

Submission to Parliament of Australia inquiry: Investigations into a possible cancer cluster on the Bellarine Peninsula, Victoria

Department of Health and Human Services



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Submission to Inquiry

This submission from the Department of Health and Human Services (the department) to the Senate Community Affairs References Committee addresses all four terms of reference of the Parliament of Australia inquiry: Investigations into a possible cancer cluster on the Bellarine Peninsula, Victoria:

- (a) the health concerns of local residents;
- (b) the incidence of cancer cases in the area, and any possible environmental or other contributing factors;
- (c) the evidence, approach and outcomes concerning the Victorian Chief Health Officer's investigation of cancer rates on the Bellarine Peninsula; and
- (d) any other related matter.

With respect to term of reference (d), this submission addresses another health concern raised by local residents and in social and mainstream media following publication of the report on the Chief Health Officer's investigation of cancer rates on the Bellarine Peninsula in January 2019. That concern is the incidence of autoimmune disease in Barwon Heads on the Bellarine Peninsula, and any possible link to the use of chemical agents in the area. As this health concern is ancillary to the concern of a possible cancer cluster, and a matter of community concern, the department has sought to address it under a separate heading at the end of this submission.

Summary

In late December 2018, there were media reports of community concerns about a perceived high number of cases of specific types of cancer in young people, including former students and teachers from local schools on the Bellarine Peninsula, Victoria, purported to be related to the past agricultural use of the pesticide dieldrin on farmland in the area. They included cancers of the blood (multiple myeloma, leukaemia and non-Hodgkin lymphoma) and brain.

Dieldrin, a synthetic organochlorine pesticide, was introduced to Australia in the 1940s. The use and sale of dieldrin has been prohibited in Victoria since 1987.

In 2016, dieldrin was classified as a probable carcinogen to humans (Group 2A) by the World Health Organisation's International Agency for Research on Cancer (IARC), based on 'limited evidence' for breast cancer in humans and 'sufficient evidence' for liver cancer in experimental animals (mice).

To investigate this issue and respond to community concerns, in early January 2019 the then Acting Chief Health Officer of Victoria reviewed the scientific literature and cancer incidence rates within the Bellarine Peninsula. Review of the available scientific literature on the carcinogenic potential of dieldrin did not identify dieldrin as a chemical associated with the specific types of cancers cited in the media. The cancers reported in the media were also of different types, suggesting that they do not have a common cause.

Review of cancer incidence data captured by the Australian Cancer Atlas for the Bellarine Peninsula, both in respect of total cancers and specific types of cancer, did not find evidence of a statistically significant higher rate of multiple myeloma, leukaemia, non-Hodgkin lymphoma or brain, breast or liver cancer or total cancers overall in any of the Statistical Area Level 2 (SA2) geographical areas of the Bellarine Peninsula that were considered, compared with the rest of Australia.

The Chief Health Officer's report on his investigation (CHO Report) was made public on 30 January 2019 (**Attachment 1**).

The department established an interagency group to coordinate responses to the community. In February 2019, the interagency group:

- published a Frequently Asked Questions (FAQ) information sheet on the City of Greater Geelong website, that continues to be updated as new information or issues are identified (**Attachment 5**); and
- held a Community Open House event in Barwon Heads where local residents and community members could drop-in, meet and speak with the Chief Health Officer and other government representatives with a broad range of expertise across public health, veterinary science, council planning, regulation, oncology (i.e. a cancer specialist), worker safety and environmental protection.

Feedback on the Community Open House event was positive. A summary of the event was published in April 2019 (**Attachment 2**). At the event, local residents and community members asked a range of questions. A small number related to the mosquito spraying program in the local area of Barwon Heads and a possible link to cancer and autoimmune diseases. Following the event, the FAQ information sheet on the City of Greater Geelong website was updated to include information on, and to respond to, common questions about these topics.

