic and scientific  
24 rigour that you would be happy to have published?

25 ASSOC PROF. BARNETT: Most definitely yes. I think if I was  
26 sending it to a journal there would be more technical  
27 detail in there, because I knew this was for public  
28 consumption I did reduce slightly the technical areas, for  
29 example, I didn't present the equations of a Poisson  
30 distribution which I would probably do, but I didn't think  
31 that would be helpful for the public.

1 MR NEAL: You acknowledge in your first document, exhibit 26 in  
2 the introduction, "I have tried to give as much technical  
3 detail as possible whilst still making it understandable to  
4 the non specialist reader".

5 ASSOC PROF. BARNETT: Exactly.

6 MR NEAL: It might be a difficult question, do you think you  
7 actually made that document understandable to the non  
8 specialist reader?

9 ASSOC PROF. BARNETT: That is a very difficult question for me  
10 to answer, I would hope so, I mean, I hoped I presented the  
11 statistics and results that were interpretable to all.

12 MR NEAL: Can I take you to page 5 of at first report, exhibit  
13 26, and ask you to clarify the very last sentence there:  
14 "The figures in the first released analysis quoted 11  
15 deaths rather than 14", do you see that?

16 ASSOC PROF. BARNETT: I don't have that on my page 5, all I  
17 have on my page 5 is table 2.

18 MR NEAL: Am I the only one in the room looking at the document  
19 in that form?

20 MRS ROPER: Ours is the same as yours.

21 MR NEAL: The board is seeing the proposition I just read out.

22 ASSOC PROF. BARNETT: Okay, sorry. So in the header bar does  
23 it have Adrian Barnett December 2014 ,

24 MR NEAL: September 2014.

25 ASSOC PROF. BARNETT: So looking at the first report then.

26 MR NEAL: Yes.

27 ASSOC PROF. BARNETT: Yes, sorry, I was looking at my second  
28 report, I have that now, yes.

29 MR NEAL: To what discuss the first release analysis refer?

30 ASSOC PROF. BARNETT: Yes, I think that was just the  
31 information I gave to Madeleine Morris, so probably

1 analysis is not the right word there.

2 MR NEAL: That draws attention to the fact "quoted 11 rather  
3 than 14, this is because of the request to present absolute  
4 deaths was made after the request to adjust for  
5 temperature."

6 ASSOC. PROF. BARNETT: Yes.

7 MR NEAL: And when you adjusted for temperature it came down to  
8 11.

9 ASSOC PROF. BARNETT: That's right.

10 MR NEAL: When you refer there to the request to present  
11 absolute deaths, from whom did that request come?

12 ASSOC PROF. BARNETT: That was from Madeleine Morris, the  
13 journalist.

14 MR NEAL: Can you say why the request was to present absolute  
15 deaths.

16 ASSOC PROF. BARNETT: Because it's something the public find I  
17 think a lot easier to understand than relative deaths.

18 MR NEAL: Dealing with your first report firstly, fairly  
19 understood what your first report does, and I'm drawing  
20 your attention to what's at page 4 under each of the  
21 tables.

22 ASSOC PROF. BARNETT: Yes.

23 MR NEAL: "The probability that the death rate was higher than  
24 the AVERAGE during the fire is 0.89, this means the  
25 probability that the death rate was not higher than the  
26 average during the fire is 0.11."

27 ASSOC PROF. BARNETT: Yes.

28 MR NEAL: "The mean increase in death is as a relative risk  
29 1.114 or 14 as a percentage." Stopping there, I'm taking  
30 it your language in this document saying the probability  
31 that death was higher than average during the fire, is

1 really drawing attention to the fact your results are  
2 talking about what I would call a temporal coincidence.

3 ASSOC PROF. BARNETT: I think the word coincidence, I would say  
4 that word has a sort of special meaning that implies the  
5 word chance, so I wouldn't use that word myself.

6 MR NEAL: Okay, that there was a temporal correlation, is what  
7 you're drawing attention to?

8 ASSOC PROF. BARNETT: Again correlation again has a special  
9 meaning in statistics, what it means is two things are  
10 changing at the same time whereas here I would say we would  
11 always be looking at an association. We know there is a  
12 known exposure and we're always looking to see whether that  
13 exposure increases death, we're not just look to see  
14 whether they happen at the same time.

15 MR NEAL: When you used the expression "higher than average  
16 quote during the fire", I'm saying to you no more than what  
17 you're exposing you would say on your data taking it at  
18 face value is that during the period associated with the  
19 fire there seems to have been statistically an increase in  
20 the deaths.

21 ASSOC PROF. BARNETT: Yes, well that probability specifically  
22 works from the premise - - -

23 MR NEAL: I'm not asking about the probability, I'm just asking  
24 about the fundamental idea.

25 ASSOC PROF. BARNETT: Can you say that again then because it  
26 isn't clear.

27 MR NEAL: I'm concerned that it's clear to everybody what  
28 you're saying in this report is that at the point I'm  
29 referring you to now, that as a result of your analyses you  
30 would posit the position there had been an increase in the  
31 death rate during the fire and it's an important

1 distinction to understand, during the fire.

2 ASSOC PROF. BARNETT: Yes, that probability is based on the two  
3 months of the fire.

4 MR NEAL: We have heard a number of people discuss this this  
5 morning, but that what I would call increase in a death  
6 rate that you posit concurrent with the period of the fire  
7 is doing no more than saying there is a concurrency between  
8 two events.

9 ASSOC PROF. BARNETT: I see.

10 MR NEAL: Do you agree, I'm putting to you that's what you're  
11 saying, fairly understood that is what you are saying.

12 ASSOC PROF. BARNETT: No, this probability is based on an  
13 association that one then causes another, not that two  
14 things are merely coincident, this is a regression model  
15 analysis and that's the way they work, we have a known  
16 cause and we look for an effect.

17 MR NEAL: Can I ask you whether the wording you chose here  
18 which was "during the fire" is happily chosen.

19 ASSOC PROF. BARNETT: I'm happy with that.

20 MR NEAL: Apropos the data you were using at that stage, is it  
21 fair to say or can I ask you this in isolation, does the  
22 death data include death prior to February 2009?

23 ASSOC PROF. BARNETT: Yes, it does.

24 MR NEAL: And if we were to sophisticate this analysis that  
25 shouldn't be so.

26 ASSOC PROF. BARNETT: Yes, I think I said somewhere in one of my  
27 documents that would be one of the easiest and obvious  
28 things to do, to exclude those deaths that happened before  
29 the fire.

30 MR NEAL: What the data does not appear to do either - can I  
31 perhaps go back a step, I think I have used the expression

1 used here often, crude data, there is a crudeness about the  
2 data.

3 ASSOC PROF. BARNETT: Compared to other analysis in this area  
4 that used daily data yes, monthly data is relatively crude.

5 MR NEAL: At this point discriminating between deaths prior to  
6 the fire is a clear exclusion from the data which would  
7 improve it.

8 ASSOC PROF. BARNETT: Yes, I think that's what we just - that's  
9 saying what we just said again, yes.

10 MR NEAL: Indeed excluding deaths that were not possibly  
11 related to the fire would be another sophistication of the  
12 analysis.

13 ASSOC PROF. BARNETT: Yes, although I would say that it could  
14 be quiet challenging and you would have to get an expert to  
15 go through every single death because pollution is actually  
16 associated with very many causes of death.

17 MR NEAL: Also it would be particularly relevant in terms of  
18 the data to understand whether attribution of death to a  
19 postcode was meaningful by which I mean one would want to  
20 know whether the person associated with the postcode  
21 actually was residing in the postcode at any relevant time  
22 irrespective of what their residential address was shown  
23 as, would you agree with that?

24 ASSOC PROF. BARNETT: That would be helpful too, yes, related  
25 to that you could also include people who were in the area  
26 but who were not actually resident.

27 MR NEAL: In which case you have to do a different study  
28 altogether, as a comparator you're doing postcode to  
29 postcode, aren't you?

30 ASSOC PROF. BARNETT: That would be an individual study, yes.

31 MR NEAL: My point is that the underlying premise of this

1 document and many others is let's compare historical  
2 postcode information to the relevant period postcode  
3 information.

4 ASSOC PROF. BARNETT: Yes, I would add that's fairly standard.

5 MR NEAL: I'm not saying it's not, I'm just saying that's a  
6 comparison we make. In this document you're comparing -  
7 you make the note you're comparing I think 144 observations  
8 - you're drawing on 144 observations.

9 ASSOC PROF. BARNETT: Yes.

10 MR NEAL: Can I understand it this way, your analysis really  
11 involves eight observations compared with 136.

12 ASSOC PROF. BARNETT: The eight would be the two months of the fire - - -

13 MR NEAL: Yes.

14 ASSOC PROF. BARNETT: Yes, that sounds correct.

15 MR NEAL: Is that level of comparison, eight and 136, would you  
16 characterise that as clearly a small sample size?

17 ASSOC PROF. BARNETT: I would say it's difficult to say because  
18 it depends entirely on how much information there is each  
19 day, so if we had a very large death rate, for example,  
20 eight months of data would be quite substantial. So it  
21 really does depend on the underlying number of deaths.

22 MR NEAL: Well, given what we actually knew here, what I'm  
23 suggesting to you is it's a relatively small sample and  
24 indeed that's consistent with what you were pointing out in  
25 the documentation we have gone through this morning in your  
26 conversations with Voices of the Valley.

27 ASSOC PROF. BARNETT: I don't think I could give an adjective  
28 to how small the sample is, I would say the proof of the  
29 pudding is in the analysis, and to rely on the results  
30 rather than going back and saying it isn't a big enough  
31 sample, I would just focus on what the sample actually told



1 us.

2 MR NEAL: Is the point about small sample size that the effect  
3 of random variation is a constant problem?

4 ASSOC PROF. BARNETT: I would have to think about that, can you  
5 say that again?

6 MR NEAL: Is one of the problems associated with a small sample  
7 size the random variation can play a significant role?

8 ASSOC PROF. BARNETT: So okay, I will try and answer that by  
9 saying we always have what we call a signal and a noise,  
10 and there is the signal which is the truth and that is  
11 often obscured by noise, by that random variation if you  
12 like, and what happens consistently is as sample size  
13 increases that signal to noise ratio becomes higher, the  
14 noise becomes less important, does that answer your  
15 question?

16 MR NEAL: It may do in this particular case, what I was  
17 suggesting to you was that the sample size we're actually  
18 involved with is relatively small and that in that sample  
19 size random variation may be problematic, simple as that.

20 ASSOC PROF. BARNETT: Okay, so my answer to that would be we  
21 can best understand all those issues by looking at the  
22 analysis because they are all made explicit in the  
23 analysis.

