

**Pittwater
Local Government Area
Cancer Incidence Study
1996 to 2005**

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October 2007

Acknowledgement

The health risk assessment expert panel advising NSW Health in relation to Ethylene Oxide emissions from the Unomedical Pty Ltd facility at Mona vale provided initial methodological advice for this study. The panel has also reviewed the report and has endorsed its conclusions.

Plain Language Summary

This report reviews the number of cases of cancer recorded by the NSW Central Cancer Registry among residents from the Pittwater region over the period 1996 to 2005. This was done following concerns raised by the community about the past operations of the Unomedical factory in the suburb of Mona Vale. The factory uses a gas called ethylene oxide that has been discharged directly into the air outside the factory during normal operations. This gas has been shown to cause cancer in laboratory animals and there is some evidence linking it to human cancers among workers exposed to high levels of the gas in the air at their workplace.

In this report the Pittwater area was approximated by combining suburbs with postcodes 2101 to 2108 as a single group. The total number of cancers among the residents of this region was similar to that expected based upon the number of people who live in the area. Looking at the number of people diagnosed with cancer in each postcode there was no unusual geographical spread of cases.

The total number of cancer cases recorded in the Mona Vale postcode is similar to the number you would expect based upon the population of the suburb. This is true for both adults and children (0 to 14 years).

When looking at childhood cancers (children aged 0 to 14 years) that occurred in the Pittwater region as a whole there was some evidence of higher than expected number of cancers diagnosed among girls. Although more than expected, the number of girls diagnosed with cancer may still be within the normal background rates. The number of boys diagnosed with cancer was similar to the number expected.

This study concludes that there is no evidence of increased cancer rates in the Mona Vale postcode for the period 1996 to 2005. This does not support the view that the ethylene oxide emitted from the Unomedical factory has caused an increase in cancer rates.

Background

Following the announcement that Unomedical Pty Ltd, a Mona Vale medical supply company had emitted untreated Ethylene Oxide (EtO) gas from its sterilizer for approximately 10 years concerns were expressed by local residents about historically increased cancer rates. Concerns focused on childhood cancer with media reports of 14 cases of childhood cancer having occurred in the last 10 years in the suburbs of Bayview, Mona Vale, Newport, Warriewood and surrounding areas.

The Unomedical facility is located near the Central Business District of the suburb of Mona Vale (see figure in *Appendix A*) and is centrally placed within the suburb (approximately 1km from nearest postcode boundary with Bayview). In July 2007 NSW Health became aware that the facility was emitting untreated EtO emissions from the company's sterilizing unit. The facility has been operating in the light industrial area of Mona vale since approximately 1996. A formal quantitative health risk assessment is currently being conducted to assess the potential health impact of past emissions. Preliminary exposure assessment has identified that the likely levels of historical annual ground level concentrations of EtO reduce relatively quickly as you move away from the facility with estimated levels likely to be non significant beyond the boundary of the suburb of Mona Vale.

To respond to community concerns related to childhood cancers and the possibility of a "cancer cluster" being present within the area NSW Health has committed to undertake a postcode level analysis of cancer incidence for the Pittwater Local Government Area (LGA). This report presents the findings of this analysis.

NSW Cancer Institute Statistics

The smallest geographical level breakdown of cancer incidence statistics reported by the NSW Cancer Institute is by local government area. For the area under consideration these rates are reported for the Pittwater and Warringah (a larger adjoining LGA) combined rather than the Pittwater LGA alone. Raw cancer data are routinely available at postcode level and the Pittwater LGA can be approximated by the following postcodes; 2101 to 2108. The postcode of 2101 includes the suburbs of Narrabeen, North Narrabeen, Elanora Heights & Ingleside. Narrabeen is part of the Warringah LGA but has been included in the estimated Pittwater LGA for the purpose of this study. Part of postcode 2084 lies within the Pittwater LGA but that portion is mainly National Park and has few residents. Consequently this postcode was excluded from the study area for this analysis. A map of the study area is included in *Appendix A*.

The NSW Cancer Institute released a position statement on cancer clusters in August, 2007 and a copy is included as *Appendix B* to assist in the interpretation of this report.

Study Period and Cancer Data

Nineteen ninety six to 2005 was chosen as the study period. The rationale for this choice was that the most recently validated NSW Cancer Institute incidence data available are for 2005, this period coincided with the operation of Unomedical in Mona Vale and 10 years was considered a reasonable period of time to accrue an adequate number of cancer cases for analysis.

All malignant cancers (ICD 10 code C00-C97) registered for residents at the time of diagnosis within the study postcodes were analysed.

The following subgroup analyses were conducted;

- All cancers (C00 to C97) for all ages
- All cancers (C00 to C97) for children (0 to 14 yrs)
- Haematopoietic & Lymphoid cancers (C81 to C96) for all ages
- Haematopoietic & Lymphoid cancers (C81 to C96) for children (0 to 14 yrs)

Haematopoietic & Lymphoid cancers were considered as a sub group as the more convincing evidence of EtO carcinogenesis in human epidemiological studies is for these types of cancer¹.

Data Analysis

Indirect standardisation was used to create various age-sex standardised incidence ratios (SIRs) using 5 year age groups. A SIR provides a measure of whether the number of cancers observed in a particular population is different to those of a reference population.