On 20 March 2019, the department convened an independent Expert Advisory Group on cancer cluster investigations to consider the available information and provide the Chief Health Officer with high quality, impartial advice. The Expert Advisory Group initially comprised Dr David Hill AO (Cancer Council Victoria), Dr Tim Driscoll (Professor of Occupational and Environmental Medicine at the Sydney School of Public Health, University of Sydney) and Professor Brian Priestly (Director of the Australian Centre for Human Health Risk Assessment, Monash University). Later Dr Kelly-Anne Phillips (Professor of Medical Oncology at The University of Melbourne and Peter MacCallum Cancer Centre) was recruited to the Expert Advisory Group to replace Professor Priestly when he retired. Among the information considered by the Expert Advisory Group was an epidemiological analysis of Victorian Cancer Registry data by

Professor Roger L Milne of the Cancer Epidemiology Division of Cancer Council Victoria that described the incidence of cancer in a smaller area of the Bellarine Peninsula (the Barwon Heads area) relative to the Victorian population (Cancer Council Victoria Report) (**Attachment 3**). The Cancer Council Victoria Report found no substantive evidence of increase in cancer incidence. It was commissioned on the advice of the Expert Advisory Group to refine the epidemiological analysis undertaken by the department using the Australian Cancer Atlas.

The Expert Advisory Group concluded that Professor Milne's analysis provides no material evidence of excess cancer rates in residents of the Barwon Heads area over the period 2001-2016 for the specific cancer types examined (including, among others, multiple myeloma, leukaemia, non-Hodgkin lymphoma, brain and central nervous system cancer, or breast and liver cancer) or for all those cancers combined for all ages, and for all those cancers combined in only 10-34 year-olds.

The findings in that report are endorsed by the Chief Health Officer.

Both the Cancer Council Victoria Report and the Expert Advisory Group's opinion of this report was made available to the community in October 2019 (**Attachment 4**).

The department takes the health of all Victorians extremely seriously. Where there is any indication or concern of a risk to public health, the department undertakes appropriate investigations, with assistance from appropriate experts, and appropriate community engagement.

Background

Who we are

The Chief Health Officer, appointed by the Secretary to the department, has a statutory function under the *Public Health and Wellbeing Act 2008* (Vic) and provides expert clinical and scientific advice to the Minister as well as leadership on issues impacting public health.

The department not uncommonly examines concerns about potential non-communicable disease clusters in the community, particularly if the concern is related to an environmental hazard or contaminant. An independent Expert Advisory Group can be convened at short notice to provide independent advice and recommendations to the Chief Health Officer when needed for the investigation of a potential cancer cluster.

The health concerns of local residents

There is significant community awareness of the historic use of dieldrin on the Bellarine Peninsula and its persistence in the environment.

Public concern within the local community became known broadly and publicly in late December 2018 with media reports of specific types of cancers (blood and brain) in former students and teachers from Bellarine Secondary College (Drysdale Campus) and Barwon Head Primary School on the Bellarine Peninsula, and a possible link to the historical use of the pesticide dieldrin. Over time and following social media interest, the concerns expanded to include other types of cancers and autoimmune diseases, including inflammatory bowel disease, and now to possible links to other pesticides used by local government for mosquito control.

The department will continue to investigate cancer rates on the Bellarine Peninsula, and any causal link between those rates and historic pesticide use in that region, as more information is received.

What we did

The department initiated and coordinated an interagency group to respond to the community's concerns. It includes, among others, the Department of Education and Training, the Victorian School Building Authority, WorkSafe Victoria, the City of Greater Geelong, the Environment Protection Authority Victoria,

Agriculture Victoria, Cancer Council Victoria and the Department of Environment, Land, Water and Planning. The interagency group met several times in 2019.

To fulfil the objectives of the interagency group, the department has:

- worked closely with the City of Greater Geelong to keep the community informed and updated using a 'Common Questions' page and by publishing related reports on the investigation and an FAQ information sheet (updated as new information or issues are identified) on their website¹; and
- liaised with the Department of Education, Victorian School Building Authority, Environment Protection Authority Victoria, Agriculture Victoria and WorkSafe Victoria concerning previous and ongoing soil testing investigations in the area, particularly at the school sites of interest. Low to negligible environmental risks and no risks to public health for organochlorines such as dieldrin were found.

Cancer and cancer rates

Cancer is very common. It is estimated that one in three Australians will experience cancer by the age of 75 years, and one in two Victorians will experience cancer by the age of 85 years.

Individuals have varying likelihoods of developing cancer due to differences in genetic predisposition, lifestyle behaviours and other risk factors including exposure to carcinogens.

The incidence of cancer across Australia can and do vary, even between neighbouring localities due to this individual variation of risk, as well as differences in health seeking behaviours and cancer testing rates. Some areas may have higher or lower rates than average, simply due to chance and the expected uneven distribution of cancers, especially when looking at smaller geographic areas.

