

The Chief Health Officer's investigation of cancer rates on the Bellarine Peninsula

January 2019

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Authorised and published by the Victorian Government, 1 Treasury Place, Melbourne.

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Available at < <https://www2.health.vic.gov.au/public-health/chief-health-officer/cho-publications> >

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Executive summary

In December 2018, *The Age* reported a potential cluster of cancers on the Bellarine Peninsula purported to be related to historical use of the pesticide dieldrin in the area. Reports detailed a potential class action by those thought to be affected.

Dieldrin is classified as a probable carcinogen (Grade 2A) by the World Health Organisation's International Agency for Research on Cancer (IARC). This is based on 'limited evidence' for breast cancer in humans and 'sufficient evidence' for liver cancer in experimental animals. Specific community concerns were raised about a perception of a high number of cases of non-Hodgkin lymphoma, multiple myeloma, brain tumours and leukaemia in the area.

In response to this issue, the Chief Health Officer initiated a review of cancer incidence rates for total cancers; breast and liver cancer; and non-Hodgkin lymphoma, multiple myeloma, brain cancers and leukaemia.

Whilst current research suggests no association between dieldrin and blood cancers, there was substantial speculation about the high number of cases of these cancers in particular and understandable distress and concern in the local community. This concern was particularly focused on these cancers in young people. This report aimed to provide a comprehensive review of cancer data relevant to the community's concerns.

The primary source of data for this report is the Australian Cancer Atlas, which includes comprehensive cancer incidence data for all of Australia by geographical area.

Analysis of these data indicates:

- no evidence of a higher rate of cancer overall in any geographical areas of the Bellarine Peninsula than elsewhere in Australia
- no higher number of the specific cancers of interest (breast, liver, non-Hodgkin lymphoma, multiple myeloma, brain cancers and leukaemia) than would be expected (based on the average cancer rates in Australia)

Assessment of the available epidemiological data has not found evidence of higher rates of the cancers assessed in any geographical areas within the Bellarine Peninsula. In addition, the hazard of concern (dieldrin) has not been identified as an agent that results in the cancers cited in the media.

Cancer in young people is unusual and particularly distressing. It is often difficult to identify a cause or to find explanation for the illness in children and young adults. Memories of these cases remain deep in communities and families for many years or a lifetime. Nothing in this report is intended to, nor should be taken to, dismiss the reports of individuals with cancers or of those friends and families who are all too aware of the tragedy that these cancers have had on many lives.

This report has examined cancer rates in defined areas known as Statistical Area Level 2 (SA2). This is the appropriate sized area to 'capture' sufficient cases of cancer to avoid the random fluctuation in rates that occurs when looking at smaller areas. As smaller areas and shorter time periods are examined, there is normal variation in cases and rates, due to chance alone. For example, if looking at areas of a few residential blocks, and one or two year time periods, it becomes apparent that there is large variation between areas and over time. Several areas will have no cases; some will have a few; and one or two areas may have several cases. This can sometimes be the basis for concern at an apparent increase in cases that occurs over particular years, or in very localised areas, or in particular age groups.

DHHS and the Chief Health Officer are committed to working with communities and relevant agencies to ensure that community concerns are conscientiously addressed, and that appropriate support and reassurance is provided.

The Chief Health Officer would like to express his heartfelt sympathy to all those affected by cancer on the Bellarine Peninsula and for the distress that concerns of a cancer cluster cause. He welcomes questions about, or critiques of, this report and recommends that anyone who wishes to further investigate the publically available data does so.

Introduction

In December 2018, media reports raised concern about a potential cluster of cancers on the Bellarine Peninsula purported to be related to historical use of agricultural pesticides. The reports linked cases to schools in the area, however increasing coverage prompted community concerns about general rates of cancer across a broad area of the Bellarine Peninsula.

Reports speculated that the historic use of the now banned pesticide dieldrin in agricultural practices in the area may have contributed to higher cancer rates. Dieldrin is classified as a probable carcinogen (Grade 2A) by the World Health Organisation's International Agency for Research on Cancer (IARC). This is based on 'limited evidence' for breast cancer in humans and 'sufficient evidence' for liver cancer in experimental animals.

The Chief Health Officer (CHO) has a statutory function under the Public Health and Wellbeing Act and provides expert clinical and scientific advice and leadership on issues impacting public health. The Department of Health and Human Services (DHHS) 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. With awareness of increasing community concern, the Acting CHO undertook a review of cancer rates in the Bellarine Peninsula area.

Historic use of dieldrin on the Bellarine Peninsula

Dieldrin is a synthetic organochlorine pesticide that was introduced to Australia in the 1940s. Land on the Bellarine Peninsula has a history of potato growing and in some cases this included the use of dieldrin. It is understood farmers often rotated paddock use between potato cropping and sown grass or pasture. At times pasture was used for grazing cattle for several years before being returned to potato cropping. (Butler, 1990) In 1987 abattoir testing of export beef consignments detected dieldrin, resulting in a number of farms on the Bellarine Peninsula being placed under quarantine. A group of affected farmers later launched a class action against the State government and received a compensation payment in 2004. The case was based on the farmers ongoing use of the pesticide on the advice of the state agricultural department after the product had already been banned in the United States. The pesticide was prohibited in Victoria in 1987.

There is significant community awareness of the historic use of dieldrin on the Bellarine Peninsula and dieldrin has come under particular scrutiny for a possible association with cancer. Given this historical use of dieldrin and its known persistence in the environment, community members have raised the question of whether illness in the community is related. This report aims to help answer these questions.

What cancers have been associated with dieldrin?

The most widely recognised classification of cancer risk from environmental factors comes from the World Health Organisation's International Agency for Research on Cancer (IARC). This agency assesses the risk of human cancer from environmental factors including chemicals, occupational exposures,

biological agents and lifestyle factors. Working groups of independent, expert scientists review published studies and determine the weight of evidence that an agent can increase the risk of cancer. The factor of interest is then given a grading of carcinogenicity (the ability of the substance to cause cancer), and the classification and the supporting evidence is published in the 'IARC Monographs'. These monographs are then periodically updated as new evidence becomes available and are publicly available online <https://monographs.iarc.fr/>.

Dieldrin was last reviewed by IARC in 2016. Eighteen scientists reviewed and evaluated the current research. 'Limited evidence' was found of an association between breast cancer and dieldrin in humans. This finding was based predominantly on a 1998 Danish study that found higher rates of breast cancer amongst women with higher levels of dieldrin in their blood. (Hoyer, Grandjean, Jorgensen, Brock, & Hartvig., 1998). IARC also found 'sufficient evidence' from studies of mice who ingested dieldrin of an association between dieldrin and liver cancer in experimental animals. Overall, IARC classified dieldrin as "probably carcinogenic to humans" (Group 2A).

Farming and some pesticides (like DDT) have previously been associated with non-Hodgkin lymphoma, chronic lymphocytic leukaemia and multiple myeloma. However, this association has not been found for dieldrin. The largest such study was published in 2014 and included farmers and commercial pesticide applicators. This study focused specifically on non-Hodgkin lymphoma, chronic lymphocytic leukaemia and multiple myeloma. It found an association between DDT and non-Hodgkin lymphoma, but no association between dieldrin and any of these cancer types. (Alavanja M, 2014) Although they are both organochloride pesticides, the chemical structures of DDT and dieldrin cause them to behave in different ways in the body. For instance, an association has been observed between dieldrin and breast cancer, but not DDT and breast cancer. Equally, the observed association between DDT and non-Hodgkin lymphoma has not been found for dieldrin.

Method and data source

Cancer incidence rates were sourced from the Australian Cancer Atlas (the Atlas). The notification of cancers to State and Territory cancer registers has been mandated for a number of years and the Atlas is considered to provide comprehensive coverage of all cancers diagnosed.

The Atlas reports cancer incidence by location relative to the Australian population using standardised incidence rates (SIRs). These 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. The Atlas includes cancer incidence data from 2010 to 2014.

An SIR of 1.0 would indicate that the cancer incidence for residents in the area of interest was the same as that for the general population, while an SIR of 0.5 would indicate that residents in the area of interest had only half the cancer incidence of the general population and an SIR of 1.5 would indicate that residents had 50% higher cancer incidence than the general population.