24 MR NEAL: So you would rely on the detail of the analyses to  
25 answer that.

26 ASSOC PROF. BARNETT: The analyses includes result size - it  
27 answers all those questions, it tells us is there a real  
28 increase or isn't there.

29 MR NEAL: In that first report it's often quoted you're saying  
30 there was something like an 80 per cent increase in the  
31 probability that the death rate was higher than average.

1 ASSOC PROF. BARNETT: No, not an 80 per cent increase, the  
2 probability that the death rate was higher than average is  
3 80 per cent.

4 MR NEAL: Sorry, that's what I meant, and the corollary of that  
5 is there is a 20 per cent chance it wasn't.

6 ASSOC PROF. BARNETT: Exactly.

7 MR NEAL: So there is a one in five chance it wasn't.

8 ASSOC PROF. BARNETT: That's right.

9 MR NEAL: In analyses such as these which have significant  
10 consequences attached to them can I suggest to you in a  
11 statistical analysis if you have that one in five  
12 possibility that you're not seeing an effect that you would  
13 be going back to the drawing board?

14 ASSOC PROF. BARNETT: No, I think it depends entirely on the  
15 context, it's not possible to give a general answer to that  
16 question.

17 MR NEAL: Well, I put it to you in this way, in any context  
18 where very serious significance is going to be attached to  
19 an analysis being it a medical one or a forensic one such  
20 as this, at the one in five level what I was putting to you  
21 is, you would be hesitating to exclude the hypothesis there  
22 was an effect but you would be loath to say there was.

23 ASSOC PROF. BARNETT: I would think the context was more the  
24 prior information we have on the exposure and the  
25 biological plausibility that it can increase the risk of  
26 death and that prior evidence we have that it can increase  
27 the risk of death, for me that's the important context, we  
28 have that information.

29 MR NEAL: So I understand that answer to be you would then go  
30 outside the four corners of the analysis to other bodies of  
31 study.

1 ASSOC PROF. BARNETT: Yes, when I think - the beauty of the  
2 analysis as I see it is that we have that 80 per cent  
3 probability and that can be interpreted by different people  
4 differently, it can be interpreted by members of the  
5 Inquiry in a way they see fit, it can be interpreted by you  
6 in the way you see fit.

7 MR NEAL: Thank you, professor, I have no other questions.

8 MR BLANDEN: I'm not sure if we're dealing only with Associate  
9 Professor Barnett or all - - -

10 CHAIRMAN: All participants .

11 MR BLANDEN: Thank you. Then I would like to ask some  
12 questions of some of the other members of the panel.

13 MS SZYDZIK: I have a couple of questions relating to some of  
14 the issues that arose, sir.

15 MR NEAL: I have been misleading people perhaps, those are the  
16 questions I had for Associate Professor Barnett.

17 CHAIRMAN: Continue to ask questions of the other members of  
18 the panel.

19 MR NEAL: Thank you. Professor Armstrong, from the panel of  
20 experts we have been hearing from, I think you're the only  
21 one who is both an epidemiologist and medically qualified?

22 PROF. ARMSTRONG: I believe that to be correct, yes.

23 MR NEAL: You mentioned in your evidence yesterday when you did  
24 the joint report that you assumed the role of chairman.

25 PROF. ARMSTRONG: That is correct.

26 MR NEAL: Now, putting aside natural modesty for a moment is  
27 that because people recognise your particular status of  
28 expertise?

29 PROF. ARMSTRONG: Probably they may have recognised that, I was  
30 on the front foot, I decided there was a need to have  
31 clarity around how the process would be led and being

1           rather experienced in avoiding wasting time in that kind of  
2           process I thought I had better make the proposition I would  
3           Chair it and if that was acceptable that would be fine. So  
4           how people judge that in terms of my making - I don't know,  
5           it was made simply because I saw it as expedient to do  
6           something.

7 MR NEAL:    It's a dangerous question perhaps but I should ask  
8           Professor Gordon, is that a fair analysis as you saw it,  
9           Professor Gordon?

10 PROF. GORDON:    Yes, it is.

11 MR NEAL:    Can I ask you this, to the extent the joint report  
12           was produced, if it contains conclusions that are  
13           inconsistent with individual reports we should understand  
14           it as now moving on from the individual reports to an  
15           agreed position.

16 PROF. ARMSTRONG:    That is as I would understand it to be.

17 MR NEAL:    Is it also fair to say that from your point of view,  
18           Professor Armstrong, that the conclusions you individually  
19           reached in your report were very substantially replicated  
20           in the joint report?

21 PROF. ARMSTRONG:    I think that's a correct representation.

22 MR NEAL:    Yesterday I think the question was being raised, this  
23           is my paraphrasing of it, of you being asked to comment on,  
24           I will call them mechanics of respiratory and  
25           cardiovascular disease and I think you declined to do that.

26 PROF. ARMSTRONG:    I declined to get down to the detail of the  
27           essentially molecular level mechanisms.

28 MR NEAL:    You can be assured I wasn't going to ask you about  
29           that. In terms of the basic mechanics of respiratory and  
30           cardiovascular disease, I think we have already heard  
31           evidence from Professor Abramson about that, do you know

1 Professor Abramson?

2 PROF. ARMSTRONG: I do.

3 MR NEAL: I will stand corrected but I think we were discussing  
4 with him the question of would you expect in an emissions  
5 event like this to see respiratory and cardiovascular, and  
6 if both weren't present was that significant, and I am  
7 broadly paraphrasing, the gist of his answer I think was to  
8 say in an event like this you would expect to see  
9 respiratory adverse effects because that's the mechanical  
10 means by which the emissions are drawn into the body. So  
11 are you clear about what I have just put to you?

12 PROF. ARMSTRONG: I am clear on what you have just said.

13 MR NEAL: Do you agree with that?

14 PROF. ARMSTRONG: Let me first say that under normal  
15 circumstances I would defer completely to Professor  
16 Abramson on that as relating to particulate effects, air  
17 pollution effects, because that is an area of substantial  
18 expertise of his, it is not an area of substantial  
19 expertise of mine although I know somewhat of it because  
20 I'm a member of the expert advisory panel to the chief  
21 health officer of New South Wales in respect of air  
22 pollution. Having said that, from my own recent study of  
23 the literature I have seen quite strong indications of a  
24 contrary view to the one that you have just put and that is  
25 to say that there the dominant effect of air pollution on  
26 health has to be seen to be cardiovascular rather than  
27 respiratory in that acute situation.

28 MR NEAL: Can you clarify in that acute - - -

29 PROF. ARMSTRONG: In the period immediately following the  
30 exposure.

31 MR NEAL: I think we may have a technical problem. Can I

1 perhaps put a slightly different thing to you, in an  
2 emissions event like the one we're looking at, would both  
3 respiratory and cardiovascular adverse outcomes be an  
4 expected concomitant?

5 PROF. ARMSTRONG: Again all I can say on recent reading I have  
6 done, it would not necessarily be unusual to see  
7 cardiovascular effect as the dominant one in the  
8 short-term.

9 MR NEAL: So you're speaking in relative terms, but - - -

10 PROF. ARMSTRONG: No, I think some of those studies suggest you  
11 would not necessarily expect to see respiratory effects.

12 MR NEAL: I wanted to take you to the expert report, but we  
13 will have to do it this way as Mr Rozen foreshadowed, the  
14 expert report has ultimate conclusions but of course the  
15 grounding propositions go back to your document and to  
16 understand that we really need to go there, you have all  
17 those documents in front of you I take it?

18 PROF. ARMSTRONG: I believe so, yes.

19 MR NEAL: This is exhibit 28 and at the bottom of page.

20 PROF. ARMSTRONG: I wonder if we could get the alternative  
21 references, so there are tabs in the folder I have and the  
22 numbers in that, I don't have anything indexed by exhibits.

23 MRS ROPER: Tab 13.

24 PROF. ARMSTRONG: My report, yes.

25 MR NEAL: And I was drawing your attention to table 1, just as  
26 a technical matter you made a number of corrections  
27 yesterday but I wonder whether there is in fact an error in  
28 the table. When you look under the rate ratio 2014 to  
29 relative to 2009/2013 you have a figure 0.80.

30 PROF. ARMSTRONG: Yes.

31 MR NEAL: It's suggested that figure in fact should be 0.59.

1 PROF. ARMSTRONG: I don't believe that's that case.

2 MR NEAL: That figure is the product of what calculation?

3 PROF. ARMSTRONG: I would have to take a few moments.

4 MR NEAL: Can I suggest it might be completely incorrect but my  
5 understanding was if you took your 0.8 figure - the  
6 calculations that are produced in this document depend upon  
7 say, let's take February to June having 1.05 divided by  
8 1.36 to get the product as a general approach.

9 PROF. ARMSTRONG: What I have done in this, these rate ratios  
10 are comparing - so if we take Morwell, February to March  
11 2014 relative to 2009/2013 then we are in each case  
12 referring to Morwell, if we take a number for Morwell for  
13 2014 and divide it by a number relating to 2009/2013 in  
14 Morwell we do not take a figure in Morwell and compare it  
15 to a figure in Churchill, Moe and Traralgon which is I  
16 think what you have just suggested would be the correct  
17 thing to do, that is not what I did and it would not be the  
18 correct in the circumstances.

19 MR NEAL: I don't want to entertain that at the moment. This  
20 first table analysis comes to a conclusion and you comment  
21 on this over the page: "Since Morwell was the most exposed  
22 of these populations to emissions from the mine fire, the  
23 comparative lack of greater mortality in Morwell in 2014,  
24 then 2009 to 2013 is inconsistent with Latrobe Valley."

25 PROF. ARMSTRONG: Yes.

26 MR NEAL: That is something that finds expression I think in  
27 the joint report.

28 PROF. ARMSTRONG: Yes.

29 MR NEAL: And as to that, I put to you that's worthy of comment  
30 because it appears somewhat counter-intuitive.

31 PROF. ARMSTRONG: That is correct.

1 MR NEAL: And the intuition, I'm taking it, is there is a close  
2 response curve to be expected?

3 PROF. ARMSTRONG: That is correct.

4 MR NEAL: And the Morwell figures confound that expectation?

5 PROF. ARMSTRONG: They are contrary to that expectation.

6 MR NEAL: Contrary, yes, and in the overall analysis that is  
7 something you weigh in the balance?

8 PROF. ARMSTRONG: Correct.

9 MR NEAL: If we could go to proposition 1.1 which is that there  
10 is moderate evidence for a higher mortality from all causes  
11 and from cardiovascular in the Latrobe Valley in  
12 February-June 2014 than in the same period 2009-'13. Is  
13 the substantial evidence for that in table 2 of your  
14 report?