When considering a possible cancer cluster, it is important to consider the types of cancer that are being reported. Cancer is not one disease with a single cause but rather a category of many diseases, each with differing causes and risk factors, involving different biochemical pathways and needing different treatments. Although there may be some overlap, generally speaking and as an example only, the causes / risk factors of lung cancer are different to those of bowel cancer or skin cancer. In addition, there are different types of lung, bowel or skin cancer with, again, different causes /risk factors. Hence a statistically significant increase in a single type of cancer in an area is much more consistent with a possible exposure to a common environmental cause, than those that involve a mixture of cancers.

All cancers diagnosed in Australia are legally required to be reported to a State or Territory Cancer Registry. The Australian Cancer Atlas draws on data collected by these registries². It uses the usual address of the patient and aggregates up the individual data into a predefined area known as Statistical Area Level 2 (SA2) (see Figure 1). Each SA2 broadly represents a community that interacts together socially and economically. They are about the size of a postcode but don't necessarily align with postcode boundaries.

The Australian Cancer Atlas reports cancer incidence by location, relative to the Australian population, using standardised incidence rates (SIRs). SIRs are calculated by dividing the number of observed cases in that area by the number of expected cases, based on the average age- and sex- specific incidence rates for the Australian population. A SIR of 1.0 means the estimated rate of cancer in that SA2 is the same as the Australian population. A SIR greater than or less than 1.0 means the estimated rate is higher or lower than the Australian average respectively.

When considering a SIR, it is important to reflect on how certain or precise the estimate is. In statistics, the precision of an estimate is frequently described using a 95% confidence interval which is the range of values (rather than a single estimate) within which it can be said with 95% confidence, that the true value is likely to fall. With regard to SIRs:

¹ See <https://www.geelongaustralia.com.au/news/item/8d687a5ff8046d9.aspx>

² Australian cancer atlas reports 5 year (2010-2014) aggregated SIR for all cancers and breast cancer and 10 year (2005-2014) aggregated SIR for brain and liver cancer, leukaemia, myeloma and non-Hodgkin lymphoma.

- if the upper and lower limits of the confidence interval are both less than 1.0, it can be said with 95% confidence that the true SIR for the area of interest is likely less than 1.0 and therefore likely lower than the Australian average; and similarly
- if the upper and lower limits of the confidence interval are both greater than 1.0, it can be said with 95% confidence that the true SIR for the area of interest is likely greater than 1.0 and therefore likely greater than the Australian average; and
- if the confidence interval for a SIR includes 1.0, it can be said that the true SIR for the area of interest may be the same as the average rate in Australia.

Data from the Australian Cancer Atlas for the SA2s correlating with the area described as the Bellarine Peninsula were analysed for the CHO Report made public on 30 January 2019. Most had confidence intervals including 1.0, indicating it was likely that there was no true difference between the cancer rate in the SA2 and the average rate in Australia. The remainder had a confidence interval that was lower than 1.0. It should be noted that when examining and calculating multiple SIRs, that a small number would be expected to be higher or lower than 1.0 *by chance alone*, and do not necessarily represent a true difference in cancer rates for a particular SA2. The further statistically significant SIR is away from 1.0, the greater the likelihood that a true difference exists.

This data uses the usual address of patients when they are diagnosed with a cancer; it does not specifically analyse where a possible exposure to a carcinogen may have occurred. Nonetheless, it is a useful surrogate, but with a number of limitations. For example, given it can take about 10 years or more for a solid tumour to develop and be diagnosed, it is likely that hundreds of people have moved into or out of the Bellarine Peninsula following any potential exposure. Similarly, this data does not take account of people who are exposed to a carcinogen away from their home addresses. These are some of the inherent difficulties in cluster investigations.