When considering an estimated standardised incidence rate, it is also important to consider how certain or precise that estimate is. It is common practice in statistics to represent this precision with a 'confidence interval'. The confidence interval commonly interpreted as the range of values above and below an estimate, in which the true value is likely to fall. Typically, a '95% confidence interval' is referred to. If both the upper and lower limit of the confidence interval are less than 1.0, then this is often interpreted to mean that we are 95% confident that the true SIR for that area is a value less than 1.0 (less than the Australian average). Similarly, if both the upper and lower limit of the confidence interval are greater than 1.0, then the true SIR is likely to be greater than 1.0 (more than the Australian average). If the confidence interval for an SIR includes 1.0 then the true SIR may in fact be 1.0, meaning that there is no difference in the cancer incidence rate of that area and the average Australian cancer incidence

rate. As more areas are examined and more cancers considered, the greater the chance that you will see a SIRs above and below 1.0. This is often called the 'multiple comparisons problem'.

Cancer cluster analysis

Many factors can contribute to concerns about a cancer cluster. Often concerns are raised by anecdotal reports of an unusual number of people suffering cancer living close together or working together.

Aspects of an apparent cluster of disease that raise concern are where:

- the number of cancers involved in the cluster is more than expected in the area (based on average cancer rates in the community)
- the affected people have the same type of cancer
- where the type of cancer is unusual, and
- where there is an exposure that is known to cause that specific cancer.

Each of these factors must be considered to appropriately address a community's concern.

Cancer is a common disease and it is estimated that 1 in 2 Victorians will experience cancer by the age of 85 years (<https://canceraustralia.gov.au/affected-cancer/what-cancer/cancer-australia-statistics>). All cancers diagnosed in Australia are reported to a State or Territory Cancer Registry (in Victoria, the Victorian Cancer Registry). This data can be used to analyse rates of cancer both across the country and in smaller localised areas. If a concern about an unusually high number of cancers is raised, the data can be used to determine if a higher than expected number of cancers has been diagnosed in the area in previous years.

Inspection of the Atlas data will reveal variation in cancer rates around Australia, even between neighbouring localities. This variation is expected and reflects a mixture of risk factors in those that live in each area. Different people have different genetic risks, different behaviours, and other differences in other risk factors including different exposure to known carcinogens that can influence the likelihood that that individual will develop cancer. There is also a random aspect to the disease and this means that there are areas and groups who may have higher rates than average and other areas with lower rates.

When considering a possible cluster, it is also important to consider the types of cancer that are being reported. Cancer is not one disease but a category of disease that is made up of different causes. If cancers in a cluster are all the same type (e.g. leukaemia) it is more likely that they reflect a common cause than if the cluster is made up of a variety of different types of cancers.

Historically, clusters of cancers related to an environmental exposure are rare. Where these have been found, the cancers are typically of a similar or identical 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 evidence for that hazard causing the cancer of concern. Furthermore, it is important to consider the likely duration of time for the cancer to develop and the possible exposure pathways of the cases.

Location of interest

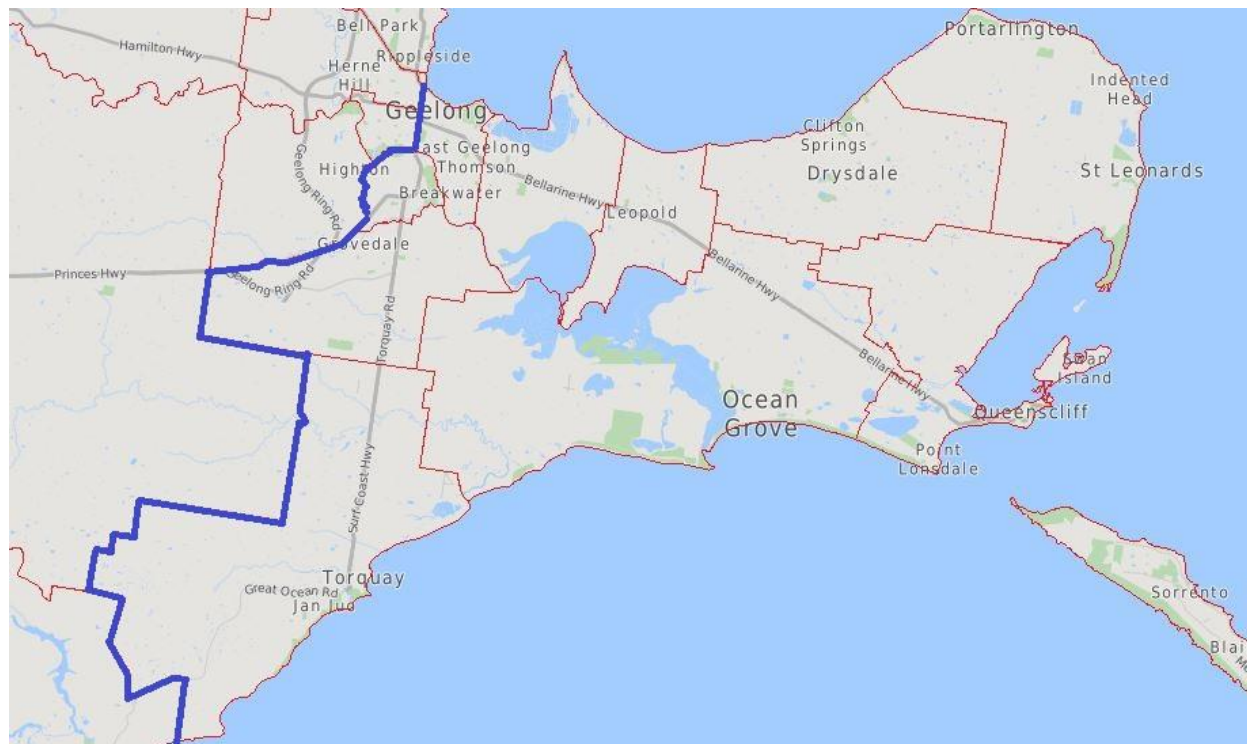
A number of locations of concern had been raised in media and community reports, these appear to be loosely based on historical use of the pesticide dieldrin and the school history of known cases. Broadly the area of concern is described as the 'Bellarine Peninsula'.

There appears to be no consistent agreement on the exact geographical boundaries of the area that forms the Bellarine Peninsula. Therefore, to ensure no relevant areas were missed a wide area was examined. The Atlas defines location by Statistical Area Level 2 (SA2), which is a standard geographical classification used by the Australian Bureau of Statistics. SA2 broadly represents a community that interacts together socially and economically. (While the SA2 areas are broadly similar sizes to postcodes, there is no direct concordance between the two area definitions.)

The SA2 areas considered in this analysis were:

- Newcomb-Moolap
- Leopold
- Clifton Springs
- Portarlington
- Queenscliff
- Ocean Grove-Barwon Heads
- Torquay
- Grovedale
- Belmont
- Geelong

Figure 1: Map showing SA2 areas included in analysis (all areas to right of blue line)



Cancers of interest

Review of the literature and IARC monograph suggest a 'limited' association between dieldrin and breast cancer in humans and a 'probable' association between dieldrin and liver cancer in animals. Media reports have focused on a number of cancer types including leukaemia and lymphomas.

For this reason, the cancer considered in this analysis are:

- All cancer (total cancers)
- Breast cancer
- Liver cancer
- Multiple myeloma
- Leukaemia
- Non-Hodgkin lymphoma
- Brain cancer

Results

Standardised incidence rates for 'all cancer' (total cancer cases) and six specific cancer types were considered. Age standardised rates were reviewed by SA2 and sex. These results are included in detailed Tables 1-7 and summarised below.

There was no evidence of a higher overall cancer incidence rate in any of the areas examined (Table 1). Similarly, no increased rates were found for breast or liver cancer. There was also no increased rates of multiple myeloma, brain cancer, leukaemia or non-Hodgkin lymphoma observed in any area or by sex. Most confidence intervals include 1.0, indicating it was likely that there was no true difference between the cancer rate in that area and the average rate in Australia.

Cancer rates do vary somewhat by area and sex and this is expected when a large number of different cancer types are examined over a large area. There is a random aspect to the incidence of disease and this means that there are areas and groups who may have higher rates than average and other areas with lower rates.

Limitations

The Cancer Atlas data is provided at an SA2 area level. However, even with this grouping there are often still very small numbers of people diagnosed with cancer in a specific SA2 each year. In order to calculate rates with sufficient reliability, the Atlas therefore groups data from a number of years together. Whilst this improves the accuracy of the estimate, there is the potential that this covers over differences within the SA2 area or within the combined time period.

The Atlas uses the address of the patient at the time of diagnosis to calculate SIRs by SA2 area. There is potential that a case may be misclassified to a SA2 if they have for example supplied a PO Box address or the hospital address instead of their home address. It is also not clear from this data how long a person has lived at their address. A person may have moved recently to that address, commute or travel each day and therefore have spent most of their time prior to their cancer developing in another area.