15 PROF. ARMSTRONG: Yes, it is.

16 MR NEAL: In that, you have compared all-cause mortality and  
17 then respiratory and cardiovascular. The sum evidence to  
18 which you're referring of increase in mortality in February  
19 to March is the figure of 1 as to .83, is that correct?

20 PROF. ARMSTRONG: From February to March it is indeed the figure  
21 1 as to 0.83.

22 MR NEAL: If we could convert it to language that is applicable  
23 to lawyers at least, we're saying that if you had one death  
24 as a model, that in 2009-'13 you would have had 0.83 of a  
25 death?

26 PROF. ARMSTRONG: Yes, 17 per cent lower, to make it even  
27 simpler.

28 MR NEAL: It is additional information. Whether it makes it  
29 simpler or not, I accept your point. In relation to that  
30 apparently increased figure, there is the P-value of .08  
31 attached to it.



1 PROF. ARMSTRONG: Yes.

2 MR NEAL: I think you said something - I might be misattributing  
3 - you made a comment yesterday about P-values.

4 PROF. ARMSTRONG: Yes.

5 MR NEAL: And the conventional approach, which is to look at .05  
6 and below.

7 PROF. ARMSTRONG: That has been the conventional approach. I  
8 think it has largely fallen out of favour - it may still be  
9 somewhere.

10 MR NEAL: When you attribute that P-value, what is it - we're  
11 talking about a difference between .83 and 1 and a P-value  
12 of .08, so what is that really telling us?

13 PROF. ARMSTRONG: In simple terms, it is an assessment of the  
14 probability that what we observe here, that 17 per cent  
15 lower rate in 2009-2013, as there was in 2014, it is the  
16 probability that that is simply a chance fluctuation, so it  
17 is essentially saying there is about a 1 in 12 probability  
18 that that is chance.

19 MR NEAL: Looking at February to June, all causes, you have a  
20 P-value there or a ratio, however one wants to put it, a  
21 1 to .9 ratio.

22 PROF. ARMSTRONG: Yes.

23 MR NEAL: And a P-value of .04.

24 PROF. ARMSTRONG: Yes.

25 MR NEAL: That is a function - so we've changed the P-values to  
26 some extent, obviously, by the February to June comparison.

27 PROF. ARMSTRONG: And that's because of the larger numbers in  
28 the comparison.

29 MR NEAL: Okay. Can I ask you this about the extension of the  
30 capture to February-June: I understood your own report to  
31 be saying that if there was an increase in deaths by reason

1 of particulate matter, that one would expect an effect  
2 which was proximate to the event.

3 PROF. ARMSTRONG: Yes.

4 MR NEAL: And that you tested for that, you tested for that  
5 hypothesis.

6 PROF. ARMSTRONG: Well, essentially the February to March one is  
7 looking at that, whereas February to June, by including the  
8 later periods, is essentially saying was there any evidence  
9 that this extended for a longer period of time.

10 MR NEAL: In medical terms, my understanding was that if the  
11 effect of a sharp increase was to be experienced, February  
12 to March would be the better indicator than February to  
13 June.

14 PROF. ARMSTRONG: That is correct.

15 MR NEAL: In the report - we can come to this in due course - in  
16 the report there are a number of agreements which emerge  
17 based on the February to June assumption of that being a  
18 relevant period.

19 PROF. ARMSTRONG: Yes.

20 MR NEAL: Just staying with table 2, when you look at the figure  
21 of the respiratory causes, one finds a greater figure in  
22 the 2009-2013 than one does in the 2014.

23 PROF. ARMSTRONG: Yes.

24 MR NEAL: Is that somewhat counter-intuitive?

25 PROF. ARMSTRONG: It is certainly not consistent with the notion  
26 that there would be higher respiratory deaths in 2014 than  
27 in 2009-13. The evidence for that is not very strong. The  
28 P-values would suggest that there we've got, in the case of  
29 the February to June one, a 1 in 4 probability of it being  
30 a chance finding, and that's also reflected, obviously, in  
31 the width of the confidence interval, but that is the

1 direction of it, it is in a contrary direction to a  
2 hypothesis that you'd expect to see more respiratory  
3 mortality in the period of the mine fire or in the period  
4 afterwards.

5 MR NEAL: Looking at this table more generally, it starts from  
6 an all causes sampling and then descends to subsets.

7 PROF. ARMSTRONG: Yes.

8 MR NEAL: When we descend to subsets, is there an increasing  
9 risk statistically of unreliability?

10 PROF. ARMSTRONG: There is an increasing risk of unreliability  
11 because the numbers get smaller and so the probability of  
12 chance variation increases and one is also now, if you  
13 like, testing multiple hypotheses and as soon as you start  
14 to do that, then each one becomes a little less certain  
15 than it would be if it were the only hypothesis to be  
16 tested.

17 MR NEAL: If we can move to 1.2, that there is some evidence  
18 that the increase in mortality in February to March 2014,  
19 the period of the mine fire, was greater than the increase  
20 in mortality during February to June. Can I just see if I  
21 understand that correctly. Does this comment propose that  
22 there is an increase over the whole period but that the  
23 increase in the February to March period - that there is  
24 some evidence that the increase in the February to March  
25 period is greater than the whole period?

26 PROF. ARMSTRONG: I don't think it is proposing that, but it is  
27 an entirely reasonable interpretation of it.

28 MR NEAL: Can I just draw attention to the language there, that  
29 there was "some evidence".

30 PROF. ARMSTRONG: Yes.

31 MR NEAL: You may correct me on this, professor, but my

1 understanding was that the equivalent proposition in your  
2 own report was that there was weak evidence.

3 PROF. ARMSTRONG: Yes.

4 MR NEAL: So just as a matter of perhaps formality, the  
5 conclusions that we see in this document, because it was  
6 introduced, I think, essentially as being, "Here is what  
7 Professor Armstrong has to say. What does everyone else  
8 have to say?" In some instances we need to be a bit more  
9 nuanced than that because it is not exactly what Professor  
10 Armstrong originally did say.

11 PROF. ARMSTRONG: That would be a fair interpretation, I think.

12 MR NEAL: And to be clear, it seems to me at page 9 of your  
13 report, at point 4 at the bottom of the page, you're saying  
14 precisely the same proposition but using "weak" rather than  
15 "some".

16 PROF. ARMSTRONG: Yes.

17 MR NEAL: And at page 25, at the top, I think pretty much  
18 verbatim the same idea, at point 2, the very top of the  
19 document.

20 PROF. ARMSTRONG: Yes.

21 MR NEAL: In relation to that proposition, I understand it that  
22 we're effectively relying on, at table 2, the .83 figure  
23 that appears in respect of all causes - - -

24 PROF. ARMSTRONG: Yes.

25 MR NEAL: - - - February-March, compared to the 1 as to .9 which  
26 appears in February to June.

27 PROF. ARMSTRONG: Correct.

28 MR NEAL: What I wanted to suggest to you was that as evidence  
29 for the proposition, what we're looking at here is in fact  
30 weak or very weak evidence.

31 PROF. ARMSTRONG: I've described it as "weak", you've chosen to

1 describe it as "very weak", I won't disagree with your  
2 assessment of it and you maybe won't disagree with mine,  
3 just as one says "some evidence", the same deal, no  
4 difference.

5 MR NEAL: Perhaps that's the point then because - perhaps my  
6 mistake - but reading these documents, I read them very  
7 technically and if language changes, I want to understand  
8 why. Are you saying to me now you don't mean any  
9 particular change?

10 PROF. ARMSTRONG: There was a change made and I think some other  
11 members of the group preferred the word "some". I didn't  
12 have any disagreement with that because I didn't see it as  
13 different to "weak".

14 MR NEAL: I'm noting the time, sir. I'm just about to change to  
15 another - - -

16 CHAIRMAN: I think because of the technical situation, we'll  
17 just keep going.

18 MR NEAL: Is it apparent from what you last answered to me that  
19 in the course of the joint conference, and don't take it  
20 pejoratively, there was some horse trading?

21 PROF. ARMSTRONG: I wouldn't describe it as horse trading, it is  
22 simply a case - in the instance we've just observed here, I  
23 guess you could say there was a need to complete the job  
24 within a reasonable period of time and in that case I felt  
25 that there was no need to have an argument about whether it  
26 was "weak" or "some" because I didn't really see any  
27 difference between their meanings. Now, if that is horse  
28 trading, then it is horse trading, but I wouldn't have  
29 called it horse trading personally.

30 MR NEAL: Moving to what is said at 1.3, you're referring to  
31 Associate Professor Barnett as reporting a 10 per cent

1 higher mortality in the Latrobe Valley during February and  
2 March 2014 relative to that in the same months in  
3 2004-2013. Can I just seek clarification. Is that what  
4 his second report is in fact doing or is it doing a  
5 comparison of the February to March 2014 with averages  
6 drawn from 2004 to 2013?

7 PROF. ARMSTRONG: As I read the report that Professor Barnett  
8 wrote, I saw that as that basically the comparison was  
9 always between the months of February-March and the rest of  
10 the months in those years, and this is a statistical model,  
11 so talking about averages is really not a correct  
12 description of what is going on, but basically the  
13 comparison is between those particular months and then all  
14 the other months with which they could be compared.

15 MR NEAL: Does that emerge from a tutored reading of his  
16 reports, what you've just expressed to me?

17 PROF. ARMSTRONG: It emerged from my reading of his reports. It  
18 may not be - - -

19 MR NEAL: I'm calling that tutored, professor, no two ways about  
20 it.

21 PROF. ARMSTRONG: Then it is a tutored reading of it.

22 MR NEAL: In terms of that 10 per cent mortality increase, what  
23 are you saying, confining ourselves to his report, what do  
24 you say is the statistical strength of that proposition?

25 PROF. ARMSTRONG: In the case of his 10 per cent compared with  
26 the approximate 10 per cent that we see in table 2 for -  
27 well, in table 2 it is 17 per cent for February to March,  
28 10 per cent for February to June - it is less precise, in  
29 the sense that it has a wider confidence interval and I  
30 would have seen that as probably due to the inclusion of  
31 two additional postcodes, both of which, as it happened,

1 had quite low mortalities, relative mortalities, during  
2 that period.

3 MR NEAL: Can I ask you at the top of page 2 of the joint  
4 report, there's, and it appears that Professor Gordon is  
5 the speaker here, "Based on my own analysis in which the  
6 period of potentially different risk is assumed to extend  
7 beyond the actual time of the fire, for example May 2014,  
8 the excess of deaths is statistically significant at  
9 conventional levels." Just so I'm clear, that is an  
10 agreement dependent upon an hypothesis.

11 PROF. ARMSTRONG: Can I just make sure I know what you're  
12 reading from.

13 MR NEAL: Page 2 of the joint expert report, at the very top,  
14 the first bullet point.

15 PROF. ARMSTRONG: Am I missing something? Yes, I am. Yes, that  
16 is correct. That is a statement from Professor Gordon's -  
17 well, it is a statement of Professor Gordon's.