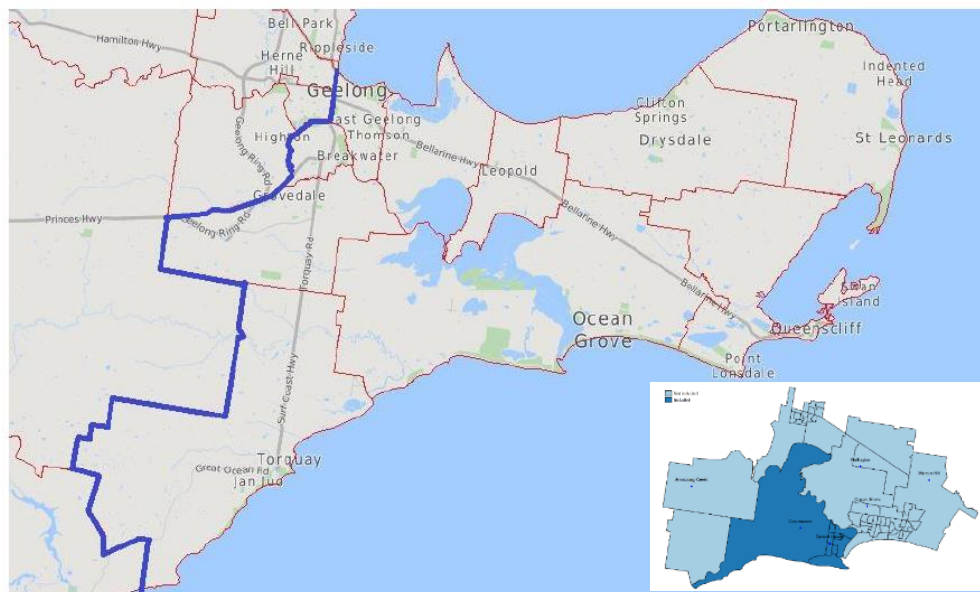


Figure 1: Map showing SA2 areas (all areas to right of blue line on the large map, being Newcomb-Moolap, Leopold, Clifton Springs, Portarlington, Queenscliff, Ocean Grove-Barwon Heads, Torquay, Grovedale, Belmont and Geelong) included in the analysis using the Australian Cancer Atlas (published in CHO Report on 30 January 2019). Inset shows smaller dark blue SA1 areas (including Barwon Heads, to the west of Ocean Grove) included in the analysis by Cancer Council Victoria using Victorian Cancer Registry data (report published October 2019).

Cancer clusters

A cancer cluster is said to occur when the number of people associated with one particular area, workplace or group diagnosed with one specific type of cancer is significantly higher than would otherwise be expected, after other contributing factors such as age and sex are taken into account.

Cancer is not uninformedly distributed across populations and clustering of cases is expected. The question for a cancer cluster investigation is to determine if the perceived increase in cancer is a red flag, signalling a common exposure to an environmental carcinogen or alternatively, related to the inherently non-uniform distribution known to exist.

Historically, true clusters of cancers related to a novel environmental exposure are rare. Where these have been found, the cancers are typically, but not always, of the same type (e.g. mesothelioma related to asbestos exposure).

When concern is raised about a specific environmental hazard, such as agricultural pesticides, it is important to consider the toxicological evidence for that hazard causing the cancer of concern. Furthermore, it is important to consider possible exposure pathways, likely dose and the duration of time from possible exposure to the detection of the cancers.

Knowing that clustering of cancers will occur without local exposures to carcinogens, and that true clusters relating to novel environmental carcinogens are rare, means that care needs to be taken such that the investigation does not cause a number of possible unintended harms such as unnecessary community concern, social stigma, social tensions and divided communities, as well as potential economic impacts. Responsibly and authentically responding to concerns and the evidence is the approach that is taken.

On the other hand, a true cluster of cancer relating to a local environmental carcinogen, must not be missed. Identifying those clusters that need increasingly detailed investigation is assisted through the input of the independent Expert Advisory Group.

Characteristics of a perceived cluster that raise greater concern include those involving a single type of cancer (i.e. with a common cause); a statistically significant increase in that specific cancer type and the magnitude of that increase; an unusual pattern of cancer such as cancers occurring in a group that is not usually regarded as at increased risk perhaps due to their age or sex; a number of very rare cancers; cancer rates that are proportionate to modelled levels of exposure; and when there is plausible or definitive exposure to a carcinogen.

For example, the Firefighters' Health Study³ conducted by Monash University (published in November 2014), found that firefighters in the high-risk group (paid full-time instructors and PAD (Practical Areas for Drills) workers had a statistically significant SIR of 13, (95% CI of 1.58 – 47.1) for testicular cancer compared to the Victorian population.