Conclusion

This analysis of cancer incidence rates on the Bellarine Peninsula does not indicate that there is a higher rate of breast or liver cancer, leukaemia, multiple myeloma, brain cancers or non-Hodgkin lymphoma in the area. Furthermore, the cancers reported in the media are of different types suggesting they do not have a common cause. Current scientific research does not suggest an association between dieldrin and the types of cancer that have been reported in the media.

Any cancer in a young person is highly distressing for the individual, their family, friends and often, the broader community. Whilst generally cancer is common, cancer in young people is not and these illnesses are often easily recalled in communities. DHHS is committed to working with the community to ensure that their concerns are conscientiously addressed, and appropriate reassurance and support is provided.

Table 1: Standardised Incidence Rates For All Cancers

| | | Standardised incidence rate | 95% confidence interval |
|-----------------------------------|---------|--|------------------------------------|
| Belmont | | | |
| | Women | 0.98 | (0.90, 1.07) |
| | Men | 0.99 | (0.90, 1.09) |
| | Persons | 0.96 | (0.90, 1.04) |
| Clifton Springs (Drysdale) | | | |
| | Women | 1.03 | (0.94, 1.12) |
| | Men | 0.93 | (0.84, 1.03) |
| | Persons | 0.98 | (0.91, 1.06) |
| Geelong | | | |
| | Women | 1.04 | (0.96, 1.12) |
| | Men | 1.01 | (0.92, 1.11) |
| | Persons | 1.03 | (0.95, 1.10) |
| Grovedale | | | |
| | Women | 1.03 | (0.96, 1.11) |
| | Men | 0.96 | (0.89, 1.04) |
| | Persons | 0.99 | (0.93, 1.06) |
| Leopold | | | |
| | Women | 1.01 | (0.91, 1.12) |
| | Men | 0.95 | (0.85, 1.06) |
| | Persons | 0.98 | (0.89, 1.07) |
| Newcomb - Moolap | | | |
| | Women | 1.06 | (0.97, 1.15) |
| | Men | 1.01 | (0.92, 1.10) |
| | Persons | 1.04 | (0.97, 1.12) |
| Ocean Grove - Barwon Heads | | | |
| | Women | 0.99 | (0.92, 1.07) |
| | Men | 0.92 | (0.85, 1.00) |
| | Persons | 0.94 | (0.88, 1.00) |
| Portarlington | | | |
| | Women | 0.97 | (0.87, 1.09) |
| | Men | 0.95 | (0.85, 1.07) |
| | Persons | 0.96 | (0.87, 1.06) |
| Queenscliff | | | |
| | Women | 1.02 | (0.91, 1.14) |
| | Men | 0.90 | (0.79, 1.02) |
| | Persons | 0.95 | (0.86, 1.05) |
| Torquay | | | |
| | Women | 1.04 | (0.95, 1.13) |
| | Men | 0.87 | (0.78, 0.96) |
| | Persons | 0.95 | (0.87, 1.02) |

Table 2: Standardised Incidence Rates For Breast Cancer

| | | Standardised incidence rate | 95% confidence interval |
|-----------------------------------|-------|--|------------------------------------|
| Belmont | | | |
| | Women | 1.06 | (0.94, 1.21) |
| Clifton Springs (Drysdale) | | | |
| | Women | 1.05 | (0.91, 1.21) |
| Geelong | | | |
| | Women | 1.06 | (0.95, 1.19) |
| Grovedale | | | |
| | Women | 1.02 | (0.92, 1.13) |
| Leopold | | | |
| | Women | 1.04 | (0.90, 1.21) |
| Newcomb - Moolap | | | |
| | Women | 1.02 | (0.90, 1.16) |
| Ocean Grove - Barwon Heads | | | |
| | Women | 1.02 | (0.91, 1.14) |
| Portarlington | | | |
| | Women | 0.95 | (0.79, 1.14) |
| Queenscliff | | | |
| | Women | 1.00 | (0.85, 1.19) |
| Torquay | | | |
| | Women | 1.02 | (0.90, 1.16) |

Table 3: Standardised Incidence Rates For Liver Cancer

| | | Standardised incidence rate | 95% confidence interval |
|-----------------------------------|---------|--|------------------------------------|
| Belmont | | | |
| | Women | 0.77 | (0.47, 1.26) |
| | Men | 0.77 | (0.49, 1.19) |
| | Persons | 0.75 | (0.51, 1.09) |
| Clifton Springs (Drysdale) | | | |
| | Women | 0.59 | (0.32, 1.08) |
| | Men | 0.76 | (0.46, 1.19) |
| | Persons | 0.69 | (0.44, 1.04) |
| Geelong | | | |
| | Women | 0.84 | (0.54, 1.31) |
| | Men | 0.81 | (0.54, 1.20) |
| | Persons | 0.83 | (0.59, 1.17) |
| Grovedale | | | |
| | Women | 0.77 | (0.51, 1.16) |
| | Men | 0.82 | (0.57, 1.15) |
| | Persons | 0.81 | (0.59, 1.10) |
| Leopold | | | |
| | Women | 0.58 | (0.31, 1.06) |
| | Men | 0.77 | (0.45, 1.27) |
| | Persons | 0.67 | (0.41, 1.05) |
| Newcomb - Moolap | | | |
| | Women | 0.68 | (0.40, 1.11) |
| | Men | 0.84 | (0.53, 1.29) |
| | Persons | 0.76 | (0.52, 1.11) |
| Ocean Grove - Barwon Heads | | | |
| | Women | 0.60 | (0.37, 0.96) |
| | Men | 0.79 | (0.53, 1.15) |
| | Persons | 0.69 | (0.48, 0.97) |
| Portarlington | | | |
| | Women | 0.58 | (0.27, 1.22) |
| | Men | 0.83 | (0.44, 1.43) |
| | Persons | 0.73 | (0.42, 1.23) |
| Queenscliff | | | |
| | Women | 0.59 | (0.30, 1.15) |
| | Men | 0.75 | (0.42, 1.30) |
| | Persons | 0.68 | (0.40, 1.11) |
| Torquay | | | |
| | Women | 0.71 | (0.43, 1.19) |
| | Men | 0.67 | (0.42, 1.05) |
| | Persons | 0.67 | (0.44, 1.00) |

Table 4: Standardised Incidence Rates For Multiple Myeloma

| | | Standardised incidence rate | 95% confidence interval |
|-----------------------------------|---------|--|------------------------------------|
| Belmont | | | |
| | Women | 1.08 | (0.83, 1.39) |
| | Men | 0.95 | (0.67, 1.29) |
| | Persons | 1.06 | (0.86, 1.29) |
| Clifton Springs (Drysdale) | | | |
| | Women | 1.18 | (0.87, 1.60) |
| | Men | 1.00 | (0.73, 1.37) |
| | Persons | 1.12 | (0.88, 1.41) |
| Geelong | | | |
| | Women | 1.08 | (0.86, 1.36) |
| | Men | 1.08 | (0.81, 1.44) |
| | Persons | 1.10 | (0.92, 1.32) |
| Grovedale | | | |
| | Women | 1.11 | (0.89, 1.37) |
| | Men | 1.02 | (0.76, 1.32) |
| | Persons | 1.10 | (0.93, 1.29) |
| Leopold | | | |
| | Women | 1.17 | (0.86, 1.58) |
| | Men | 1.06 | (0.75, 1.49) |
| | Persons | 1.14 | (0.90, 1.45) |
| Newcomb - Moolap | | | |
| | Women | 1.12 | (0.86, 1.45) |
| | Men | 1.00 | (0.73, 1.36) |
| | Persons | 1.10 | (0.89, 1.34) |
| Ocean Grove - Barwon Heads | | | |
| | Women | 1.15 | (0.90, 1.47) |
| | Men | 1.00 | (0.75, 1.31) |
| | Persons | 1.11 | (0.92, 1.33) |
| Portarlington | | | |
| | Women | 1.13 | (0.77, 1.64) |
| | Men | 0.97 | (0.66, 1.41) |
| | Persons | 1.07 | (0.80, 1.44) |
| Queenscliff | | | |
| | Women | 1.15 | (0.82, 1.59) |
| | Men | 0.94 | (0.64, 1.32) |
| | Persons | 1.07 | (0.82, 1.38) |
| Torquay | | | |
| | Women | 1.13 | (0.88, 1.45) |
| | Men | 1.06 | (0.78, 1.45) |
| | Persons | 1.12 | (0.92, 1.37) |