Age-sex standardisation is a method to account for differences in the age and sex distributions of populations being compared. The SIR is the ratio of the number of cancer cases observed in the study area to the number that would be expected if the age-sex specific incidence rates observed in the reference (standard) population were applied to the population distribution in the study area.

Indirect standardisation was chosen in preference to direct standardisation because of the unavoidable instability in the age-sex specific rates in the study area, due to the small number of cases studied. Direct standardisation uses the age-sex specific rates of the study area.

If we use the notation as defined in *Statistical Methods in Medical Research*
For age-group by sex combination i , ($i = 1, 2, \dots, 36$)

- N_i = number in standard population
- R_i = number of events (cases or deaths) in standard population
- P_i = R_i / N_i = event rate in standard population
- n_i = number in study population
- r_i = number of events (cases or deaths) in study population
- p_i = r_i / n_i = event rate in study population

Then the SIR is defined as

$$\begin{aligned} \text{SIR} &= [(\sum r_i) / (\sum n_i P_i)] * 100 \\ &= [\text{observed events} / \text{expected events}] * 100 \end{aligned}$$

Estimated resident populations reported for 30 June 2001 were used as population estimates as this represents the mid point of the 10 year period 1996 to 2005. As the number of observed cancers is small asymmetrical 95% confidence intervals were constructed around these ratios using a Poisson distribution of errors. *Appendix C* contains 95% Lower (LL) & Upper (UL) limit estimates for observed numbers of

¹ Ethylene oxide. (Concise international chemical assessment document ; 54)
International Programme on Chemical Safety II.Series. WHO 2003.

cases up to 100. The confidence limits around the SIR estimates have been calculated as follows;

$$\text{Lower Limit} = (\text{LL/expected cases}) * 100$$

$$\text{Upper limit} = (\text{UL/expected cases}) * 100$$

Both the former Northern Sydney Area Health Service (NSA)² population and the NSW population were used as standard populations. This was done as the Northern Sydney region of Sydney tends to have a higher socioeconomic status than other parts of NSW and the incidence of some cancers is known to be associated with socioeconomic status.

All cancer data was sourced from HOIST (Centre for Epidemiology & Research, NSW Department of Health). Population figures were also obtained from HOIST estimated resident populations for each postcode considered, NSA & NSW. Population estimates for the Pittwater LGA was calculated by summing the individual postcode populations. All analyses and data manipulation were carried out using the SAS System® version V8.02 and Microsoft® Excel 2002.

Ethics Review

Advice was sort from the NSW Population & Health Services Research Ethics Committee, NSW Cancer Institute concerning the presentation of this report.

The committee expressed concerns related to publishing a report that presented small numbers of cancer cases among a readily identifiable group eg children who live in a particular postcode. The committee expressed the view that “In principle, the Committee would not usually support the release of data with small cell sizes.” The committee did however appreciate an overriding community interest in the current situation and on balance supported the release of data for the suburb of Mona Vale even if there were only small numbers of cases present.

² NSA consisted of the following local government areas: Hornsby, Ku-ring-gai, Pittwater, Warringah, Manly, Mosman, North Sydney, Willoughby, Lane Cove, Hunters Hill, Ryde

Results

Populations

Table 1
Estimated Resident Populations, 30 June 2001, by postcode, Northern Sydney Area and NSW.

Postcode	Post Code	Sex	0 to 14 yrs	Total Population
Narrabeen ¹	2101	M	1585	8999
		F	1525	9151
Warriewood	2102	M	326	1649
		F	288	1599
Mona Vale	2103	M	804	4814
		F	790	4994
Bayview	2104	M	271	1586
		F	272	1864
Church Point ²	2105	M	206	1073
		F	228	1082
Newport	2106	M	891	4784
		F	897	4961
Avalon ³	2107	M	1592	7313
		F	1486	7388
Palm Beach ⁴	2108	M	149	857
		F	126	854
Combined		M	5824	31075
		F	5612	31893
NSA		M	71296	381747
		F	68039	403316
NSW		M	689346	3264203
		F	654897	3311014

1 - includes Narrabeen, Nth Narrabeen, Elanora Heights & Ingleside

2 - includes Church Pt, Scotland Is, Elvina Bay & Lovett Bay

3 - includes Avalon, Bilgola, Clareville & Whale Beach

4 - includes Palm Beach, Currawong Beach & Great Mackerel Beach

It should be noted that a series of RSL Retirement Villages are located within the suburb of Narrabeen accounting for approximately 1200 residents. According to the Australian Bureau of Statistics there has been a dramatic increase in the population residing in Warriewood between 2001 and 2006. Consequently using the population figures in Table 1 may underestimate the number of expected cancers for this postcode.

All Age Cancer

Table 2
SIRs, All cancers (C00 – C97), all ages, 1996 to 2005, by postcode, standardised to NSW.