There are four potential and progressive stages of a cluster investigation, with the investigation moving to a more detailed investigation and analysis when supported by the available evidence. Stage 1 is the initial response to the inquiry and involves collection and assessment of information provided. In this case, there was no specific inquirer who provided the department the necessary background information including demographic characteristics (age, gender etc.) of the individuals with cancer. In this case, the concerns were initially only available to the department through media and social media reporting and it was therefore challenging to understand the exact issues of concern. The department was conscious of issues of privacy so did not directly contact affected individuals named in the media but instead provided information online and in other media on the mechanisms to report any concerns. Stage 2 involves formation of an assessment team, communication plan, appointing an Expert Advisory Group if required and analysis of existing data. Stage 3 may require a collection of new data for more detailed and focused

³ https://www.monash.edu/_data/assets/pdf_file/0004/982219/fiskvillereport1.pdf

analysis and this very infrequently progresses to Stage 4 where the investigation becomes a research study. In Australia and across the world most investigations are managed at Stage 1 or 2.

Findings of the epidemiological investigations

The Expert Advisory Group considered the CHO Report and agreed that there appeared to be no evidence of a cancer cluster.

Professor Milne, of the Cancer Epidemiology Division of Cancer Council Victoria, used Victorian Cancer Registry data to analyse cancer rates in a smaller localised area (Barwon Heads area) and undertook specific analysis involving younger people (10 – 34 years). Population estimates were available from the Australian Bureau of Statistics (ABS) for 2001 to 2016 for individual geographic regions, including Level 1 Statistical Areas (SA1s) which are the smallest geographically coded areas for which data were available. SA1s have an average population size of 400 persons compared to 10,000 persons for SA2s.

Cancer Council Victoria found no substantive evidence of increased incidence of selected cancers diagnosed in residents of the Barwon Heads area over the period 2001-2016 when compared with the incidence that would normally be expected in Victoria. The Expert Advisory Group reviewed this additional analysis and concurred with the finding. The finding is endorsed by the Chief Health Officer.

Both the Cancer Council Report and Expert Advisory Group commentary were shared with the local community in October 2019 (**Attachments 3 and 4**).

Assessing environmental data

There are certain cluster investigations that are best resolved by undertaking suitable environmental testing to empirically determine the level of the particular hazard of concern. The Victorian School Building Authority made the results of its 2019 soil testing program of the Bellarine Secondary College (Drysdale Campus) and the Barwon Heads Primary School available on the City of Greater Geelong Website.

In addition, some organisations, including councils and government departments or agencies, may undertake soil testing for contamination as part of ongoing due diligence, or in response to an issue or complaint. Testing may also occur for planning scheme amendments or applications where potentially contaminated land would be used for a sensitive use, such as residential development, schools, childcare or public open space.

The department was informed by relevant agencies that all relevant soil testing available to members of the interagency group showed no contamination at levels harmful to human health for dieldrin or any other relevant chemicals of concern.

Community engagement

In February 2019, the interagency group published a FAQ information sheet on the City of Greater Geelong website, and this has been updated as new community concerns were raised.

On 25 February 2019, a Community Open House event was held in Barwon Heads. Approximately 45 community members, including representatives from the Barwon Heads Association, and 25 government staff attended the event in order to listen, provide information and respond to questions. Attendees included people who lived in the area and had suffered a range of cancers and the parents of young adults who had died of a range of cancers. Some attendees discussed their individual health with government staff, including their history of illnesses.

After the open house, the interagency group prepared additional information for the community and published it in the FAQ information sheet. An evaluation of the Community Open House is included in **Attachment 2**.

The department has continued to liaise with the Barwon Heads Association following the Community Open House event to obtain additional information about community concerns and to discuss the best forums to provide sensitive and appropriate information to the wider community.

Mosquito spraying

At the Community Open House event in February 2019, some community members raised concerns about the historical mosquito spraying program in the local area of Barwon Heads. The President of the Barwon Heads Association also emailed the department with queries about the management of the mosquito spraying program in Geelong. These concerns were not specifically related to schools, but to the Barwon Heads area more generally. In March 2019, a community group published concerns on Facebook regarding the historical mosquito spraying program in the City of Greater Geelong and links to cancer.

The FAQ information sheet on the City of Greater Geelong website was updated following the Community Open House event to include information on, and to respond to common questions about, historical and current mosquito spraying programs in the Bellarine Peninsula.