Table 5: Standardised Incidence Rates For Leukaemia

| | | Standardised incidence rate | 95% confidence interval |
|-----------------------------------|---------|--|------------------------------------|
| Belmont | | | |
| | Women | 0.92 | (0.69, 1.20) |
| | Men | 1.01 | (0.83, 1.23) |
| | Persons | 0.98 | (0.83, 1.16) |
| Clifton Springs (Drysdale) | | | |
| | Women | 0.89 | (0.65, 1.20) |
| | Men | 0.91 | (0.71, 1.14) |
| | Persons | 0.89 | (0.73, 1.09) |
| Geelong | | | |
| | Women | 0.95 | (0.73, 1.21) |
| | Men | 1.02 | (0.85, 1.21) |
| | Persons | 1.00 | (0.86, 1.15) |
| Grovedale | | | |
| | Women | 1.02 | (0.82, 1.28) |
| | Men | 0.99 | (0.84, 1.17) |
| | Persons | 1.00 | (0.87, 1.14) |
| Leopold | | | |
| | Women | 0.97 | (0.69, 1.33) |
| | Men | 0.96 | (0.76, 1.21) |
| | Persons | 0.96 | (0.78, 1.17) |
| Newcomb - Moolap | | | |
| | Women | 0.96 | (0.72, 1.27) |
| | Men | 0.95 | (0.78, 1.15) |
| | Persons | 0.95 | (0.80, 1.12) |
| Ocean Grove - Barwon Heads | | | |
| | Women | 0.94 | (0.72, 1.20) |
| | Men | 0.92 | (0.76, 1.10) |
| | Persons | 0.92 | (0.78, 1.07) |
| Portarlington | | | |
| | Women | 0.86 | (0.57, 1.25) |
| | Men | 0.88 | (0.65, 1.16) |
| | Persons | 0.86 | (0.67, 1.09) |
| Queenscliff | | | |
| | Women | 0.95 | (0.67, 1.33) |
| | Men | 0.90 | (0.69, 1.15) |
| | Persons | 0.90 | (0.72, 1.12) |
| Torquay | | | |
| | Women | 1.09 | (0.83, 1.45) |
| | Men | 0.92 | (0.75, 1.12) |
| | Persons | 0.97 | (0.81, 1.13) |

Table 6: Standardised Incidence Rates For Non-Hodgkin Lymphoma

| | | Standardised incidence rate | 95% confidence interval |
|-----------------------------------|---------|--|--------------------------------|
| Belmont | | | |
| | Women | 1.03 | (0.87, 1.21) |
| | Men | 1.07 | (0.90, 1.27) |
| | Persons | 1.05 | (0.90, 1.21) |
| Clifton Springs (Drysdale) | | | |
| | Women | 1.01 | (0.83, 1.23) |
| | Men | 1.10 | (0.91, 1.33) |
| | Persons | 1.06 | (0.90, 1.25) |
| Geelong | | | |
| | Women | 1.07 | (0.92, 1.24) |
| | Men | 1.11 | (0.95, 1.29) |
| | Persons | 1.12 | (0.98, 1.28) |
| Grovedale | | | |
| | Women | 1.06 | (0.93, 1.22) |
| | Men | 1.08 | (0.94, 1.24) |
| | Persons | 1.09 | (0.97, 1.22) |
| Leopold | | | |
| | Women | 1.07 | (0.88, 1.31) |
| | Men | 1.13 | (0.92, 1.38) |
| | Persons | 1.14 | (0.96, 1.34) |
| Newcomb - Moolap | | | |
| | Women | 1.07 | (0.91, 1.27) |
| | Men | 1.09 | (0.92, 1.29) |
| | Persons | 1.10 | (0.96, 1.28) |
| Ocean Grove - Barwon Heads | | | |
| | Women | 1.04 | (0.89, 1.22) |
| | Men | 1.09 | (0.93, 1.28) |
| | Persons | 1.08 | (0.95, 1.24) |
| Portarlington | | | |
| | Women | 0.96 | (0.74, 1.22) |
| | Men | 1.05 | (0.82, 1.34) |
| | Persons | 0.98 | (0.79, 1.20) |
| Queenscliff | | | |
| | Women | 1.01 | (0.82, 1.25) |
| | Men | 1.09 | (0.87, 1.35) |
| | Persons | 1.05 | (0.87, 1.27) |
| Torquay | | | |
| | Women | 1.07 | (0.92, 1.27) |
| | Men | 1.04 | (0.88, 1.22) |
| | Persons | 1.07 | (0.92, 1.24) |

Table 7: Standardised Incidence Rates For Brain Cancer

| | | Standardised incidence rate | 95% confidence interval |
|-----------------------------------|---------|--|--------------------------------|
| Belmont | | | |
| | Women | 1.10 | (0.89, 1.41) |
| | Men | 0.96 | (0.76, 1.19) |
| | Persons | 1.06 | (0.90, 1.24) |
| Clifton Springs (Drysdale) | | | |
| | Women | 1.10 | (0.85, 1.45) |
| | Men | 0.98 | (0.76, 1.26) |
| | Persons | 1.07 | (0.88, 1.29) |
| Geelong | | | |
| | Women | 1.09 | (0.90, 1.36) |
| | Men | 0.99 | (0.81, 1.22) |
| | Persons | 1.06 | (0.93, 1.22) |
| Grovedale | | | |
| | Women | 1.11 | (0.92, 1.36) |
| | Men | 0.99 | (0.82, 1.20) |
| | Persons | 1.07 | (0.94, 1.22) |
| Leopold | | | |
| | Women | 1.11 | (0.87, 1.47) |
| | Men | 0.99 | (0.77, 1.27) |
| | Persons | 1.07 | (0.90, 1.29) |
| Newcomb - Moolap | | | |
| | Women | 1.09 | (0.88, 1.40) |
| | Men | 0.97 | (0.78, 1.22) |
| | Persons | 1.06 | (0.90, 1.25) |
| Ocean Grove - Barwon Heads | | | |
| | Women | 1.10 | (0.90, 1.40) |
| | Men | 0.98 | (0.79, 1.19) |
| | Persons | 1.07 | (0.91, 1.24) |
| Portarlington | | | |
| | Women | 1.10 | (0.82, 1.53) |
| | Men | 1.00 | (0.74, 1.34) |
| | Persons | 1.08 | (0.86, 1.35) |
| Queenscliff | | | |
| | Women | 1.10 | (0.85, 1.49) |
| | Men | 0.99 | (0.75, 1.31) |
| | Persons | 1.07 | (0.88, 1.32) |
| Torquay | | | |
| | Women | 1.11 | (0.91, 1.41) |
| | Men | 0.99 | (0.79, 1.23) |
| | Persons | 1.08 | (0.93, 1.25) |

References

Alavanja M, H. J. (2014). Non-Hodgkin Lymphoma Risk and Insecticide, Fungicide and Fumigant Use in the Agricultural Health Study. *Plos One*.

Butler, K. S. (1990). Spatial distribution of soil dieldrin levels within dieldrin contaminated paddocks in southern Victoria. *Proceedings of the Australian Society of Animal Production*.

Hoyer, A. P., Grandjean, P., Jorgensen, T., Brock, J. W., & Hartvig., H. B. (1998). Organochlorine exposure and risk of breast cancer. *The Lancet*, 352(9143), 1816-20.

<https://canceraustralia.gov.au/affected-cancer/what-cancer/cancer-australia-statistics>

Attachment 2

Community Open House Event Bellarine Peninsula cancer concern

April 2019

In response to concerns regarding a potential cancer cluster on the Bellarine Peninsula believed to be related to historical use of the pesticide dieldrin, the Department of Health and Human Services co-ordinated a Community Open House event. This document provides a summary of the event.

The Open House was held on Monday 25 February 2019 at 13th Beach Golf Links in Barwon Heads, and the format was a drop-in session from 3:00pm to 7:00pm. The Open House provided an opportunity for the Bellarine Peninsula community to meet face-to-face with experts from many agencies who could discuss, clarify or provide further information about their questions and concerns. The event was advertised on the City of Greater Geelong website as well as in local media.

Twenty-five government representatives attended, including experts from the Environment Protection Authority, Victorian School Building Authority, Department of Education and Training, Agriculture Victoria, City of Greater Geelong, WorkSafe Victoria and the Department of Health and Human Services.

Forty-five community members attended the event.

Set-up of the event

Agencies were grouped into the following five topic areas and provided a broad range of expertise across public health, veterinary science, council planning, regulation, oncology (cancer), worker safety and environmental protection.

1. School testing

The Victorian School Building Authority (VSBA) and Department of Education and Training (DET) spoke to people about the soil testing they had undertaken at the local schools.