Postcode	Post Code	Sex	SIR	Observed cases	Expected cases	SIR 95%LCL	SIR 95%UCL
Narrabeen ¹	2101	M	95	561	593	87	103
		F	105	472	451	95	114
Warriewood	2102	M	109	88	81	88	134
		F	127	76	60	100	159
Mona Vale	2103	M	102	285	279	91	115
		F	89	224	251	78	102
Bayview	2104	M	107	162	151	91	125
		F	121	165	137	103	141
Church Point ²	2105	M	94	50	53	70	124
		F	91	36	40	64	126
Newport	2106	M	107	262	244	95	121
		F	97	206	211	85	112
Avalon ³	2107	M	109	401	370	98	120
		F	116	358	308	104	129
Palm Beach ⁴	2108	M	134	87	65	107	165
		F	121	56	46	91	157
Combined		M	103	1896	1835	99	108
		F	106	1593	1504	101	111

- 1 - includes Narrabeen, Nth Narrabeen, Elanora Heights & Ingleside
 2 - includes Church Pt, Scotland Is, Elvina Bay & Lovett Bay
 3 - includes Avalon, Bilgola, Clareville & Whale Beach
 4 - includes Palm Beach, Currawong Beach & Great Mackerel Beach

Figure 1

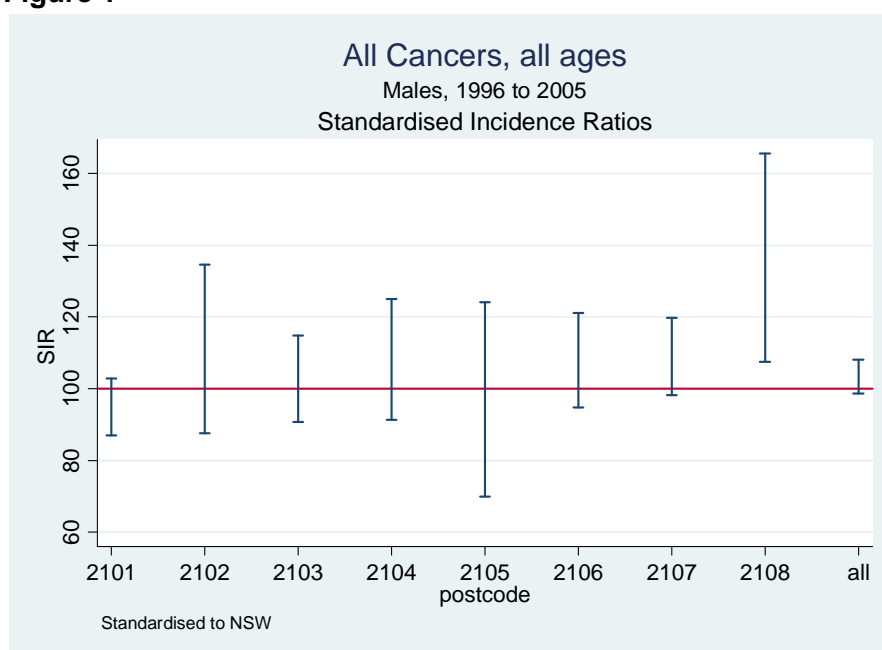
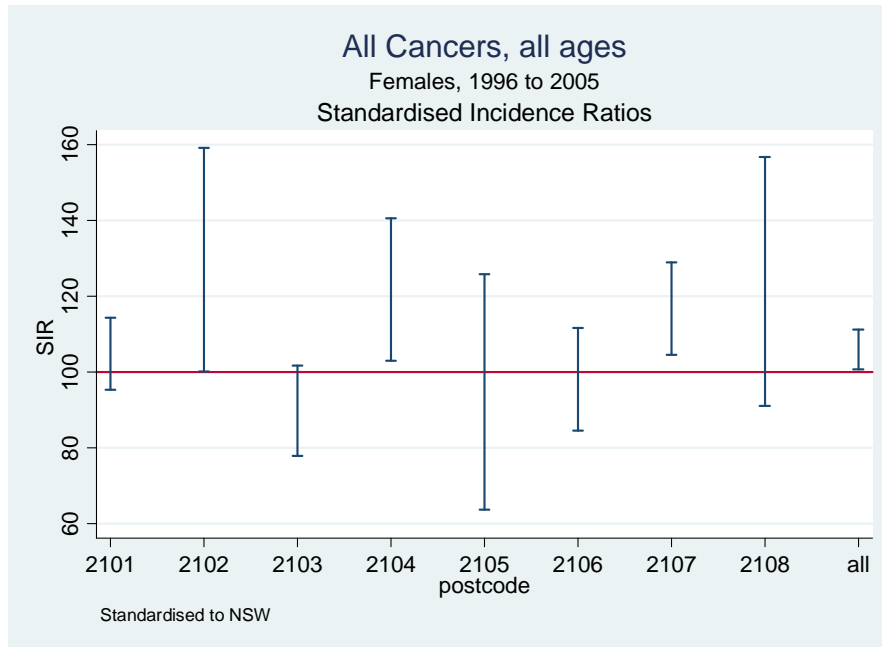


Figure 2



The numbers of observed cancers for the combined postcodes were marginally greater than those expected for both females and males. The lower 95% confidence bound was above 100 for females.

Total numbers of cancers reported for the postcode of Mona Vale were not outside the 95% confidence bounds for either males or females.

The SIR point estimates varied from a minimum of 89 to a maximum of 134 across postcodes. Four lower confidence limits were marginally above 100 across the 16 reported figures.