18 MR NEAL: The confirmation I was seeking was that it is from, at  
19 least from your point of view, an agreement based on an  
20 assumption without an expression about the validity of the  
21 assumption.

22 PROF. ARMSTRONG: That is the way it is expressed and I'd agree  
23 with that.

24 MR NEAL: Can I just draw your attention to the words "the  
25 excess of death is statistically significant at  
26 conventional levels." Is it fair to paraphrase that idea  
27 as they are interesting outcomes, they are worthy of  
28 further investigation?

29 PROF. ARMSTRONG: I think it is simply stating a piece of  
30 information that can be used in whatever context is  
31 appropriate, I don't think it is limiting it in any way to

1 saying that this is only useful for further investigation.

2 MR NEAL: Does it include that idea?

3 PROF. ARMSTRONG: It would include that idea.

4 MR NEAL: Can I ask you more generally when people use that I  
5 think term of art, "statically significant", it might have  
6 a number of meanings, but will it always at least have the  
7 meaning, "That's worthy of further investigation. Given  
8 where we've gotten to and given what we've seen, let's not  
9 discard that idea, that's perhaps got some viability"?

10 PROF. ARMSTRONG: No, I think that misrepresents the common use  
11 of that and if we go back to a paradigm that's been  
12 referred to on several occasions in the context of a  
13 randomised controlled trial that has been well conducted  
14 and carried out, you get a statistically significant result  
15 that says that treatment A is better than treatment B, this  
16 will be taken as a reason for preferring treatment A over  
17 treatment B, not just for doing another study to see  
18 whether it is really true or not.

19 MR NEAL: That is the reason why you answered it is  
20 contextualised.

21 PROF. ARMSTRONG: Yes, it is why my answer is contextualised,  
22 yes.

23 MR NEAL: At 2.1 you are commenting on environmental exposures  
24 which might have increased mortality and in particular  
25 mortality from all causes in February and March and  
26 February to June 2014 was closer to that in the  
27 corresponding periods of 2009 than in those for 2009 to  
28 2013. Do I understand correctly that would be largely  
29 based upon your table 3?

30 PROF. ARMSTRONG: Let me have a look.

31 MR NEAL: Which appears at page 9.



1 PROF. ARMSTRONG: Yes.

2 MR NEAL: That proposition in itself lends itself to a number of  
3 interpretations, does it not?

4 PROF. ARMSTRONG: I assume so. I hadn't been thinking about the  
5 number of interpretations, but most things are.

6 MR NEAL: A number of hypotheses. What it appears, amongst  
7 other things, to be doing is to show a value in the 2009  
8 comparator to the 2014.

9 PROF. ARMSTRONG: Yes.

10 MR NEAL: And it shows a fairly close correlation between those  
11 two years.

12 PROF. ARMSTRONG: It suggests that in particular when one looks  
13 at all the data as laid out, that 2014 is more like 2009  
14 than it is to any of the other years in that period, 2009  
15 to 2013, in terms of the mortality patterns, except in  
16 respect of cardiovascular disease.

17 MR NEAL: And in those two years, we know we have a coincidence  
18 of high temperatures in the summer period and bushfires.

19 PROF. ARMSTRONG: That is certainly - it was the reason for  
20 doing the analysis.

21 MR NEAL: Looking at the joint report and propositions 2.2 and  
22 2.3, 2.2, across the whole period 2009 to 2014, mortality  
23 in Latrobe Valley in both February and March and February  
24 to June was higher on days when particulate air pollution  
25 was greater than or equal to 50 microns per cubic metre of  
26 PM 10 than when it was lower.

27 PROF. ARMSTRONG: Yes.

28 MR NEAL: You yourself did some examination of that proposition,  
29 did you not, in your report?

30 PROF. ARMSTRONG: I did an examination in my report of the  
31 period of the mine fire and this was with respect to

1 PM 2.5, not PM 10.

2 MR NEAL: Can we go to that, which I understand appears in  
3 figure 1 - this is starting at page 11 of your report -  
4 figure 2 and figure 3.

5 PROF. ARMSTRONG: Yes.

6 MR NEAL: You have some commentary I think at the end of that  
7 discussion, which appears at page 14, at the top.

8 PROF. ARMSTRONG: Yes.

9 MR NEAL: "Overall I have found no evidence in the data on the  
10 relationship between PM 2.5 concentration and deaths during  
11 the mine fire that PM 2.5 concentrations increased  
12 mortality in the Morwell area, where the exposure was  
13 greatest, or in the Latrobe Valley."

14 PROF. ARMSTRONG: Yes.

15 MR NEAL: You go on to note that that is at variance with the  
16 work of Dr Flander, but staying with your own analysis, is  
17 it fair to understand that your testing failed to show an  
18 expected correlation?

19 PROF. ARMSTRONG: That is correct.

20 MR NEAL: And is it also correct to say that your testing, as  
21 I've referred to it, included the idea of let's not focus  
22 on death coincident with a particular measurement but let's  
23 allow for a lag period?

24 PROF. ARMSTRONG: One of the analyses, the one that appears in  
25 figure 3, I think it is, allowed for a lag period.

26 MR NEAL: And it was pretty much counter-hypothetical.

27 PROF. ARMSTRONG: The same result.

28 MR NEAL: Do I understand then the position to be this: in your  
29 own testing of a correlation between higher PM 2.5  
30 exposures and mortality, you didn't find a correlation in  
31 the sense of death went up with higher exposure?

1 PROF. ARMSTRONG: That is correct.

2 MR NEAL: But that you were aware that others, Dr Flander in  
3 particular, had postulated to the contrary.

4 PROF. ARMSTRONG: I was certainly aware of that. I think it is  
5 important, in looking at those two results, to recognise  
6 that they're based on quite different analyses and  
7 Dr Flander's relates to the full period from 2009 to 2014  
8 and that's where she observes that association, so it is  
9 based on a much larger volume of data and, secondly, it is  
10 a different measurement. Now, in principle you should get  
11 roughly the same results with those two measurements, but  
12 it is a different measurement. So I think the  
13 inconsistency is real, but in terms of statistical power,  
14 there's much more in Dr Flander's analysis than there is in  
15 mine.

16 MR NEAL: Is it also open to the interpretation that there may  
17 be a difficulty in transferring studies that are not like  
18 to like?

19 PROF. ARMSTRONG: Could you elucidate?

20 MR NEAL: Yes, I should. Is it not correct to say that some of  
21 the expected correlation, that is an increase, were based  
22 substantially on urban air pollution?

23 PROF. ARMSTRONG: That would be urban air pollution in the  
24 Latrobe Valley, which is, I guess, a bit different to most  
25 urban areas.

26 MR NEAL: What I wanted to suggest to you was, without  
27 flattering you unduly, there is no reason to discard your  
28 own analysis of that correlation.

29 PROF. ARMSTRONG: Let me say I think that there is an important  
30 weakness in my analysis, and that is in the estimates of  
31 exposure. Now, what I did was to take a simple average, on

1 a period-by-period basis, of all the measurements that were  
2 done in the Valley of PM 2.5, so for each day, essentially,  
3 so that is based on a variable collection with different  
4 areas being weighted differently depending on where the  
5 measurements were being taken in that particular period,  
6 and these are from various points and obviously the way in  
7 which air pollution spreads across a whole area is quite  
8 complex, so there would be potentially quite a lot of error  
9 when you're trying to allocate a measure down to a  
10 particular day and a particular set of deaths in what I  
11 did, much more so, I believe, than in what Dr Flander did,  
12 because there it is one measurement in one place repeated  
13 over many days over a long period of time. And let me say,  
14 just to complete the story, when you get measurement error,  
15 then associations that might otherwise be present can be  
16 obscured, so the consequence of essentially random  
17 measurement error is to lead to a lower probability that  
18 you will see an association when one is there.

19 MR NEAL: At 2.4 there is the consensus position that, "Crude  
20 mortality data suggests that mortality from all causes in  
21 Morwell in February and March and February to June 2014 was  
22 little, if at all, greater than in the corresponding  
23 periods of 2009-2013 in Churchill, Moe and Traralgon.  
24 However, crude mortality in these periods was greater than  
25 2009-2013. Since Morwell was the most exposed of the  
26 populations to emissions from the mine fire, the  
27 comparative lack of greater mortality in Morwell in 2014  
28 than 2009-'13 is inconsistent with the mine fire being the  
29 cause of greater mortality in the Latrobe Valley." I know  
30 there is an added proposition, but in the first instance,  
31 again we have an agreed position which is counter-intuitive

1 or counter-hypothetical.

2 PROF. ARMSTRONG: It is inconsistent with the general  
3 proposition that the emissions from the mine fire caused an  
4 increase in mortality.

5 MR NEAL: And that is a conclusion which I think appears in your  
6 own report.

7 PROF. ARMSTRONG: Yes.

8 MR NEAL: And which should be, you would say, put into the  
9 bundle of considerations.

10 PROF. ARMSTRONG: Yes.

11 MR NEAL: In 2.5 you draw attention to Associate Professor  
12 Barnett's analysis and you say this, "Associate Professor  
13 Barnett also observed a lack of increase in mortality in  
14 Morwell during February and March 2014 relative to that  
15 over the whole period of 2004-2014."

16 PROF. ARMSTRONG: Yes.

17 MR NEAL: The first matter that draws attention is that he  
18 observed a lack of increase rather than a decrease. Is  
19 there a reason for that?

20 PROF. ARMSTRONG: No, no particular reason.

21 MR NEAL: Does it suggest a hypothesis being worked with which  
22 was there was an increase?

23 PROF. ARMSTRONG: I guess that would be a reasonable inference  
24 to draw from that.

25 MR NEAL: Can I draw your attention then to the added comment  
26 there.

27 PROF. ARMSTRONG: Yes.

28 MR NEAL: And drawing on your recollection as chairman of the  
29 joint session, where did that come from?

30 PROF. ARMSTRONG: Let me say I can't now recall the origin of  
31 it, except to say that it is certainly a position that I

1 hold, that is that due to statistical uncertainty of the  
2 estimate, a large increase in mortality in Morwell cannot  
3 be ruled out, and I may well have said it.

4 MR NEAL: Is it also fair to put to you, based on the Barnett  
5 analysis and the confidence intervals there, that you  
6 wouldn't want to rule out a large decrease either?

7 PROF. ARMSTRONG: Absolutely. It goes in the opposite direction  
8 just as readily.

9 MR NEAL: I'm wondering why both those propositions don't  
10 appear.

11 PROF. ARMSTRONG: Let me say perhaps for Freudian reasons, that  
12 one has in mind a particular proposition and it tends to  
13 come out, but it certainly was not a deliberate omission or  
14 wish to bend the evidence in a particular direction.