2. Our agricultural past

Agriculture Victoria discussed the historical use of dieldrin and related organochlorines in the Bellarine area. They also discussed the systems in place to manage the past use of chemicals including the implications for farming produce.

3. Local planning

The City of Greater Geelong spoke about the processes and requirements involved in planning and re-zoning land, including the development of farm land into residential zones or schools.

4. Our environment and health

Community members were able to speak with toxicology experts and environmental scientists about dieldrin, its health effects, how it is measured in soil and when and how detailed investigations are triggered. Both the Environment Protection Authority (EPA) and WorkSafe Victoria were also able to provide information about testing they had undertaken.

5. Our health

The Chief Health Officer and the Director of the Barwon Health Cancer Service were both present to listen to and speak with community members about cancer, the Chief Health Officer's investigation of cancer rates on the Bellarine Peninsula, and the approaches and complexities when a community is concerned that there is an unusual increase in cancer cases.

Community feedback at the event

All visitors were asked to provide feedback on the event on departure. The majority indicated they felt comfortable and able to participate and that their concerns and issues were understood.

Some of the key concerns identified included:

- methods and limitations of the Chief Health Officer's investigation of cancer rates on the Bellarine Peninsula
- potential spray drift from local golf clubs and maintenance of the Barwon Heads Primary school oval
- the mosquito spraying program in the area, particularly the chemicals and processes used historically
- why there are different health investigation levels in Australia and the USA
- the controls and regulations including for organochlorides

Responses to community concerns have been made available on the City of Greater Geelong website in the Frequently Asked Questions section <https://www.geelongaustralia.com.au/news/item/8d687a5ff8046d9.aspx> and updated following the Open House.

The feedback on the Open House event itself indicated that in general, the open house format was useful, friendly, helpful and effective, and concerns and issues were understood but not always able to be answered.

It is intended that the Open House and follow-up processes are the beginning of an ongoing engagement that keeps communications open and timely.

Next Steps

The Department of Health and Human Services and other agencies are following up directly with those who provided their contact details at the Open House or who make direct enquiries. The Frequently Asked Questions on the City of Greater Geelong website will continue to be updated as needed. Agencies will continue to assess any new information to see what further actions are possible or appropriate. A collaborative approach with the community is encouraged.

Families with specific concerns about clusters of non-communicable diseases such as cancer are advised to contact the Department of Health and Human Services or Cancer Council Victoria as there are established procedures to investigate such matters.

To receive this publication in an accessible format phone 1300 761 874 using the National Relay Service 13 36 77 if required, or email environmental.healthunit@dhhs.vic.gov.au

Authorised and published by the Victorian Government, 1 Treasury Place, Melbourne.

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Bellarine Peninsula Cancer Incidence Report

Prepared by:

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Prepared for:

Health Protection Branch
Victorian Department of Health & Human Services

17 October 2019

Background

In response to community concern about the incidence of cancer in the Barwon Heads area on the Bellarine Peninsula (Victoria, Australia), Cancer Council Victoria was approached by the Health Protection Branch of the Victorian Department of Health and Human Services, to carry out an analysis of data from the Victorian Cancer Registry (VCR).

The purpose of this type of analysis is to describe the incidence of cancer in a defined area relative to the population average, in order for any excess incidence to inform the investigation of potential exposures to environmental carcinogen(s). In this regard, a large excess in the incidence of a particular type of cancer would be of particular concern.

The aim of this analysis was to assess the incidence in a defined geographical area, relative to that of the general population of Victoria, of the following International Classification of Disease code groupings of cancers for people of all ages: all cancers combined (C00-C96, D45-D47); liver cancer (C22); breast cancer (C50); testis cancer (C62); cancer of the brain and central nervous system (C70-C72); Hodgkin lymphoma (C81); non-Hodgkin lymphoma (C82-C86); multiple myeloma (C90); leukaemia (C91-C95); and other haematopoietic cancers (C88, C96, D45-D47). Further, given community concern about cancers diagnosed in young people in the area, an additional aim was to assess the incidence of all cancers combined for people aged between 10 and 34 years.

Data sources

Cancer incidence data were obtained from the Victorian Cancer Registry (VCR). The notification of cancers to the VCR has been mandated by legislation since 1982 and this registry is the most authoritative source of data on cancer incidence in Victoria. Cancer data available for this analysis are considered complete up to and including 2017.

Population data for the defined area were obtained from the Australian Bureau of Statistics (ABS) but were only available for 2001 to 2016. Annual estimated resident populations were calculated by the ABS based on the Australian census and births, deaths and migration statistics. These population estimates were available for individual geographic regions within each state of Australia, including Level 1 Statistical Areas (SA1s) which are the smallest unit for which data were available. SA1s were defined based on Australian Statistical Geography Standard (ASGS), 2011 version.

The geographical area for this analysis was defined by aggregating the following relevant contiguous SA1s: 20303105036, 20303105016, 20303105017, 20303105035, 20303105034, 20303105032, 20303105031, 20303105033, 20303105042 (Figure 1).

Based on the available data from both the VCR and the ABS, analyses were able to be conducted for the period 2001-2016.

Analyses

The cancer incidence for the pre-defined geographical area was assessed relative to the Victorian population by estimating standardised incidence ratios (SIRs). These are calculated by dividing the number of observed incident cases in the defined area by the number of expected cases, the latter calculated based on the average age- and sex- and year-specific incidence rates for the Victorian population. Only incident (newly diagnosed) cancers diagnosed in residents of the area during the study period (2001-2016) were considered; only those diagnosed in residents aged 10-34 years at diagnosis were included in the analysis of younger people.

The incidence rates used for this calculation were obtained from the VCR's annual incidence files. Exact 95% confidence intervals were calculated for the SIR, which are the most appropriate confidence intervals when the number of expected cancers is relatively low.

The SIR can be interpreted as an estimate of the relative incidence of cancer. An SIR of 1 would indicate that the cancer incidence for residents in the defined area of interest was the same as that for the general population of Victoria, while an SIR of 1.30 would indicate that residents had 30% higher cancer incidence than the general population; conversely, an SIR of 0.70 indicates that residents had a 30% lower cancer incidence than the general population. The ninety-five percent confidence interval (95%CI) provides an indication of the degree of uncertainty about the estimated SIR, with a wider interval indicating greater uncertainty; the smaller the number of observed and expected cases, the greater the uncertainty. When a 95%CI includes 1, the corresponding SIR estimate, however large, cannot be excluded as a chance occurrence.

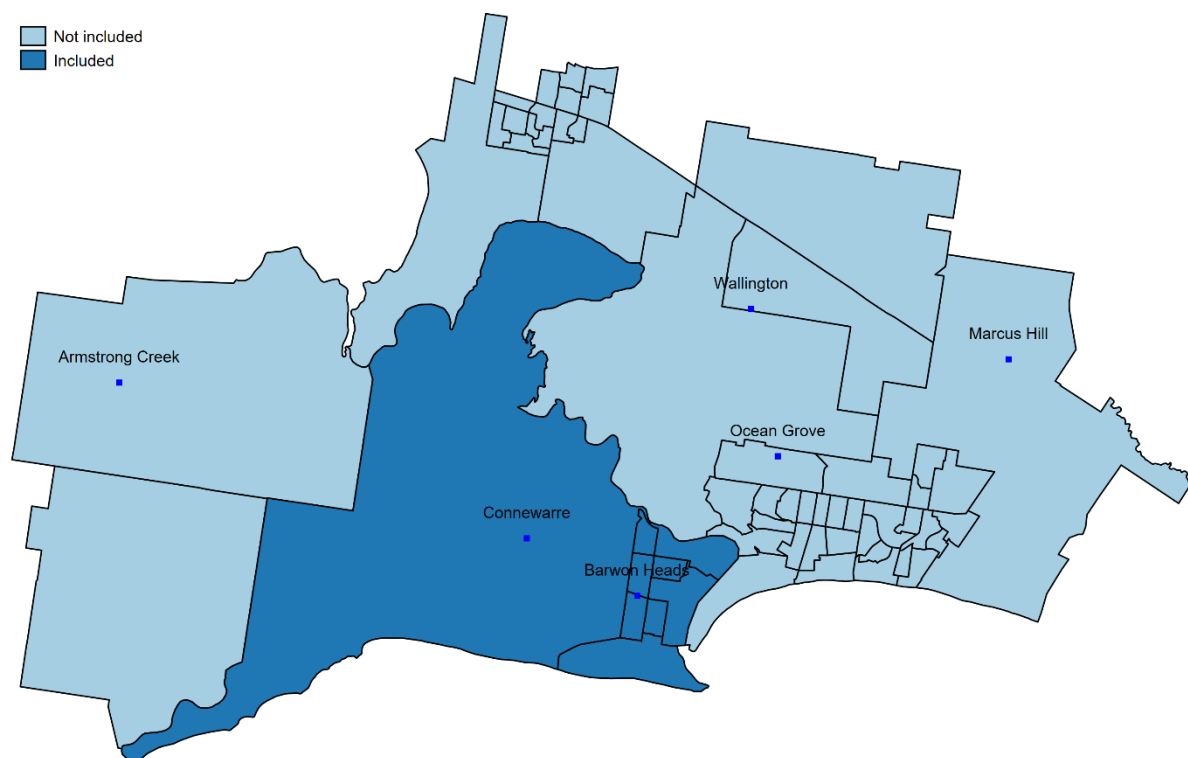


Figure 1: Map of the defined area on the Bellarine Peninsula, Victoria

Results

On average over the period 2001-2016, the defined area had a population of 3,779 persons (1,887 women), with 1,013 aged between 10 and 34 years. Over that period, a total of 315 incident cancers were observed in residents of the area, six of which occurred in residents aged 10 to 34 years at diagnosis.