The table below lists the chemicals used for mosquito control to minimise vector-borne disease on the Bellarine Peninsula, Victoria and elsewhere in Australia. According to Australian and international approved product registrations and refereed publications where available, none of these chemicals is known to cause cancer or autoimmune disease in humans during normal use by or for the public, or by workers when the product is used according to the label and with any recommended personal protection equipment for prolonged exposure to concentrated product, which may contain other potentially toxic carriers.

Table 1: Chemical used for mosquito control on the Bellarine Peninsula

Chemical of concern to Bellarine community	Historical or current use on Bellarine Peninsula ¹	How it works
Bti (Bacillus thuringiensis israelensis)	Yes, 2005 to present	Product (spores and endotoxins) of a naturally occurring bacterium; only toxic to mosquito larvae
S-methoprene	Yes, 2005 to present	Insect growth regulator – e.g. prevents normal egg-laying and insect maturation
Pyrethrin or pyrethrum	Yes, by thermal fogging, up to 2010	Natural insecticide found in chrysanthemum flowers. Kills adult insects (mosquitoes, fleas, ticks, lice) by disrupting nervous system.
Phenothrin – a pyrethroid (which is synthetic pyrethrin)	Yes, by ultra-low volume fogging in 2007, 2010 and 2012	Same as pyrethrin - kills adult insects by disrupting nervous system.
Piperonyl butoxide; often used with pyrethrins	Yes, with phenothrin	Not active on its own. Synthetic pesticide designed to synergise with pyrethrin or pyrethroids. Acts by inhibiting the insect enzymes that degrade some insecticides.
Temephos (Abate®)	Yes, 1984 to 1987 in a powder form to stagnant water	Organophosphate with low toxicity. Approved by the World Health Organisation for use in potable water for mosquito larvae control.

¹Information from City of Greater Geelong website.

Autoimmune disease

Since the Community Open House event, some community members have progressively increased their concerns of a higher rate of autoimmune disease and its relationship to mosquito spraying.

Similar to cancers, autoimmune disease is a broad category of diseases involving essentially any organ or system in the body, with different causes, pathways and treatments. Examples include inflammatory bowel disease (IBD, affecting the gastrointestinal tract), rheumatoid arthritis (affecting the joints), type 1 diabetes (affecting the pancreas), Graves' disease (affecting the thyroid gland), psoriasis (affecting the skin), and systemic lupus erythematosus (affecting connective tissue) and many others.

The exact causes of autoimmune disease are not known; however, a range of risk factors have been identified that are likely to play a role in triggering the disease, including genetics, lifestyle and the environment.

Taken together autoimmune diseases are not uncommon and affect about five per cent of the population. Unlike cancers, there is no specific registry recording the incidence of these many and varied diseases.

An analysis of recent literature about the rates of IBD indicates that the incidence in Australia is similar to other western, industrialised nations and are regarded from a global perspective as high. There is a lower incidence of IBD in non-industrialised countries.

As at the date of this submission, the department has not received any reports of a concern of an increase in specific autoimmune diseases (for example, inflammatory bowel disease) from specialist units at the local public hospital, the University Hospital Geelong. Further, enquiries made of these specialist clinicians have not identified any perceived increase in the incidence of any specific autoimmune disease.

Conclusion and suggestions

The department has investigated the concerns and, in doing so, has looked to the best evidence of whether a cancer cluster may exist. That evidence includes Australian registry data and, while there are limitations with any statistical analysis, the data of itself and in combination with the investigation of potential environmental exposures, does not suggest that there is a cancer cluster or harmful levels of Dieldrin or other relevant chemicals of concern at the Bellarine Secondary College (Drysdale Campus) and the Barwon Heads Primary School.

The department recognises that care and sensitivity must be taken when investigating potential cancer clusters as community concern about cancer and other diseases is very real to the individuals involved and to those proximally affected. Care also needs to be taken not to cause undue harm by amplifying concerns in the absence of objectively verified data substantiating a cause for concern.

The department looks forward to the findings of the Senate inquiry and welcomes recommendations that aim to enhance communities' understanding of the nature of potential non-communicable disease clusters and to assist agencies to respectfully and effectively engage with communities.

Attachments

1. CHO Report, January 2019
2. Community Open House Event Bellarine Peninsula cancer concern, April 2019
3. Cancer Council of Victoria Report, October 2019
4. Statement from Expert Advisory Group, October 2019
5. Cancer concerns on the Bellarine Peninsula FAQ update, August 2019