Table 3
SIRs, Haematopoietic & Lymphoid cancers (C81 – C96), all ages, 1996 to 2005,
by postcode, standardised to NSW.

Postcode	Post Code	Sex	SIR	Observed cases	Expected cases	SIR 95%LCL	SIR 95%UCL
Narrabeen ¹	2101	M	95	50	53	70	125
		F	95	38	40	67	130
Warriewood	2102	M	191	14	7	105	321
		F	164	8	5	71	323
Mona Vale	2103	M	88	22	25	55	134
		F	69	15	22	39	114
Bayview	2104	M	186	24	13	119	277
		F	112	14	12	61	188
Church Point ²	2105	M	#	#	#	#	#
		F	#	#	#	#	#
Newport	2106	M	99	22	22	62	151
		F	129	23	18	82	194
Avalon ³	2107	M	110	37	34	77	152
		F	126	32	25	86	178
Palm Beach ⁴	2108	M	145	8	6	63	286
		F	#	#	#	#	#
Combined		M	110	180	164	94	127
		F	104	134	129	87	123

- 1 - includes Narrabeen, Nth Narrabeen, Elanora Heights & Ingleside
- 2 - includes Church Pt, Scotland Is, Elvina Bay & Lovett Bay
- 3 - includes Avalon, Bilgola, Clareville & Whale Beach
- 4 - includes Palm Beach, Currawong Beach & Great Mackerel Beach
- # - observed number of cases 5 or less

Figure 3

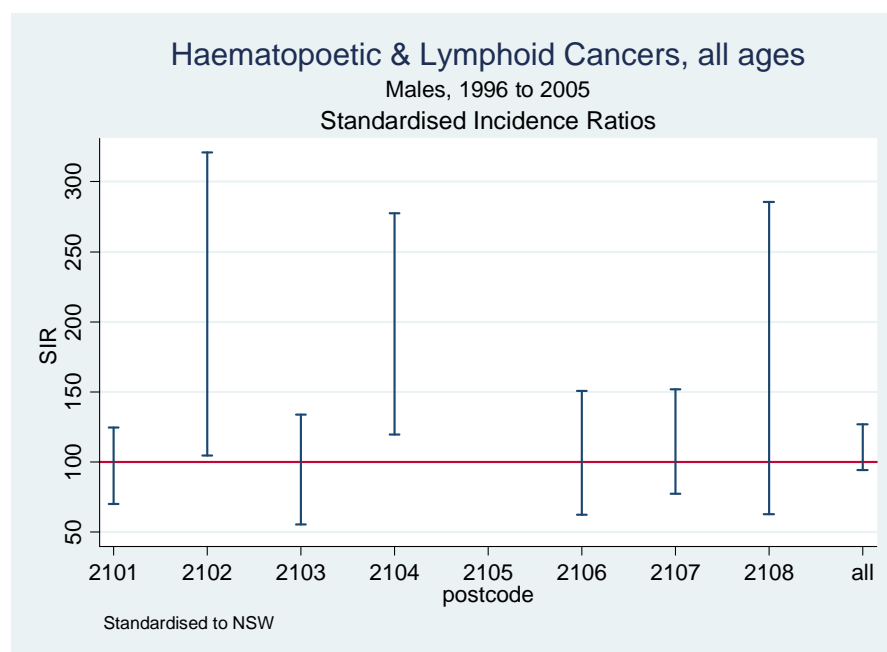
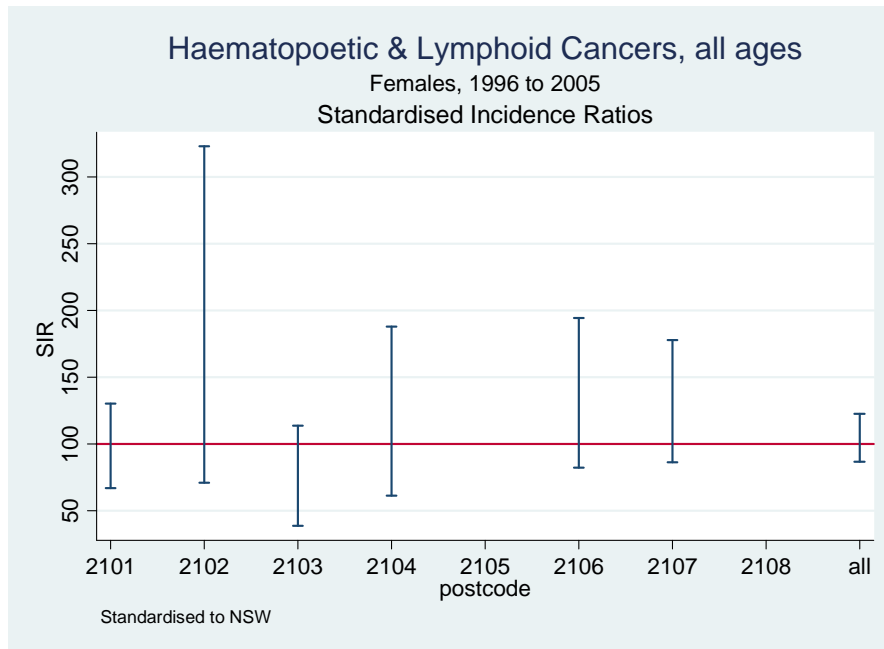


Figure 4



The numbers of observed Haematopoietic & Lymphoid cancers for the combined postcodes were greater than those expected for both females and males but the lower 95% confidence bounds were below 100.