The results from the analyses conducted are summarised in Table 1. In the interests of protecting privacy, and in line with general VCR and ABS practice, for cancers for which the counts included fewer than 5 cases, the estimated SIR is given without the counts. For all cancer groupings considered, the number of observed cases was very similar to the number expected, indicating no excess cancer incidence. This is reflected in the SIR estimates which are close to 1. The highest SIR estimate was 1.20 for each of leukaemia and Hodgkin lymphoma, but 95%CI were wide, suggesting substantial uncertainty about the estimate. Further, the 95%CI included 1, suggesting the observed estimates of 1.2 could be due to chance.

Table 1: Observed and expected cancer counts, and standardised incidence ratio estimates for the geographical area defined by nine SA1s* on the Bellarine Peninsula, Victoria: 2001-2016

| Cancer | Obs | Exp | SIR | 95%CI |
|----------------------|-----|-----|-------------|-------------|
| All | 315 | 333 | 0.95 | (0.84-1.06) |
| Liver | | | 0.62 | (0.13-1.80) |
| Breast | 50 | 43 | 1.16 | (0.86-1.53) |
| Testis | | | 1.12 | (0.14-4.03) |
| Brain and CNS | | | 0.77 | (0.21-1.97) |
| Leukaemia | 12 | 10 | 1.20 | (0.62-2.09) |
| Hodgkin lymphoma | | | 1.20 | (0.15-4.33) |
| Non-Hodgkin lymphoma | 12 | 14 | 0.85 | (0.44-1.49) |
| Multiple myeloma | | | 0.79 | (0.22-2.02) |
| Other haematopoietic | | | 0.38 | (0.08-1.11) |
| All (ages 10-34) | 6 | 7 | 0.86 | (0.32-1.88) |

Obs, number of cancers observed; Exp, number of cancers expected; SIR, standardised incidence ratio; CI, confidence interval

* SA1 codes 20303105036, 20303105016, 20303105017, 20303105035, 20303105034, 20303105032, 20303105031, 20303105033, 20303105042.

This analysis had three limitations. First, the study period was restricted to the years 2001 to 2016 (inclusive), as this was the period for which population data were available from the ABS for consistently defined Level 1 Statistical Areas. This means that cancers diagnosed prior to 2001 and since 2016 were not considered. Second, the timing of exposure to a carcinogen (resulting in the initiation of cancer) is important. There is typically a period of up to 10-20 years between an exposure that might initiate a cancer and the manifestation of clinically evident disease. The period that was able to be examined in the analysis may, therefore, have been too short to have detected all cancers that might have been initiated due to exposure to a common carcinogen in the geographical area considered, beyond those that might be expected as a result of ageing and established lifestyle risk factors. Related to this, residents who move out of the area and are later diagnosed with cancer will not

have been included in the observed cancer counts. Third, we were unable to adjust SIRs for known lifestyle-related cancer risk factors such as smoking, alcohol consumption and obesity, which may at least in part account for SIR estimates that differ from 1.

Conclusions

This analysis assessed the incidence of selected cancers diagnosed in residents of a defined area on the Bellarine Peninsula over the period 2001-2016 and compared it with the expected incidence based on the average incidence for Victoria. Although standardised incidence ratio estimates varied both below and above 1, no substantive evidence of increased incidence was found.

Attachment 4 - Statement from Expert Advisory Group

Potential Cancer Cluster Expert Advisory Group (EAG)

Opinion provided to Department of Health and Human Services, October 25th, 2019

The EAG has considered the document titled Bellarine Peninsula Cancer Incidence Report prepared by Professor Roger Milne, Cancer Epidemiology Division, Cancer Council Victoria, dated 17 October 2019.

The EAG is of the opinion that the data used in this report are of very high quality; the methods of analysis are appropriate and appear well-executed; and the conclusions are valid.

The report from Professor Milne was commissioned on the advice of the EAG, in order to interrogate Victorian Cancer Registry (VCR) data to refine the epidemiological analysis already undertaken by the Department and made public in January 2019 using the publicly accessible Australian Cancer Atlas. That analysis, while appropriate to the level of detail available from the Cancer Atlas database, was somewhat limited by the fact that the smallest geo-coded categories available to it were Level 2 Statistical Areas (SA2). The average population size of SA2s is 10,000 persons.

In the interests of ensuring that any relevant epidemiological trends that might be detectable on the Bellarine Peninsula could be identified, the EAG advised exploring an aggregation of the smallest geo-coded areas (i.e., SA1s, average population of 400) to more closely represent those parts of the Bellarine Peninsula where community concerns about a potential cancer cluster have been focussed. Figure 1 (map) in the report shows the area that was included.

It is important to recognise that the geographical area covered in Professor Milne's analysis is based solely upon those community concerns, and not upon any other a priori scientific indicators or hypotheses.

The EAG notes that the quality of the records and scientific integrity of the Victorian Cancer Registry (VCR) is extremely high. It has a strong track record in guiding and supporting cancer control efforts in Victoria, as well as nationally and internationally. The VCR publishes its annual cancer incidence data within 12 months of the diagnosis year. It is also among the most technologically advanced registries in the world and routinely uses artificial intelligence software to improve the accuracy of cancer case identification from pathology reports.

Since the VCR has on record each patient's address at the time of their cancer diagnosis, it is possible to calculate cancer rate per head of population for individual SA1s (and aggregations of SA1s). The VCR data does not record how long a patient has lived at that address. Since people are constantly moving in and out of localities this limits inferences that can be made about location-specific effects on cancer rates. Nevertheless, cancer registry data have been shown to reliably reflect location-specific effects of carcinogenic exposures, where they exist.

The EAG has concluded that Professor Milne's analysis provides no material evidence of excess cancer rates in the area examined between 2001 and 2016 for the specific cancer types that were examined: liver, breast, testis, brain and central nervous system, leukaemia, Hodgkin lymphoma, Non-Hodgkin lymphoma, multiple myeloma and other haematopoietic malignancies. There was also no material evidence of excess rates suggested by the additional analyses of all those cancers combined, for all ages combined, and for all those cancers combined in 10-34 year-olds.

The cancer types examined were those which were identified as of community concern or were selected because of published evidence of a possible connection with dieldrin, which was one of the main exposures of concern to the community.

Table 1 in the report compares the number of cancers observed in each of the categories with what the number would be if the rate in the Bellarine area was the same as for Victoria as a whole. In seven of the 11 comparisons the observed rate was lower than expected, and for four the observed rate was greater. However, as the 95% confidence intervals indicate, in no case did the observed rate, whether it be higher or lower than the expected rate, lie outside what could simply be attributed to chance variation.

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Cancer concerns on the Bellarine Peninsula

FAQ update – August 2019

This community information sheet provides a summary of the historic use of dieldrin, testing of dieldrin levels in soil on the Bellarine Peninsula, and the Chief Health Officer's review of cancer rates on the Bellarine Peninsula following related community and media concerns.

Since this issue was first raised, an "Open House" style community forum has been held (on 25 February 2019) in Barwon Heads to give members of the community the opportunity to discuss their concerns with representatives from the Environment Protection Authority, Victorian School Building Authority, Department of Education and Training, Agriculture Victoria, City of Greater Geelong, WorkSafe Victoria and the Department of Health and Human Services.

The event was advertised on the City of Greater Geelong website as well as in local media and forty-five community members attended the event over the course of the afternoon. Topics included health concerns, past agricultural practices, school testing, local planning and health and the environment.

The Department of Health and Human Services has also convened an independent Expert Advisory Group to review all available information in response to community concerns including those raised at the Open House. The Group was convened in March to provide expert and impartial advice to the Chief Health Officer.