15 MR NEAL: I'm not suggesting that and I'm not going to go into  
16 any Freudian reasons why it was said, but in any event, you  
17 have acknowledged that the corollary proposition might  
18 equally have appeared.

19 PROF. ARMSTRONG: Absolutely, yes.

20 MR NEAL: Can I ask you in relation to the 2.6 and the carbon  
21 monoxide air pollution, the proposition there was no  
22 consistent evidence that deaths from all causes or from  
23 cardiovascular disease alone during the period of the mine  
24 fire were more frequent on days with higher carbon monoxide  
25 levels than on days with lower.

26 PROF. ARMSTRONG: Yes.

27 MR NEAL: Counter-intuitive?

28 PROF. ARMSTRONG: Let me say I don't think the evidence for  
29 increased levels of environmental carbon monoxide in  
30 causing an increase in deaths is anywhere near as strong as  
31 it is for the particulates and so it is probably not as

1 counter-intuitive as the lack of evidence for an increase -  
2 for death being associated with increased particulates, but  
3 clearly it is a toxin, it is a cardiotoxin, although the  
4 levels leading to death are generally above those that will  
5 occur in this wider environment situation.

6 MR NEAL: Is it your understanding that where the higher carbon  
7 monoxide levels are being measured, they are being measured  
8 as a function of emissions from the fire?

9 PROF. ARMSTRONG: I would assume that that was the case.

10 MR NEAL: Is it fair to assume that the carbon monoxide and the  
11 particulate matter are probably physically associated?

12 PROF. ARMSTRONG: I can't answer that from a point of any  
13 expertise that I have, so I would have to simply say I  
14 don't know the answer to that question. I would, though,  
15 say that the same problem of disparate measurements in  
16 different places at different times and, in this particular  
17 circumstance, by using two different techniques is again a  
18 problem and leads to uncertainties because of measurement  
19 error.

20 MR NEAL: At 3.1 you're dealing with the emergency admissions to  
21 hospitals. Again, might it be fair to suggest that 2014  
22 and 2009 are the better comparators here?

23 PROF. ARMSTRONG: It would have been an interesting comparison  
24 to make. The data that I had available to me did not  
25 include 2009.

26 MR NEAL: Interesting because of the first blush sort of  
27 comparability - - -

28 PROF. ARMSTRONG: For the reason that it was seen to be of  
29 interest with respect to mortality. It would be reasonable  
30 to ask the same question of morbidity.

31 MR NEAL: In this respect we are largely relying on your table

1           5, are we not? That is at page 21.

2    PROF. ARMSTRONG: Yes.

3    MR NEAL: Extracted from that table - perhaps let me ask you  
4           this proposition: as a general proposition, given the  
5           event that we're studying here, are the cardio and the  
6           respiratory emergency admissions perhaps a better reference  
7           point than the all causes are?

8    PROF. ARMSTRONG: That is an interesting question. I think in  
9           terms of the impact of the particulates, then you would  
10           certainly expect to see them manifest more in  
11           cardiovascular and respiratory, yes.

12   MR NEAL: When we look at cardiovascular conditions, we have the  
13           rate ratio of 1.16.

14   PROF. ARMSTRONG: Yes.

15   MR NEAL: And a P-value of .26.

16   PROF. ARMSTRONG: Yes.

17   MR NEAL: What is that really saying to us?

18   PROF. ARMSTRONG: It is saying that there was observed a  
19           16 per cent increase in probability of emergency admission  
20           to hospital during that period for cardiovascular disease  
21           but, given the numbers, it is uncertain and that there may  
22           be no increase. In fact, there could have even been a  
23           decrease.

24   MR NEAL: Is it consistent with there being a 1 in 4 prospect  
25           that it was just a chance variation?

26   PROF. ARMSTRONG: Yes, indeed.

27   MR NEAL: And in terms of respiratory, where you have a rate  
28           ratio of 1.31 and a P-value of .07 there - now, that is  
29           obviously above the magic level. I know you say you  
30           shouldn't be - - -

31   PROF. ARMSTRONG: It is about a 1 in 14 probability of chance.



1 MR NEAL: Does, in this particular context, the lack of increase  
2 in the zero to the 4 year age group, is that surprising?  
3 I'm going down to table 6.

4 PROF. ARMSTRONG: Well, firstly there isn't a lack of increase,  
5 there is a 16 per cent increase but the P-value is high and  
6 it is very important to make the distinction between what  
7 the P-value is telling you and what the number is and what  
8 we're dealing with of course is a relative smaller sample.

9 MR NEAL: In this case I take your point that statistically the  
10 evidence of increase is weak, very weak.

11 PROF. ARMSTRONG: Very weak, weak, there is some evidence, all  
12 of the above.

13 MR NEAL: You scientists surprise me sometimes.

14 PROF. ARMSTRONG: Epidemiology is not a precise science.

15 MR NEAL: In your own report you posed for us the question, a  
16 two-fold question which if I can say was very helpful and  
17 you structured your report - that was the framework for  
18 your report.

19 PROF. ARMSTRONG: Yes.

20 MR NEAL: In separating those questions of was there an  
21 increase from the second and necessarily subsequent  
22 question, how did that increase come about, amongst other  
23 things you have drawn attention to the risk of some  
24 conflation of the first with the second.

25 PROF. ARMSTRONG: Yes.

26 MR NEAL: When you delivered your report as opposed to the  
27 joint expert report, my reading of the report was this,  
28 that you said they are the questions we need to answer and  
29 when it came to each aggregation of conclusions which you  
30 did at the end you deployed the conclusion and brought them  
31 to collection.

1 PROF. ARMSTRONG: Yes.

2 MR NEAL: And you did not in terms propose an answer.

3 PROF. ARMSTRONG: Correct.

4 MR NEAL: Why was that?

5 PROF. ARMSTRONG: Because I thought that was the job of the  
6 Inquiry and not mine.

7 MR NEAL: Can I suggest to you that given the evidence you  
8 marshall in your report which clearly we have seen has  
9 counter-veiling - has tensions going this way, going that  
10 way, that deploying all that as you fairly did, tended to  
11 expose the problems of leaping to any form of conclusion?

12 PROF. ARMSTRONG: I think that's a fair statement, yes.

13 MR NEAL: And could I also suggest this to you, that in terms  
14 of the first proposition statistically if you allow that  
15 there may have been an increase that it's fair to say in  
16 respect of the second proposition, we should not exclude  
17 the hypothesis there was a causal relationship with the  
18 fire.

19 PROF. ARMSTRONG: I think that's fair to say, yes.

20 MR NEAL: Thank you, no other questions of this witness.

21 Professor Gordon, can I clarify with you in answer to a  
22 previous question where I stepped out from Professor  
23 Armstrong and spoke to you, you're not medically trained  
24 and as Professor Armstrong did, you would defer to others  
25 on questions of medical mechanics.

26 PROF. GORDON: Yes, I certainly would, the only qualification I  
27 would put on that is I did through my experience in the  
28 department of community medicine sort of become an  
29 epidemiologist, not one even remotely in the same league as  
30 Professor Armstrong but I'm a card carrying member of the  
31 Australasian Epidemiological Association, for example, and

1 I have maintained an interest in epidemiology but I  
2 certainly have no medical training.

3 MR NEAL: So you're a lesser member of a society which is an  
4 imprecise science.

5 PROF. GORDON: That was Professor Armstrong's characterisation  
6 of it, the society is not the science to be pedantic.

7 MR NEAL: To the extent you made the overnight analysis that  
8 you referred to Mr Rozen, you put a number of prudent  
9 caveats around that, at the time you had et cetera, et  
10 cetera I hear all that. Is part of the premise of that  
11 analysis that you took out 11 deaths on the premise that  
12 they were residential deaths?

13 PROF. GORDON: Well, they would have been included in the 2009  
14 count of deaths, yes.

15 MR NEAL: And that 2009 count of deaths was related to  
16 residents?

17 PROF. GORDON: In the data I had attributed to the postcodes,  
18 yes.

19 MR NEAL: So if it's the case that the figure of 11 doesn't  
20 relate entirely to residential people you would adjust what  
21 you did to accord with those that were residents?

22 PROF. GORDON: Yes, I think I said that when I reported my  
23 analysis.

24 MR NEAL: You may very well have done. Just another point on  
25 that same issue, from what I am going to suggest is a  
26 logical point of view, if you have done an analysis which  
27 excludes a number of deaths, be it 11 or something else,  
28 you have done that on the premise that they were let's call  
29 them traumatic deaths in the 2014 statistics that you're  
30 looking at and comparing to, we can assume that there might  
31 be also traumatic deaths.

1 PROF. GORDON: Yes, but not as I understand it deaths from the  
2 direct cause of the bushfire.

3 MR NEAL: That's maybe another question for the moment, but if  
4 we're leading a body of mortality statistics that are  
5 clearly unrelated to a fire event and making a comparison  
6 one to one, would it not be logical to have the 2014  
7 figures filtered for death events which are clearly not  
8 related to the fire?

9 PROF. GORDON: Well, a more refined analysis by cause of death  
10 would be desirable, I believe I said that in my first  
11 report certainly, but I don't think I quite agree with the  
12 proposition as you have put it. As I said in my paragraph  
13 33 I don't think this is a clear cut question in any case.  
14 If I did think it was clear cut I probably would have then  
15 done the analysis excluding and including it in my report.  
16 So I accept there is an issue there. It's just this  
17 pointed issue about well, bushfires in 2009 and 2014, so  
18 now we're talking about the effect of a bushfire, not  
19 talking about a car crash or other traumatic deaths. We  
20 observed that there was a particular outcome from the  
21 bushfire in 2009 which is quite different from the  
22 possibilities that were entertained in the 2014 period,  
23 namely tragically direct deaths as I understand it, people  
24 burned to deaths in their homes as I understand it.  
25 Therefore if we're saying well, it could have just been the  
26 bushfires we have to say hold on, there is quite a  
27 different causal change of events occurring in 2009 that  
28 does not arise in 2014, therefore there is some kind of  
29 basis for allowing for that and excluding those deaths in  
30 comparison made, and the third thing I say is I did the  
31 analysis because Mr Rozen asked me to do it.

1 MR NEAL: I'm not sure how that increases the evidential value  
2 but it may do, I will leave that for the board. Mr Rozen  
3 fairly points out it was the third reason for the idea. If  
4 I can take you to your individual report, professor. At 14  
5 on page 3 you are advancing a reason why you might extend  
6 the catchment beyond February to March, your words there,  
7 and I think they were repeated in your viva voce evidence  
8 yesterday, that it's not hard to envisage scenarios for  
9 this, that is the extension is a logical possibility.