Total numbers of Haematopoietic & Lymphoid cancers reported for the postcode of Mona Vale were lower than expected for both males and females but the upper 95% confidence bounds were not below 100.

The SIR point estimates varied from a minimum of 52 to a maximum of 191 across postcodes. Two lower confidence limits were marginally above 100 across the 16 reported figures.

Table 4
SIRs, All cancers (C00 – C97), all ages, 1996 to 2005, by postcode,
standardised to NSA.

Postcode	Post Code	Sex	SIR	Observed cases	Expected cases	SIR 95%LCL	SIR 95%UCL
Narrabeen ¹	2101	M	96	561	583	88	104
		F	102	472	463	93	112
Warriewood	2102	M	111	88	79	89	137
		F	123	76	62	97	153
Mona Vale	2103	M	104	285	274	92	117
		F	87	224	258	76	99
Bayview	2104	M	109	162	149	93	127
		F	118	165	139	101	138
Church Point ²	2105	M	96	50	52	71	127
		F	88	36	41	61	121
Newport	2106	M	109	262	240	97	123
		F	95	206	218	82	108
Avalon ³	2107	M	111	401	362	100	122
		F	113	358	318	101	125
Palm Beach ⁴	2108	M	136	87	64	109	168
		F	117	56	48	88	152
Combined		M	105	1896	1803	100	110
		F	103	1593	1547	98	108

- 1 - includes Narrabeen, Nth Narrabeen, Elanora Heights & Ingleside
- 2 - includes Church Pt, Scotland Is, Elvina Bay & Lovett Bay
- 3 - includes Avalon, Bilgola, Clareville & Whale Beach
- 4 - includes Palm Beach, Currawong Beach & Great Mackerel Beach

Figure 5

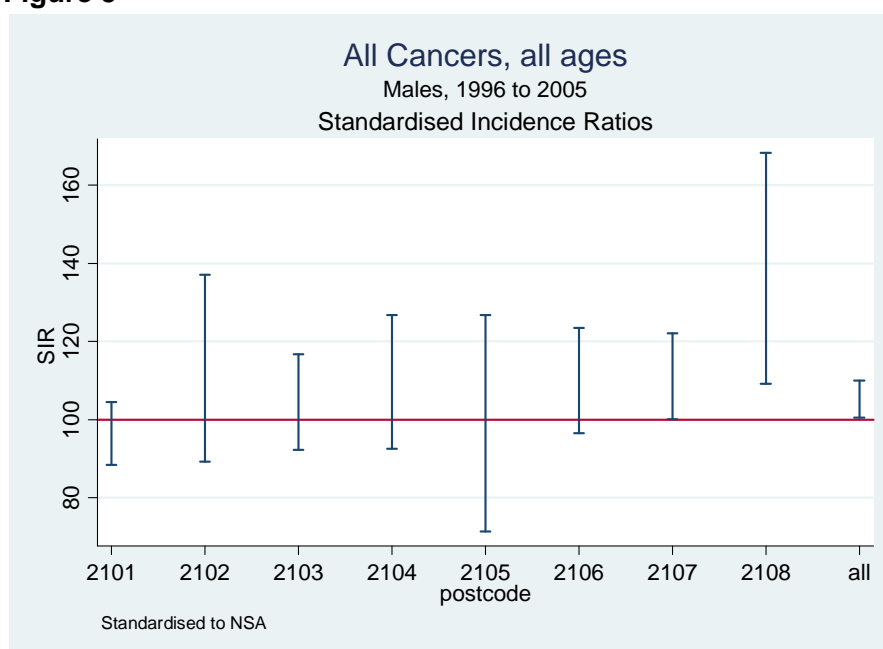
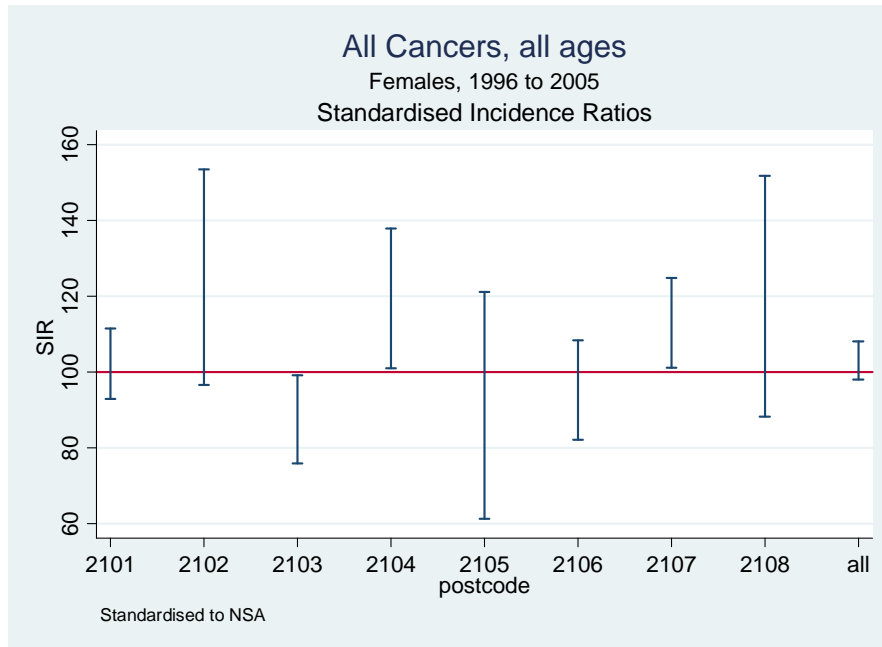