Agencies will continue to consider any concerns and provide information to support the community.

This document of frequently asked questions (FAQs) will continue to be updated as new information or issues are identified.

About dieldrin, its historic use and its health impact

What is dieldrin?

Dieldrin is a manufactured 'organochlorine' insecticide that was used worldwide in agriculture to protect crops from insect pests. It was also an effective control for termites in houses. Dieldrin works by interfering with the central nervous system of insects. It is toxic to aquatic organisms and other wildlife and accumulates in the environment.

Dieldrin sticks to soil and breaks down slowly. The levels in soil reduce by half approximately every 5 to 7 years. Dieldrin was prohibited for use and sale in Victoria in 1987.

Where is dieldrin found?

Dieldrin at low levels may still be present in soil in areas where it was used as a pesticide. It may also be attached to dust particles. Dieldrin does not dissolve in water very well and was therefore not found in water at high concentrations. When dieldrin was used in agriculture, the main route of exposure occurred by eating contaminated food, including root crops, dairy products and meat. People who live in homes that were treated for termites using dieldrin may also have potentially been exposed.

Because of the way dieldrin breaks down and the length of time since it was last used, the amount of dieldrin still present in the environment has significantly reduced since 1987.

What are the health effects of exposure to dieldrin?

When dieldrin was used in agriculture, accidental exposure could cause health effects including headache, nausea, vomiting, dizziness, light-headedness and fainting. There have been cases where people have been poisoned and died after swallowing large amounts of dieldrin (intentionally or accidentally). These health effects of dieldrin are no longer relevant since it is not used and not available to buy.

Is dieldrin linked to cancer?

The most widely recognised classification of cancer risk from environmental factors comes from the World Health Organisation's (WHO) International Agency for Research on Cancer (IARC). This agency assesses the risk of human cancer from environmental factors including chemicals, occupational exposures, biological agents and lifestyle factors. In 1987, the IARC determined that dieldrin was 'not classifiable as to human carcinogenicity'. However, when dieldrin was last reviewed by the IARC in 2016, its classification was changed to 'a probable carcinogen' based on 'limited evidence' for breast cancer in humans and 'sufficient evidence' for liver cancer in experimental animals.

Some pesticides (like DDT) have previously been associated with non-Hodgkin lymphoma, chronic lymphocytic leukaemia and multiple myeloma. However, this association has not been found for dieldrin.

Why were farms on the Bellarine Peninsula tested for dieldrin and other pesticides?

Land on the Bellarine Peninsula has a history of potato growing and in some cases this included the use of dieldrin to control insects. It is understood farmers often rotated paddock use between potato cropping and sown grass or pasture for grazing cattle. In 1987, dieldrin was detected in export beef consignments sent to the United States, resulting in the imposition of trade restrictions. Since then the Victorian Government has undertaken extensive monitoring to identify properties with contamination and, working closely with the livestock industry, to manage the risk of residues transferring into beef products.

Who is responsible for testing (contaminated) land and approving its future use?

The Environment Protection Authority Victoria (EPA) recommends that any buyer of land undertake their own independent sampling of any land for contaminants if they are worried about past land use. The City of Greater Geelong Planning Scheme has applied soil assessment requirements for all major residential growth areas. If significant levels of contamination are found, this would trigger the full requirements of the Environment Protection Act 1970.

Why does some land get tested and some not?

The planning scheme is the primary means for regulating land use and approving development. It is an important mechanism for triggering the consideration of potentially contaminated land. The City of Greater Geelong Planning Scheme requires land contamination testing for planning scheme amendments or applications where potentially contaminated land would be used for a sensitive use, such as for residential development, schools, childcare or public open space.

The EPA maintains a Priority Sites Register, which lists sites with a *Clean Up* or *Pollution Abatement Notice* requiring actions to manage or reduce the risk to human health and the environment from contamination. These sites are identified because land contamination may cause harm to human health or the environment under the current use. In some cases, the required actions include testing for contamination, and can also include clean-up of the site, monitoring, and other controls.

Some organisations, including councils and government departments or agencies, may also undertake testing for contamination as part of ongoing due diligence, or in response to an issue or complaint.

How is contaminated land tested and made safe for future use?

The Australian Government's National Environment Protection (Assessment of Site Contamination) Measure [NEP(ASC)M] sets out how contamination must be tested across Australia. The NEP(ASC)M lists concentrations of chemicals in soil, Health Investigation Levels (HIL), above which further health investigation and evaluation are required.

To determine whether a site is safe for future use, the EPA has an established audit system. A statutory environmental audit provides for an environmental auditor appointed under the Environment Protection Act 1970, to undertake an independent assessment of the condition of a site and form an opinion about its suitability for the proposed use.

An audit of the condition of a site may result in issuing either:

a Certificate of Environmental Audit that indicates the auditor believes the site is suitable for any beneficial use and that there is no restriction on use of the site due to its environmental condition; or

a Statement of Environmental Audit that indicates that the auditor believes there is, or may be, some restriction on use of the site due to its environmental condition. A Statement may include conditions that require remediation works to be undertaken or places ongoing requirements on the site. A Statement might also indicate that a site is not suitable for any use, in which case the EPA will usually issue a Notice to require clean up or management of that site.

I grow produce on the Bellarine Peninsula – how can I reassure consumers that it is safe?

Chemical residue monitoring programs under the National Residue Survey and by Agriculture Victoria, demonstrate a very high level of compliance with residue standards in Australian produce.

Many producers participate in Quality Assurance programs and routinely undertake chemical residue testing of their produce to provide assurance to themselves, and their customers, that their produce is not contaminated.

You may wish to undertake testing of your soil if you have reason to believe organochlorine chemicals may have been used on your property or if you feel this would provide additional assurance to you or your customers.

For further information you can contact your local Agriculture Victoria Chemical Standards Officer on 136 186.

What tests have been conducted on the Bellarine Peninsula?

The EPA has sampled several locations in the Geelong region for organochlorines (the family of chemicals that includes dieldrin). Sites at Point Lonsdale, Ocean Grove, Leopold, Queenscliff, Moolap and Portarlington have been sampled in the past. Since the 1990s there have been environmental audits at 21 sites across the Bellarine Peninsula, many of which have included tests for organochlorine pesticides. The audits were found to have low to negligible environmental risks for organochlorines.

What chemicals are being tested for as part of EPA's ambient sampling program?

The EPA has sampled several locations in the Geelong region for fungicides, herbicides, triazine herbicides, organochlorine pesticides, organophosphate pesticides, synthetic pyrethroids, biocides, metals, perfluorinated compounds and phthalates.

What levels were found and what do they mean?

Soil testing revealed that organochlorine pesticides, including dieldrin, were below the detection level of the analytical test, which in this case was 0.001 mg/kg. In Australia, the level of dieldrin in soil that would trigger the need for further investigation is 6 mg/kg. The levels were all well below this 'Health Investigation Level' or HIL, which is the concentration of a substance in soil, water or air that triggers further investigation and evaluation to determine whether there is any risk to public health.

Why is the Australian Health Investigation Level (HIL) for dieldrin different from the United States HIL?

The Australian Health Investigation Level for dieldrin is 6 milligrams/kilogram for soil in a residential setting. In the US, the Regional Screening Level is 0.034 milligrams/kilogram. While most countries consider similar evidence to calculate investigation levels, the levels exist for different purposes. It is not uncommon for regulatory authorities to base their assessments of chemical toxicity on different key studies or dose levels, and they can also apply different uncertainty factors. The exposure and toxicity results are translated from animal studies to humans using complex models. The methods for deriving a HIL are based on similar scientific approaches and include large safety margins to protect human health.

The Australian Health Investigation Level for dieldrin is reviewed every ten years and was last reviewed in 2013.

About schools in the area and dieldrin testing

When is testing of land required for schools and by whom?

As part of the process of acquiring land, the Victorian School Building Authority conducts comprehensive testing for contaminants to ensure that each site is suitable for use as a school. Current government policy requires approval from the Victorian Government Land Monitor for all land acquisitions above a value of \$750,000, and this approval process requires investigating the suitability of the land. This includes: soil testing for possible contamination; geotechnical and topographical features investigations; assessment of flora and fauna; and archaeological or cultural heritage significance.

Soil testing is undertaken according to the EPA's guidelines for school use, which is designated as 'sensitive'. Soil testing addresses a number of potential risks, including contaminants harmful to human health such as organochlorine pesticides (dieldrin).

Which schools were tested?