10 PROF. GORDON: Yes.

11 MR NEAL: Is it a proposition of logic that you're relying on.

12 PROF. GORDON: I think so but I'm suspicious you're going to  
13 tell me it's not.

14 MR NEAL: Don't be suspicious, please, no need. I'm simply  
15 asking you you're saying you're putting it forward as a  
16 matter of logic.

17 PROF. GORDON: I'm certainly saying it's a possibility, logic  
18 is the correct adjective, I'm not sure, I will have to  
19 think about that very carefully.

20 MR NEAL: Perhaps you're saying it occurs to me as a  
21 possibility.

22 PROF. GORDON: Yes.

23 MR NEAL: In your table 1 which appears at page 4 you're doing  
24 a death analysis extending it over the full period.

25 PROF. GORDON: Yes.

26 MR NEAL: Perhaps I should read what you say there, under the  
27 table itself: "The smaller the P-value the stronger the  
28 evidence that the 2014 death rates were abnormally high", I  
29 don't want to get into a sectarian statistical problem here  
30 but what do you say about the 0.05 benchmark?

31 PROF. GORDON: I agree with Professor Armstrong, I have spent

1 half my career trying to dissuade people of the importance  
2 of a threshold of 0.05, it's nevertheless true that the  
3 direction of the strength of the evidence is the smaller  
4 the P-value the stronger the evidence.

5 MR NEAL: In the last sentence you say: "On the basis of the  
6 numbers in table 1 of the Flander and English report there  
7 is quiet strong and statistically significant evidence that  
8 the death rates from February to June were abnormally  
9 high"; is it also fair to add but due to what seemed to be  
10 high P-values in February to March there is statistically  
11 weak evidence, that is that we're not seeing something  
12 abnormal in the scheme of things.

13 PROF. GORDON: I'm unhappy about the conclusion precisely  
14 because of the difficulty with treating 0.05 as a magical  
15 threshold, after all there is not a huge difference between  
16 0.06 and 0.02, the ratio for February to March is greater  
17 than the ratio for February to June, so from a scientific  
18 point of view my perspective is you shouldn't treat the  
19 difference between those results, there is a difference  
20 between the results, I acknowledge that, but you shouldn't  
21 treat it as sharply as you might as if you believed to use  
22 your term, that there was something magic about the  
23 threshold of 0.05.

24 MR NEAL: Accepting that as an idea if we're constructing a  
25 spectrum here, it is fair to say in the strength spectrum,  
26 my term, the February to June figures are more compelling  
27 than the February to March.

28 MR GORTON: On the basis of the P-value value, not on the basis  
29 of the rate ratio.

30 MR NEAL: I ask you, and this is in relation to table 2, where  
31 you I think essentially are doing a similar analysis, are

1           you not?

2    PROF. GORDON:    Yes.

3    MR NEAL:        And you have a confidence interval in this table.

4    PROF. GORDON:    Yes.

5    MR NEAL:        Can I ask you this, was it known to you at the time  
6            you constructed tables which were beyond February and March  
7            that there were in fact relevantly higher figures in the  
8            later months?

9    PROF. GORDON:    Sorry, I'm not quite sure what you mean by that,  
10           this is all based on Dr Flander's first report so that's  
11           what I was operating with.

12   MR NEAL:        So actual data.

13   PROF. GORDON:    Yes, table 1 of Dr Flander's first report is  
14           what I was operating on, so I had that in front of me and  
15           in mind.

16   MR NEAL:        In this instance when you extend from March to  
17           February to June you're doing so in the context of where  
18           you already know that in the subsequent months April, May,  
19           June, you have statistically significant higher figures.

20   PROF. GORDON:    No, I don't believe I knew that when I did it  
21           because that's not in Dr Flander's report, there is just  
22           the table of the observed and predicted, so I didn't know  
23           how it was going to turn out and quite honestly I was  
24           largely framed by that table in terms of what I did, I  
25           considered well, they have looked at January to June, I'm  
26           going to look at February to June because I consider it  
27           meaningless to look at January seeing January was before  
28           the fire. So I looked at what I considered to be the  
29           relevant period from table 1 of Dr Flander's first report.

30   MR NEAL:        Can I ask you this, did you know when you captured  
31           those extra months in mortality numbers you had in some

1 sense relatively higher figures compared to the historical  
2 data.

3 PROF. GORDON: Yes, I did because that was in Dr Flander's  
4 report.

5 MR NEAL: So to the extent that in table 2 that P-value reduces  
6 from top to bottom.

7 PROF. GORDON: Yes.

8 MR NEAL: That was not surprising.

9 PROF. GORDON: No, it wasn't surprising because if the rate  
10 ratio was at all approximately maintained it would be  
11 inevitable given the larger sample sizes.

12 MR NEAL: Yes. At paragraph 28 you say this: "In all these  
13 analyses the excess is not markedly unusual according to  
14 strict conventions of statistical significance in that the  
15 P-values are not smaller than 0.05."

16 PROF. GORDON: Yes.

17 MR NEAL: So is that another way of saying there is weak  
18 evidence that the rate was higher than average during these  
19 month?

20 PROF. GORDON: Well, I take you back to my previous comment  
21 about the magical threshold of 0.05, as it were I'm writing  
22 paragraph 28 through gritted teeth knowing that people  
23 looking at this material will say what about the threshold  
24 of 0.05 and I'm sort of reluctantly signing up to the  
25 convention to some extent in writing that paragraph so to  
26 that extent I would agree with your proposition.

27 MR NEAL: Can I ask you Professor Gordon similar to the way I  
28 was asking Professor Armstrong, in his report which it  
29 seems common ground is largely replicated in the joint  
30 report, I appreciate there are some nuanced differences, is  
31 he largely replicated the findings he did in his personal



1 report?

2 PROF. GORDON: Yes.

3 MR NEAL: In that report he deployed all sorts of conclusions  
4 which spoke equivocally about the question of an increase  
5 in death rate.

6 PROF. GORDON: I'm not quite sure what it means to deploy a  
7 conclusion.

8 MR NEAL: At the end of his document he aggregated what he  
9 understood all the conclusions he had been drawing along  
10 the way and put them out.

11 PROF. GORDON: I see.

12 MR NEAL: I think he agreed, and I'm interested to know if you  
13 do those conclusions on the question of was there increase  
14 spoke equivocally, some went this way, some went the other  
15 way.

16 PROF. GORDON: Yes, that's true.

17 MR NEAL: What I put to him and what I put to you is this, a  
18 comfortable position to try and capture your overall view  
19 might be this, that if there were some evidence of an  
20 increase in the mortality rate in the relevant period that  
21 leaves open, leaves viable an hypothesis there was a causal  
22 link between the fire and the increase.

23 PROF. GORDON: Yes, it does, it allows for the possibility of a  
24 causal link, is that what you mean?

25 MR NEAL: It allows for it, it leaves that proposition viable,  
26 not substantiated but open?

27 PROF. GORDON: You mean undecided?

28 MR NEAL: Yes.

29 PROF. GORDON: Well, you have heard our views about that, I  
30 think that's a little bit simplistic to characterise it in  
31 that way when we were asked specifically a question along

1           those lines by Mr Rozen.

2 MR NEAL:    Well, are you - - -

3 PROF. GORDON:  It certainly allows for the hypothesis of  
4           course.

5 MR NEAL:    I think that is all, thank you.

6 CHAIRMAN:    Thank you.

7 MR BLANDEN:   Professor Armstrong, I have a few questions for  
8           you.

9 PROF. ARMSTRONG:  No problem.

10 MR BLANDEN:   I just wanted to ask you this as a starting point,  
11           irrespective of what statistical technique is used in  
12           relation to numbers of deaths, we have the actual data for  
13           deaths in Morwell in the period of the fire, don't we?

14 PROF. ARMSTRONG:  Yes.

15 MR BLANDEN:   And in terms of the actual number of deaths in  
16           Morwell during the fire, those numbers are fewer than in  
17           previous years?

18 PROF. ARMSTRONG:  Well, maybe we need to just be clear about  
19           what those numbers mean.  They will be deaths in people  
20           whose usual place of residence was stated to be Morwell or  
21           at least in terms of the postcode a resident within that  
22           postcode and yes, it's true that they in 2014 were less  
23           than on average they were from 2009 to 2013.

24 MR BLANDEN:    You have indicated I think that the health risks  
25           that arise from particulate matter exposure are primarily  
26           respiratory and cardiovascular issues, is that correct?

27 PROF. ARMSTRONG:  Yes.

28 MR BLANDEN:    I think you indicated to the members of the  
29           Inquiry that in fact the expert in that regard, that is the  
30           result or effect of such exposure on the population was the  
31           gentleman we actually heard from yesterday, Professor

1 Abramson.

2 PROF. ARMSTRONG: It is Professor Abramson, yes.

3 MR BLANDEN: Yes. In terms of the figures to do with deaths  
4 from cardiovascular or respiratory disease you were asked  
5 to turn by Mr Neal to 2.1 of the joint report, and I won't  
6 take you to it now, but that was based I think you agreed  
7 on table 3 of your own report.

8 PROF. ARMSTRONG: Yes.

9 MR BLANDEN: And can I ask you to turn to table 3 of your own  
10 report, page 9 of that report.

11 PROF. ARMSTRONG: Yes.

12 MR BLANDEN: You have in that table posited some figures based  
13 on the mortality data for February to June, firstly for  
14 deaths from all causes, correct?

15 PROF. ARMSTRONG: Yes.

16 MR BLANDEN: Then death from respiratory causes.

17 PROF. ARMSTRONG: Yes.

18 MR BLANDEN: Then death from cardiovascular causes.

19 PROF. ARMSTRONG: Yes.

20 MR BLANDEN: I take it in line with what you have just told us  
21 it's those latter two components that are primarily the  
22 ones you would expect to see as a result of exposure to  
23 particulate matter.

24 PROF. ARMSTRONG: Let me clarify what I said and that is my  
25 understanding of reading recent literature is that I would  
26 not necessarily expect to see an increase in respiratory  
27 deaths but I would expect to see an increase in  
28 cardiovascular deaths.

29 MR BLANDEN: But as you said, Professor Abramson is the man who  
30 really is the go to person - - -

31 PROF. ARMSTRONG: Absolutely.

1 MR BLANDEN: For a view on that issue. If we look down at your  
2 figures and I'm looking at the rate ratio at the moment for  
3 February to June, do we see, and please tell me if I get  
4 this wrong, taking as a comparison to 2014 the years 2009  
5 to 2013, does the rate ratio of 1.2 for deaths from  
6 respiratory causes indicate there were in fact 20 per cent  
7 fewer respiratory deaths in that period compared to 2014.