Figure 6



The numbers of observed cancers for the combined postcodes were marginally greater than those expected for both females and males. The lower 95% confidence bound was above 100 for males.

The number of cancers reported for females in the postcode of Mona Vale was lower than expected with 95% upper confidence bound lower than 100. The number of cancers for males was similar to that expected.

The SIR point estimates varied from a minimum of 87 to a maximum of 136 across postcodes. Four lower confidence limits were marginally above 100 and 1 upper confidence levels was marginally below 100 across the 16 reported figures.

Table 5
SIRs, Haematopoietic & Lymphoid cancers (C81 – C96), all ages, 1996 to 2005,
by postcode, standardised to NSA.

Postcode	Post Code	Sex	SIR	Observed cases	Expected cases	SIR 95%LCL	SIR 95%UCL
Narrabeen ¹	2101	M	87	50	58	64	114
		F	88	38	43	63	121
Warriewood	2102	M	181	14	8	99	304
		F	152	8	5	66	300
Mona Vale	2103	M	82	22	27	51	124
		F	64	15	23	36	106
Bayview	2104	M	169	24	14	108	251
		F	105	14	13	57	175
Church Point ²	2105	M	#	#	#	#	#
		F	#	#	#	#	#
Newport	2106	M	93	22	24	58	141
		F	121	23	19	77	181
Avalon ³	2107	M	104	37	36	73	143
		F	117	32	27	80	165
Palm Beach ⁴	2108	M	134	8	6	58	264
		F	#	#	#	#	#
Combined		M	102	180	177	88	118
		F	96	134	139	81	114

- 1 - includes Narrabeen, Nth Narrabeen, Elanora Heights & Ingleside
- 2 - includes Church Pt, Scotland Is, Elvina Bay & Lovett Bay
- 3 - includes Avalon, Bilgola, Clareville & Whale Beach
- 4 - includes Palm Beach, Currawong Beach & Great Mackerel Beach
- # - observed number of cases 5 or less

Figure 7

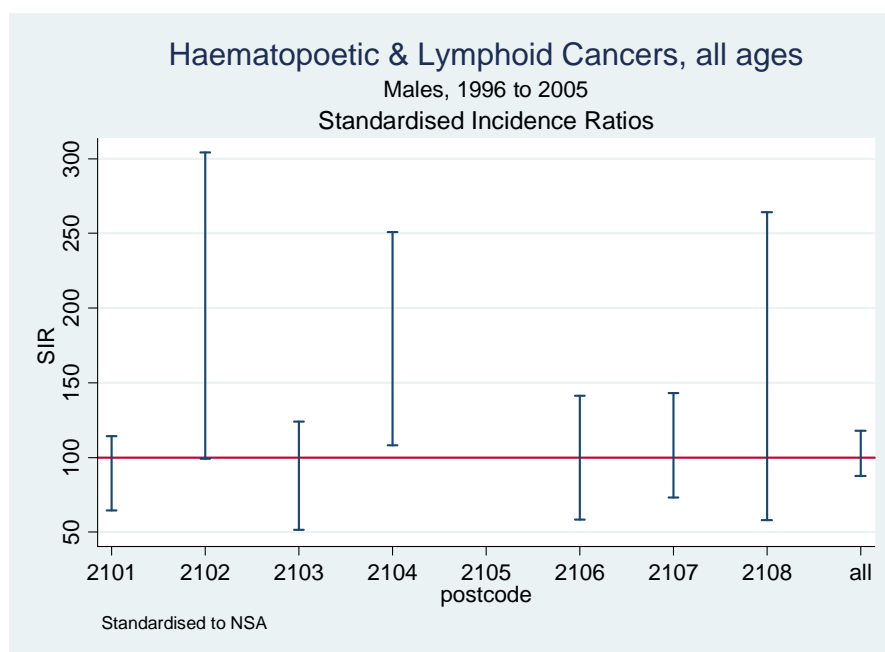
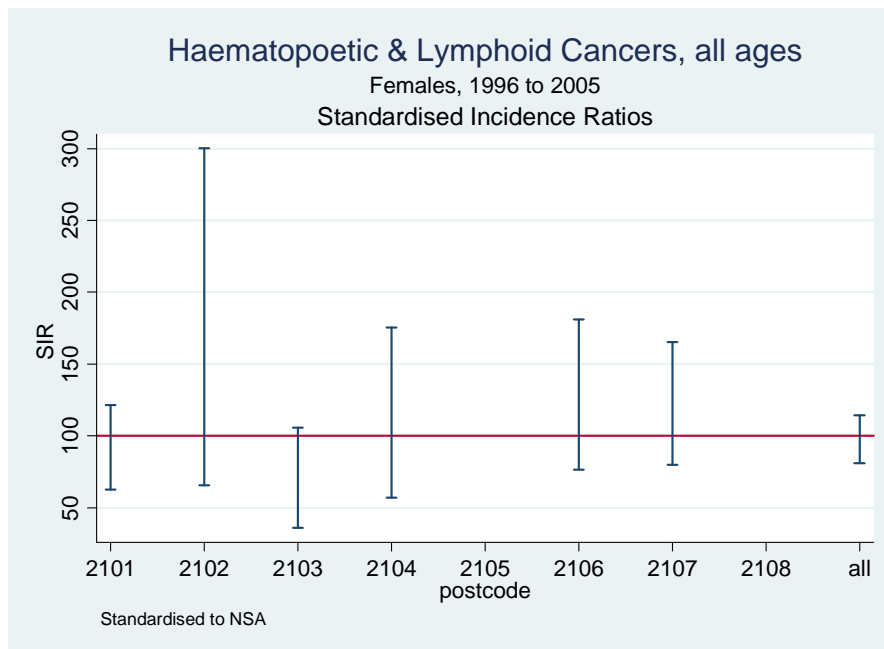