Bellarine Secondary College (Drysdale Campus) site was purchased in the late 1990s from the City of Greater Geelong and was farming land prior to its acquisition. The Department of Agriculture conducted tests on farming land in the area of the school site prior to the purchase of the land in the late 1990s. The results show that contaminants were not detected at harmful levels. The Education Department relied on these results to determine that the land was suitable for use as a school.

In 2016, in response to community concern, the Geelong Council tested the oval adjacent to the Drysdale Campus.

In September 2018, the Department of Education and Training commissioned independent tests on the soil at this school. The results showed no cause for concern about levels that could affect human health. Around the same time, WorkSafe conducted separate soil testing of this school and found that concentrations of contaminants were well below guideline levels for the protection of human health.

The **Barwon Heads Primary School** site was purchased in 1946. The Department of Education and Training understands that it was grazing land prior to its purchase. In response to community concern, the Department commissioned independent soil testing at this school in January 2019. The results showed no cause for concern about levels that could affect human health.

Are children and teachers attending these schools safe now?

The health and safety of students and staff is the Department of Education and Training's top priority. Families can be reassured that there has been independent testing carried out at both school sites, confirming that there are no contaminants such as dieldrin in the soil at levels that could have potential health effects.

What about other schools – are they routinely tested for chemicals such as dieldrin in the soil?

The issue of dieldrin contamination relates to prior historical agricultural use. Existing schools are not routinely tested for chemical contamination. However, the Department of Education and Training takes health and safety in our schools extremely seriously. Where there is any indication of a risk to health or safety in schools, the Department undertakes appropriate investigations and employs conservative risk mitigation strategies, with assistance from technical experts.

Will other schools on the Bellarine Peninsula be tested?

The testing for historical chemical contamination is done before a school is built. This together with recent soil tests showing negligible levels of any chemical of concern, the Department of Education and Training has no current plans for further testing of school land on the Bellarine Peninsula. The requirements under the land planning scheme remain applicable for any amendments or applications where potentially contaminated land would be used.

Who can I talk to about the topics above?

For more information about land use, contaminated land, and environmental investigations visit:

<https://www.epa.vic.gov.au/your-environment/land-and-groundwater>

For more information about the effects of dieldrin on the environment and human health contact the EPA on 1300 372 842.

For more information about the historic use of dieldrin in agriculture or the management of farming properties with soil residues contact Agriculture Victoria on 136 186.

For information on schools testing contact the Department of Education and Training on 1300 333 232.

About mosquito control in Barwon Heads

When did mosquito treatment begin?

The Bellarine Shire began mosquito treatments around the Bellarine Peninsula in 1984.

What chemicals are used in the City's mosquito management program?

We use a range of approved products to control mosquito larvae. We do not use broad based pesticides in our aerial treatment program.

The mosquito control products used in our aerial treatments are *Bacillus thuringiensis israelensis* (Bti) and s-Methoprene. These products only affect mosquito larvae and do not harm people, pets and the general environment. Both products are approved by the Australian Pesticides and Veterinary Medicines Authority for mosquito management. These products target aspects of the mosquito biology and do not adversely affect humans, animals, other insects or the environment. The products have limited residual properties and do not magnify in the food chain.

Bacillus thuringiensis israelensis (Bti) produces proteins that react with cells of the gut lining of the mosquito and the infected mosquito stops feeding within hours. s-methoprene is an insect hormone analogue, which when applied to larvae, prevents the larvae from completing development to an adult.

Depending on the larval stage and breeding location of the mosquito, a decision is made on which product to use. Up until 1987 we also used a product called Abate, which was approved for the same purpose.

How are the treatments applied?

Ground treatment

If breeding sites are easily accessible, ground crews can treat the area manually. Breeding sites around townships like pits and drains are always treated by ground based methods.

Aerial treatment

We have a permit from the Commonwealth Government (EPBC 2005/2132) that allows aerial treatments for mosquito larvae to take place in RAMSAR protected wetlands on the Bellarine Peninsula between 15 August and 15 March each year. This involves dropping pellets from a helicopter into remote water bodies. Treating mosquito breeding sites by aerial methods is effective in reaching areas that are difficult to access. Aerial treatments only take place in the wetlands, they do not occur over townships.

Is mosquito treatment undertaken at the Barwon Heads Village Park?

No aerial treatments have been undertaken at Village Park or anywhere close to townships.

In response to community requests, isolated and targeted application of pyrethrum (commonly found in personal insect repellents and household fly sprays) was undertaken in sections of dense vegetation within the park. This was to reduce adult mosquito populations and any reinfestation of nearby wetlands. The last time this was done was in 2003.

About the review of cancer rates on the Bellarine Peninsula

What prompted a review of cancer rates on the Bellarine Peninsula?

In December 2018, the media reported a pending class action and a potential cluster of cancers on the Bellarine Peninsula involving ex-students and teachers from local schools, thought to be related to the historical use of the pesticide dieldrin. No one affected or on their behalf has contacted the Department of Health and Human Services to advise of details. Given this, the Acting Chief Health Officer reviewed cancer incidence data for the Bellarine Peninsula using The Australian Cancer Atlas. The report is now publicly available on the Department of Health and Human Services website.

What did the review find?

The review found no unusual excess of cancers thought to be associated with dieldrin.

The primary source of data was the Australian Cancer Atlas, which includes comprehensive cancer incidence data for all of Australia by geographical area. The notification of cancers to State and Territory cancer registers has been mandated for a number of years and the Atlas is considered to provide comprehensive coverage of all cancers diagnosed. This data can be used to analyse rates of cancer both across the country and in smaller localised areas. If a concern about an unusually high number of cancers is raised, the data can be used to determine if a higher than expected number of cancers has been diagnosed in the area in previous years.

The Chief Health Officer reviewed cancer incidence rates for total cancers, breast and liver cancer, and non-Hodgkin lymphoma, multiple myeloma, brain cancers and leukaemia.

Analysis of these data indicated there is:

- no evidence of a higher rate of total cancers in any geographical areas of the Bellarine Peninsula than elsewhere in Australia
- no higher number of the specific cancers related to dieldrin (breast or liver) than would be expected (based on the average cancer rates in Australia)

no higher number of cancers mentioned in the media (non-Hodgkin lymphoma, multiple myeloma, brain cancers and leukaemia) than would be expected (based on the average cancer rates in Australia)

About cancer

For excellent general information regarding cancer, please visit the Cancer Council website:

<https://www.cancervic.org.au/cancer-information>

Autoimmune disorders

Some community members have raised concerns about the levels of autoimmune disorders in Barwon Heads.

What are autoimmune disorders?

The body's immune system is there to fight infection-causing agents such as bacteria and viruses. However, if someone has an autoimmune disorder, their immune system mistakenly attacks their own body, causing inflammation and damage. The tissue attacked differs according to the specific autoimmune disorder and can affect nearly every organ or system of the body.

Autoimmune disorders make up a category of differing diseases with different causes, pathways and treatments. Examples of the different autoimmune disorders include:

- Type 1 diabetes (affecting the pancreas)
- Rheumatoid arthritis (affecting the joints)
- Inflammatory bowel disease (affecting the gastrointestinal tract)
- Grave's disease (affecting the thyroid gland)
- Psoriasis (affecting the skin)
- Systemic lupus erythematosus (SLE) affecting connective tissues.

How common are autoimmune disorders?

Taken together autoimmune disorders affect approximately 5 per cent of the population. Some are more common than others and each can vary in severity in different people.

What causes autoimmune disorders?

The exact causes of autoimmune disorders are not known, however there are a range of risk factors. Some people can have a genetic tendency toward autoimmune disorders – they can be passed down through families. Women are more likely than men to develop autoimmune disorders, and these typically strike during child bearing years, suggesting that sex hormones play a role.

Other factors such as infection, stress, medication, diet or even ultraviolet radiation can also play a role in triggering disease.

Are there any environmental factors that cause autoimmune disorders?

It is likely that a combination of genetic, environmental and lifestyle factors play a role in triggering autoimmune disorders. For example, cigarette smoking is a risk factor for rheumatoid arthritis. Sun, fluorescent and halogen

light are known to trigger lupus in some people, although reduced sunlight exposure is associated with multiple sclerosis.

Can autoimmune disorders be cured?

There is generally no cure, but the symptoms of autoimmune disorders can be managed. If you have any concerns about your health, talk to your doctor.

Who can I talk to about the topics above?

You can find more detail about the review in the Chief Health Officer's report, which is available online at: <https://www2.health.vic.gov.au/public-health/chief-health-officer/cho-publications/cancer-rates-bellarine-peninsula>

If you have concerns about your health or the health of your family, talk to your doctor or another health professional.