8 PROF. ARMSTRONG: The 1.230 means there were 20 per cent more  
9 in 2009/2013 than in 2014.

10 MR BLANDEN: So put the other way around and I think you're  
11 quite right, apologies for putting it the wrong way around,  
12 20 per cent fewer deaths from respiratory deaths in 2014  
13 than 2009 to 2013.

14 PROF. ARMSTRONG: Yes.

15 MR BLANDEN: Then going down 24 deaths from cardiovascular  
16 causes there are 20 per cent more cardiovascular deaths in  
17 the period 2014 as compared to 2009/2013 approximately.

18 PROF. ARMSTRONG: Yes.

19 MR BLANDEN: Looking at those approximate percentages you have  
20 20 per cent fewer of one, 20 per cent more of the other  
21 adding up conveniently to about one.

22 PROF. ARMSTRONG: No, because the numbers tend to be different,  
23 in practice there are generally more respiratory deaths  
24 than cardiovascular deaths, I may be wrong. You can't just  
25 add them up, you have to actually have the numbers, you  
26 can't add the rate ratios.

27 MR BLANDEN: I wasn't meaning to add the rate ratios but in  
28 terms of the percentages, number of deaths from those  
29 combined causes, that is respiratory causes and  
30 cardiovascular causes seem to be on your table the same in  
31 2014 as compared to 2009 to 2013.

1 PROF. ARMSTRONG: Approximately.

2 MR BLANDEN: Yes. And insofar as the joint report is  
3 concerned, I have one question, could you to turn to page 3  
4 for a moment. It's 2.4, you were asked by Mr Neal who  
5 added the 2.5 and I think you said you thought it was  
6 probably you, I want to ask you the same question in  
7 relation to 2.4; that note is added: "However the  
8 conclusion doesn't take account of evacuation of some  
9 residents from Morwell", who inserted that concept into the  
10 discussion?

11 PROF. ARMSTRONG: I don't recall.

12 MR BLANDEN: You don't recall. No idea?

13 PROF. ARMSTRONG: I don't think it was me in which case it was  
14 Professor Gordon or Professor Barnett or Dr Flander.

15 MR BLANDEN: Someone else who was there, but you would agree  
16 there is no data that you had available that would indicate  
17 with any certainty what those numbers might be, if there  
18 were any?

19 PROF. ARMSTRONG: That's why I didn't mention it in my report,  
20 I was aware of the issue but to the point I finalised my  
21 report no-one had been able to provide me with any data  
22 that would substantiate how extensively or not extensively.

23 MR BLANDEN: So to make allowances for it would fall into the  
24 realm of speculation rather than anything else.

25 PROF. ARMSTRONG: To make a precise allowance for it would fall  
26 into the realm of speculation, I don't think it's  
27 unreasonable to speculate it could have an impact.

28 MR BLANDEN: Thank you.

29 MS SZYDZIK: Professor Gordon, I have just a few short  
30 questions for you. You were asked some questions about in  
31 particular two tables in your report, tables 1 and 2,

1 behind tab 8, on pages 4 and 5. You were asked some  
2 questions specifically about the differences in the  
3 P-values as between the period February to June compared to  
4 February to March. Now when you were being asked those  
5 questions you noted that as between those two periods the  
6 rate ratio increased but the P-value decreased. I  
7 understood from your evidence yesterday that P-value is  
8 linked directly to the size of the data set, is that  
9 correct?

10 PROF. GORDON: Yes.

11 MS SZYDZIK: So my question to you is are you able to say if  
12 the size of the data set in fact explains or in part  
13 explains the reduction or change in P-value as between  
14 those two time periods?

15 PROF. GORDON: Yes, I am able to say that.

16 MS SZYDZIK: Can you elaborate on that for us, please.

17 PROF. GORDON: If you look at table 2 for example, the rate  
18 ratio of 1.2 for February to March 2014 is larger than the  
19 rate ratio February to June 2014, 1.17, so 1.20 is larger  
20 than 1.17. So what we call in statistics the point  
21 estimate, the best single estimate of what's going on is  
22 larger in February to March 2014 than February to June  
23 2014. But in contrast to that the P-value is smaller for  
24 February to June 2014 than for February to March 2014 and  
25 that is a simple consequence of the larger sample size for  
26 February to June 2014. Of course it doesn't have to  
27 inevitably turn out that way in a sense the P-value is a  
28 function of both the size of the rate ratio and of the  
29 sample size.

30 MS SZYDZIK: Are you able to recall in this case which it  
31 relates to or to what extent?

1 MR GORTON: It relates to both of them always.

2 MS SZYDZIK: Linked in with that is the conclusions that were  
3 found at paragraphs 1.1 and 1.2 of the joint report so if I  
4 could take you to that now, behind tab 15.

5 PROF. GORDON: Yes.

6 MS SZYDZIK: And so there has been some discussion about this  
7 today in particular 1.2 and the language that has been used  
8 there, given there is that higher rate ratio for the  
9 February to March period compared to the February to June  
10 period yet we see the language of moderate evidence in  
11 paragraph 1.1 and some evidence or however otherwise put  
12 today in 1.2; are you able to elaborate upon the different  
13 use in language then in those two paragraph and why it's  
14 like that.

15 PROF. GORDON: Yes, I am from my own perspective.

16 MS SZYDZIK: Please do.

17 PROF. GORDON: I recall the discussion of this very  
18 specifically, Professor Armstrong had the wording there as  
19 weak evidence ... and there was concern among the group  
20 that that could lead to a misinterpretation of the intended  
21 meaning of what Professor Armstrong had written with a  
22 direct comparison between the moderate and weak, so  
23 moderate for February to June 2014, weak from February to  
24 March 2014, whereas that was not the intended meaning of  
25 the statement in the first place in Professor Armstrong's  
26 report as I understood it, he can contradict me if he  
27 disagrees with this but rather how a comparison of February  
28 to March with February to June. So not two absolute  
29 statements but the second one is a relative statement. The  
30 first one is an absolute statement, February to June, the  
31 second one is a relative statement about February to March

1 compared to February to June which is the way it reads if  
2 you read it. But the concern there could be some risk of  
3 misinterpretation of 1.2 is what led in my view to the  
4 substitution of some for weak, and in discussion with  
5 Professor Armstrong about that he said well, it's okay with  
6 me, I accept some is a legitimate word to use and he had no  
7 problem using that adjective and for removal of the  
8 potential ambiguity of the interpretation some members of  
9 the group including me were happier with that word than  
10 weak for that reason.

11 MS SZYDZIK: There were also questions asked of Professor  
12 Armstrong in relation to the use of the phrase  
13 statistically significant in a comment concluded underneath  
14 the conclusion of paragraph 1.3, that's on page 2 of the  
15 joint report, are you able to explain how you would  
16 interpret or use the phrase statistically significant, what  
17 it means for you.

18 PROF. ARMSTRONG: In that point there at the top of page 2 it  
19 really means nothing is more than the P-value of 0.05  
20 because the relevant phrase there is conventional levels,  
21 it's included for that reason.

22 MS SZYDZIK: Thank you, they are all the questions I have for  
23 you Professor Gordon. I have a couple of questions in  
24 relation to cross-examination of Associate Professor  
25 Barnett.

26 CHAIRMAN: I think we have him here on Skype, yes.

27 MS SZYDZIK: Thank you, associate professor. You were asked a  
28 number of questions about interactions that you had with  
29 Voices of the Valley and others and to what extent then  
30 that influenced your views on this issue. I wondered, if  
31 possible, if I could just ask you some questions about your



1 CV. We'll see how those two things relate in a moment. I  
2 understand that you have provided your CV to the board and  
3 that that is included, certainly for our part, behind tab 9  
4 of the Inquiry book, annexed to your second report.

5 ASSOC. PROF BARNETT: Yes.

6 MS SZYDZIK: Your CV, am I right, runs for 23 pages?

7 ASSOC. PROF BARNETT: Yes.

8 MS SZYDZIK: At the start you obviously set out your various  
9 degrees and your education, your employment, research, but  
10 then starting on page 3 you set out the peer reviewed  
11 papers that you have prepared or been involved in being an  
12 author of. That runs for some 161 peer reviewed papers.

13 ASSOC. PROF BARNETT: Yes.

14 MS SZYDZIK: The final one is on page 13.

15 ASSOC. PROF BARNETT: Yes.

16 MS SZYDZIK: You then have editorials and letters, conference  
17 papers, reports, other book details and then skipping over,  
18 there are various grants, research funding, research  
19 students that you've supervised, international visitors,  
20 and we keep going on, but if we drop down to the final  
21 page, and that is page 23, professional activity, we also  
22 see there that you have been a participant in, for example,  
23 the expert review of the Queensland Greens document on the  
24 health effects of air pollution, expert advisory - I'll ask  
25 you to agree or disagree with me there.

26 ASSOC. PROF BARNETT: Yes.

27 MS SZYDZIK: Expert advisory panel for the Queensland Evaluation  
28 Group, evaluating submissions for the Australian  
29 Pharmaceutical Benefits Scheme.

30 ASSOC. PROF BARNETT: Yes.

31 MS SZYDZIK: I won't go through all of them, but in short, you

1 are a very experienced and distinguished academic,  
2 Associate Professor Barnett?

3 ASSOC. PROF BARNETT: I would like to say so, yes.

4 MS SZYDZIK: Thank you, associate professor. And is it right to  
5 say that in all of those research and academic endeavours -  
6 sorry, I'll ask. In all of those research and academic  
7 endeavours, can you please tell me how highly you have  
8 regarded academic integrity and academic independence.

9 ASSOC. PROF BARNETT: I would say it is the most important  
10 thing, the thing that I am always conscious of in all of my  
11 work.

12 MS SZYDZIK: When you were undertaking the work that you did,  
13 originally approached by the ABC and then when you were  
14 dealing with Voices of the Valley, did you approach that  
15 task with that same level of rigour in terms of  
16 independence and integrity?

17 ASSOC. PROF BARNETT: Absolutely.

18 MS SZYDZIK: No further questions.

19 CHAIRMAN: Yes, Mr Rozen.

20 MR ROZEN: Three brief matters, if I may, firstly for Associate  
21 Professor Barnett. Just picking up on the last questions  
22 that you were asked, at any time in your communications  
23 with Voices of the Valley, did they ask you to change the  
24 wording of your reports?

25 ASSOC. PROF BARNETT: No.

26 MR ROZEN: Professor Armstrong, if I could ask you a question  
27 about clause 2.4 of the joint report, please - I'm sorry,  
28 2.5, where the observation is made that in Associate  
29 Professor Barnett's second report there's an observation  
30 about the lack of increase or decrease in mortality in  
31 Morwell during February and March 2014 relative to the

1 period 2004-'14 and then it is the added words that I want  
2 to ask you about, "It is acknowledged that due to the  
3 statistical uncertainty of this estimate, a large increase  
4 in mortality cannot be ruled out."