Figure 8



The numbers of observed Haematopoietic & Lymphoid cancers for the combined postcodes was marginally greater for males and marginally lower for females than those expected but the 95% confidence bounds included 100 in both instances.

Total numbers of Haematopoietic & Lymphoid cancers reported for the postcode of Mona Vale were lower than expected for both males and females but the upper 95% confidence bounds were not below 100.

The SIR point estimates varied from a minimum of 49 to a maximum of 181 across postcodes. One 95% lower confidence limit was above 100 out of the 16 reported figures.

Childhood Cancer

Table 6
SIRs, All cancers (C00 – C97), 0 to 14 yr olds, 1996 to 2005, by postcode, standardised to NSW.

Postcode	Post Code	Sex	SIR	Observed cases	Expected cases	SIR 95%LCL	SIR 95%UCL
Mona Vale	2103	M	82	1	1.2	2	459
		F	97	1	1.0	2	538
Combined Postcodes*		M	122	11	9.0	61	218
		F	192	14	7.3	105	322

* all postcodes 2101 to 2108 including Mona Vale

There were only 2 cases of childhood cancer reported among Mona Vale residents which was similar to the number expected.

For girls there were more childhood cancers reported for the combined postcodes than expected with the lower 95% confidence bound being above 100. Confidence limits around observed number of cases were 5 to 20 for boys and 8 to 23 for girls (see appendix C). The expected number of cases for girls was slightly lower than the lower confidence limit of 8 cases.

Table 7
SIRs, Haematopoietic & Lymphoid cancers (C81 – C96), 0 to 14 yr olds, 1996 to 2005, by postcode, standardised to NSW.

Postcode	Post Code	Sex	SIR	Observed cases	Expected cases	SIR 95%LCL	SIR 95%UCL
Mona Vale	2103	M	0	0	0.4	na	na
		F	0	0	0.6	na	na
Combined Postcodes*		M	180	8	4.5	78	354
		F	195	6	3.1	72	424

* all postcodes 2101 to 2108 including Mona Vale

There were no cases of Haematopoietic & Lymphoid cancers reported among children resident in Mona Vale.

There were 14 Haematopoietic & Lymphoid cancers among children reported for the combined postcodes over the 10 year period making interpretation difficult. Although there were more cases reported than expected the lower 95% confidence bounds were not above 100. Confidence limits around observed number of cases were 3 to 16 for boys and 2 to 13 for girls with expected numbers falling within these ranges.

At an individual postcode level there were less than 5 boys and 5 girls diagnosed with cancer in any postcode. The actual numbers recorded in gender/postcode groups exceeded that expected in some instances and was less than that expected in some others. Generally there was a wide variation in SIRs calculated with broad 95% confidence intervals and no obvious geographical pattern.

Table 8
SIRs, All cancers (C00 – C97), 0 to 14 yr olds, 1996 to 2005, by postcode, standardised to NSA.

Postcode	Post Code	Sex	SIR	Observed cases	Expected cases	SIR 95%LCL	SIR 95%UCL
Mona Vale	2103	M	85	1	1.2	2	473
		F	95	1	1.1	2	529
Combined Postcodes*		M	125	11	8.8	62	224
		F	188	14	7.4	103	316

* all postcodes 2101 to 2108 including Mona Vale

Table 9
SIRs, Haematopoietic & Lymphoid cancers (C81 – C96), 0 to 14 yr olds, 1996 to 2005, by postcode, standardised to NSA.

Postcode	Post Code	Sex	SIR	Observed cases	Expected cases	SIR 95%LCL	SIR 95%UCL
Mona Vale	2103	M	0	0	0.6	na	na
		F	0	0	0.5	na	na
Combined Postcodes*		M	179	8	4.5	77	352
		F	165	6	3.6	61	359

* all postcodes 2101 to 2108 including Mona Vale

Tables 8 & 9 present the SIRs for the Mona Vale postcode and combined postcodes using the Northern Sydney Area (NSA) as the standard population. Using the NSA population rather than the NSW population has not made a substantive difference in the number of cases expected and hence the interpretation of the reported SIRs.