5 PROF. ARMSTRONG: Yes.

6 MR ROZEN: Is that a reference to page 5 of your report, and  
7 specifically table 1? I'm specifically drawing your  
8 attention to the P-values in the right-hand column  
9 concerning the Morwell figures.

10 PROF. ARMSTRONG: It is a reference in fact, I think, to the  
11 result in Professor Barnett's paper, but it is not very  
12 different to mine and what you observe there with the  
13 95 per cent confidence interval, while we have a rate  
14 ratio - the point estimate, as Professor Gordon referred to  
15 it as - of 0.80, the confidence interval ranges from .51,  
16 so it could be as low as that, reasonably as low as that,  
17 up to 1.26 and it could be reasonably as high as that and  
18 our discussion and our reason for making that statement was  
19 that it could be as much as 26 per cent higher in Morwell  
20 in 2014 than in 2009-'13, on the basis of the upper  
21 95 per cent confidence bound, that is the uncertainty we're  
22 talking about and the potential range of values that could  
23 be under consideration.

24 MR ROZEN: Of all the statistics that are before the board, that  
25 is one which stands out as being - I'll carefully choose my  
26 words. Is "unreliable" the right word or open to - - -

27 PROF. ARMSTRONG: "Imprecise" is the correct word.

28 MR ROZEN: Thank you. And it is based on the 95 per cent  
29 confidence interval and the P-value that that conclusion  
30 was reached?

31 PROF. ARMSTRONG: That range is entirely in the 95 per cent

1 confidence interval. The two do reflect each other to some  
2 degree, but I - and I don't know whether Professor Gordon  
3 agrees with me - have an aversion to people using  
4 confidence intervals as if they were P-values.

5 MR ROZEN: Is there anything, Professor Gordon, that you'd like  
6 to add to that or do you agree?

7 PROF. GORDON: No, I'm in furious agreement with Professor  
8 Armstrong on that point. He is not only an eminent  
9 epidemiologist, he is a very good statistician as well,  
10 don't worry about that.

11 MR ROZEN: Lots of praise coming Professor Armstrong's way  
12 today. One final matter, and I'll start with Professor  
13 Armstrong, a lot of questions you were asked by my learned  
14 Mr Neal to my left during the course of today. Do we take  
15 anything that was put to you by Mr Neal, and the answers  
16 that you gave, as detracting from the evidence you gave  
17 earlier today in questions that I asked you?

18 PROF. ARMSTRONG: I don't believe so.

19 MR ROZEN: I'll ask you the same question, Professor Gordon.

20 PROF. GORDON: No.

21 MR ROZEN: Associate Professor Barnett?

22 ASSOC. PROF BARNETT: No.

23 MR ROZEN: That concludes the questioning of the experts, if the  
24 board pleases.

25 CHAIRMAN: Thank you, Mr Rozen. It is perhaps appropriate that  
26 I make some closing remarks - - -

27 MR ROZEN: Just before you do, sir, there is a matter of some  
28 documents which need to be tendered.

29 CHAIRMAN: This will be the time.

30 MR ROZEN: Ms Shann will do that as quickly as we're able to.

31 MS SHANN: Perhaps the experts could be excused, unless they

1 wish to hear the tendering of the - - -

2 CHAIRMAN: I think that is probably right, but I do want to  
3 thank you and that includes Associate Professor Barnett and  
4 also the two professors at the table. This has been, in  
5 one sense, a very difficult exercise generally but it has  
6 put you in a situation where we've had to take all of you  
7 through a process that is, regrettably, very long. So I do  
8 excuse you and I do thank you very much for your  
9 participation in the way that you have participated over  
10 the last two days and, of course, in the lead-up to today's  
11 proceedings, so thank you very much.

12 <(THE WITNESSES WITHDREW)

13 CHAIRMAN: I will now handball it back to Ms Shann and then come  
14 back to making some more general words of thanks and  
15 provision of information.

16 MS SHANN: Thank you. I expect this will take only five  
17 minutes. There is seven exhibits to add to what is already  
18 there.

19 CHAIRMAN: Yes.

20 MS SHANN: I'll take the board by reference to tabs and then the  
21 document numbers. The first is behind tab 16,  
22 EXP.0006.001.001. There is firstly a report of a  
23 Dr Jonathan Burdon entitled, "The respiratory effects of  
24 smoke, fume and other particular inhalation" and attached  
25 to that a CV, and I tender that.

26 #EXHIBIT 32 - EXP.0006.001.001

27 MR BLANDEN: If the board pleases, just as part of that tender,  
28 it is not a dated document and we don't have any documents  
29 which invite its compilation either and I'm wondering if we  
30 could ask those assisting to look into those matters and  
31 perhaps provide us with whatever further information there

1 is to explain its existence and how it came into being and  
2 when it was done.

3 MS SHANN: We're more than happy to deal with that and  
4 Ms Stansen, the principal legal adviser, will perhaps be  
5 the person to liaise with.

6 CHAIRMAN: Yes. I'll leave that to the secretariat.

7 MS SHANN: The next document is behind tab 8, DOC.0001.001.0001.

8 This is a determination following a request to investigate  
9 a fire from the Coroner's Court and if I may, by way of  
10 brief overview, explain the document. It is dated  
11 11 November 2014 and was a response by the Coroner's Court  
12 to a request by the United Firefighters Union of Australia,  
13 Occupy Latrobe Valley and Voices of the Valley to  
14 investigate this issue which is before the board. The  
15 coroner declined to do so, on the basis of duplication, for  
16 three reasons: firstly, that it was already the subject of  
17 investigation by the first Hazelwood Mine Fire Inquiry and  
18 that any deficiency in providing death data to the first  
19 Inquiry was a deficiency of Voices of the Valley's own  
20 making, and the board has heard some evidence about the  
21 timing of that from Ms Sims. The second reason is that the  
22 Department of Health and Human Services had already  
23 considered the issue and the third, that the long-term  
24 health study would also answer the question. If I could  
25 tender that document.

26 #EXHIBIT 33 - DOC.0001.001.0001

27 The next two documents, which could form a single exhibit, are  
28 behind tabs 19 and 20, DOC.0001.001.0011 and  
29 DOC.0001.001.0013. These are two letters from the coroner  
30 to the Board of Inquiry and in essence indicate that, in  
31 response to a request from the board, the court was unable

1 to locate any single example of a death investigated or  
2 considered by the coroner where there was either an  
3 allegation or a finding of a link to the mine fire, and for  
4 completeness I note that in part of the public submissions  
5 there is at least one example of notification to the  
6 coroner of in fact a specific example and that is a public  
7 submission available on the website and that is a  
8 Ms Clissold's submission, and there is some correspondence  
9 with the coroner which is attached to that submission. If  
10 I could tender those.

11 #EXHIBIT 34 - DOC.0001.001.0011 and DOC.0001.001.0013

12 Behind tab 23, at VGSO.1013.001.0001, is a letter from Victorian  
13 Government Solicitor's Office to the board dated 9 July  
14 2015 which sets out the various steps that the Department  
15 of Health and Human Services undertook in response to this  
16 issue and attaches some documents which are already before  
17 the board but also, behind tab 24, some data, including  
18 breakdowns of deaths by date and admission data relevant to  
19 the morbidity question and if I could tender that as a  
20 bundle.

21 #EXHIBIT 35 - VGSO.1013.001.0001 & DHHS.1001.001.0931.

22 There is some further data which was provided attached to the  
23 letter from VGSO, but it has that same sensitivity already  
24 discussed, identifying people, so it won't be part of that  
25 tendered document.

26 Finally, behind tab 35, at DHHS.1008.001.0114, is a  
27 document titled Minutes Hazelwood Study Contract Steering  
28 Committee which, at pages 4 and 5, deals with the issue of  
29 inclusion or exclusion of firefighters and other emergency  
30 responders to the long-term health study and, as I  
31 understand it, there is some enquiries which will be made

1 on behalf of the board about the issue of what other  
2 studies might exist to cover that particular group in  
3 reference to the issues raised by Professor Abramson.

4 Just for the assistance of the parties, we will also  
5 be following up the reports requested by Mr Neal of  
6 Associate Professor Barnett, that he's made some reference  
7 to this morning, and provide whatever we can obtain to all  
8 of the parties.

9 #EXHIBIT 36 - DHHS.1008.001.0114

10 CHAIRMAN: That is all?

11 MS SHANN: That is all.

12 MR ROZEN: I think all that remains is for the board to make the  
13 closing remarks that were referred to and also to program  
14 the remainder of this hearing, in particular the  
15 anticipated date for submissions next Wednesday,  
16 9 September.

17 CHAIRMAN: If you think that I haven't included in what I'm  
18 about to say those further matters, you can say so then.

19 There is a number of areas where we need to thank  
20 people. I have already thanked the people who have taken  
21 part as witnesses in relation to the expert session, which  
22 has gone for a considerable length of time, but it is also  
23 appropriate to thank the witnesses in the earlier part of  
24 the hearings. It is also appropriate to thank counsel and  
25 those who have been assisting counsel and the parties for  
26 their cooperation in these public hearings. It was a major  
27 purpose of our having these in this setting to give the  
28 opportunity for those witnesses to be seen by the locals,  
29 if I can express it in those terms, particularly when it  
30 comes to the matter of how they are tested, so it is a  
31 somewhat legal environment, but I think it should be



1 appreciated that by doing that, you get some idea of the  
2 amount of work that has been done to get ready for today  
3 and insofar as we've been able to have the information, the  
4 evidence out there, the testing of that evidence and done  
5 so in a way that enables the local community to understand  
6 what that is all about, we're grateful for the cooperation  
7 that you've shown and for you being in attendance on so  
8 many occasions.

9 So far as information is concerned, the closing  
10 submissions are to be made next Wednesday here at Kernot  
11 Hall and we again invite people who are interested to  
12 attend for those submissions.

13 The transcripts of the hearings will be posted on the  
14 website and ultimately the board's findings in relation to  
15 reference 6 will be published in December of this year as  
16 part of the second volume of our 2015/16 report.

17 We thank those other people who are not present who  
18 have provided hospitality to us and the local organisations  
19 that have also looked after us during the period that we've  
20 been here.

21 So with a final word of thanks, unless Mr Rozen wants  
22 to add anything more - he is shaking his head - is to  
23 really just repeat the thanks for all concerned that I  
24 mentioned earlier for participation over the past three  
25 days and if there is nothing more, I'll adjourn until next  
26 Wednesday.

27 ADJOURNED UNTIL WEDNESDAY 9 SEPTEMBER 2015