The distribution of cancer types diagnosed among children from the Pittwater region was compared to that for all NSW children for the period 1996 to 2005. There were 25 cancers registered among children from Pittwater. Ten of these were cases of Lymphoid Leukaemia representing 40% of all cancers. In comparison there were 534 cases of Lymphoid Leukaemia diagnosed among NSW children which represented 28% of all cancers diagnosed. Although the proportion of Lymphoid Leukaemia cases was higher among Pittwater children than that for NSW children considered as a whole this difference was not statistically significant ($p=0.2$)³ For the remaining cancers there were less than 5 cases diagnosed among Pittwater children for any individual type.

³ Two proportions test

Discussion

The analysis of routinely collected cancer data usually occurs in the absence of a specific exposure that is suspected to have caused an increase in cancers. However, the current analysis is being done in the context of there being a specific exposure (EtO from the Unomedical facility). Should this point source have caused an increase in cancer incidence you might expect the observed cases of cancer for the postcode of Mona vale to be elevated. The observed numbers of cases of Haematopoietic & Lymphoid cancers for all ages in the Mona Vale postcode were less than the number expected. In addition, there were no cases of childhood Haematopoietic or Lymphoid cancer recorded among children in Mona Vale over the period 1996 to 2005.

The use of routinely reported statistics to determine whether a geographically defined subpopulation of a community has an increased rate of cancer has several limitations. They include:

- a difficulty in estimating “true” incidence rates due to small populations being analysed
- an inability to consider length of time individuals have lived in the area
- an inability to adjust for potential confounders other than age and gender.

Nevertheless routinely collected data such as that collected by the NSW Cancer Registry can be used for this purpose provided that these limitations are borne-in-mind when interpreting the findings.

The NSW Cancer Institute has defined a “cancer cluster” as “a greater than expected number of cancer cases that occurs within a group of people, a geographical area or over a period of time”. In its position statement it goes onto outline that a statistical elevation of rates by itself does not necessarily mean that there is an underlying aetiological factor that can be identified or indeed that there is one present. Factors such as the magnitude of any association observed, whether cases consist of a single type of cancer or whether the cancers observed are of a rare type or a type not usually seen in a particular age group all need to be considered when making a judgement about whether there is a true elevation in the number of cases observed above background rates.

For the study to achieve sufficient numbers of cases per postcode to allow a gender and an age group analysis to be conducted it was necessary to consider reported cancers in broad groups ie all cancers and Haematopoietic & Lymphoid Cancers.

This report has used 95% confidence intervals to test to assess the statistical significance of differences between observed and expected numbers of cases. Thus when an observed number falls outside this interval there is up to a 5% probability that the difference between the observed and the expected number could be due to chance alone.

Standardising ratios to either NSW or to NSA does not appear to have an influence on the interpretation of the data analysis. When analysed as a combined group of postcodes for all ages, the observed number of cancers is elevated by approximately 5%. An elevation of this magnitude could well be explained by factors such as the effect of a higher proportion of very old residents (eg nursing home residents) not being fully accounted for or by differences in health behaviours.

Postcode level SIRs for all cancers among residents of all ages show some variation in point estimates as would be expected with the relative small number of residents living in each postcode. Although 4 postcodes are reported as having lower 95% confidence bounds above 100 they are only marginally elevated and the point estimates are modestly increased. There does not appear to be an obvious geographic pattern of SIR estimates at a postcode level.

When considering “Haematopoietic and Lymphoid cancers” separately the observed number of cases among residents of all ages falls within expected background rates. At a postcode level there is a greater variability in SIR point estimates. Two of the 16 comparisons have been reported as being having lower 95% confidence bounds above 100, however only by a small margin with no obvious geographical pattern.

The interpretation of childhood cancer incidence data is much more difficult due to the small numbers of children resident in individual postcodes. When combining postcodes to represent Pittwater LGA the observed number of all childhood cancers among girls is higher than expected. There were 14 cases recorded over the period and if you assume cases follow a Poisson distribution the 95% confidence interval is between 8 and 23 cases. The expected number of cases in the population was 7.3 cases, less than one case below the lower confidence limit.

When considering Haematopoietic & Lymphoid childhood cancers the number of expected cases was very low and although there were approximately 6 more cases among children in Pittwater than expected this was not statistically significant in either sex.

A review of the types of childhood cancers reported in the Pittwater area demonstrated a similar pattern to that for all NSW children in the study period. Although a relatively high proportion of childhood cancer cases were reported as Lymphoid Leukaemia among Pittwater children it should be remember that this is usually the commonest cancer type diagnosed among children and the proportion was not statistically elevated above NSW background proportions for the period.

Childhood cancers have not been reported by postcode except for the suburb of Mona Vale. This has been done following ethical advice that raised privacy concerns related to the identification of individuals when reporting small number of cases among identifiable groups. The relatively small number of children resident in each postcode is likely to have contributed to the large variation in SIRs at the postcode level.

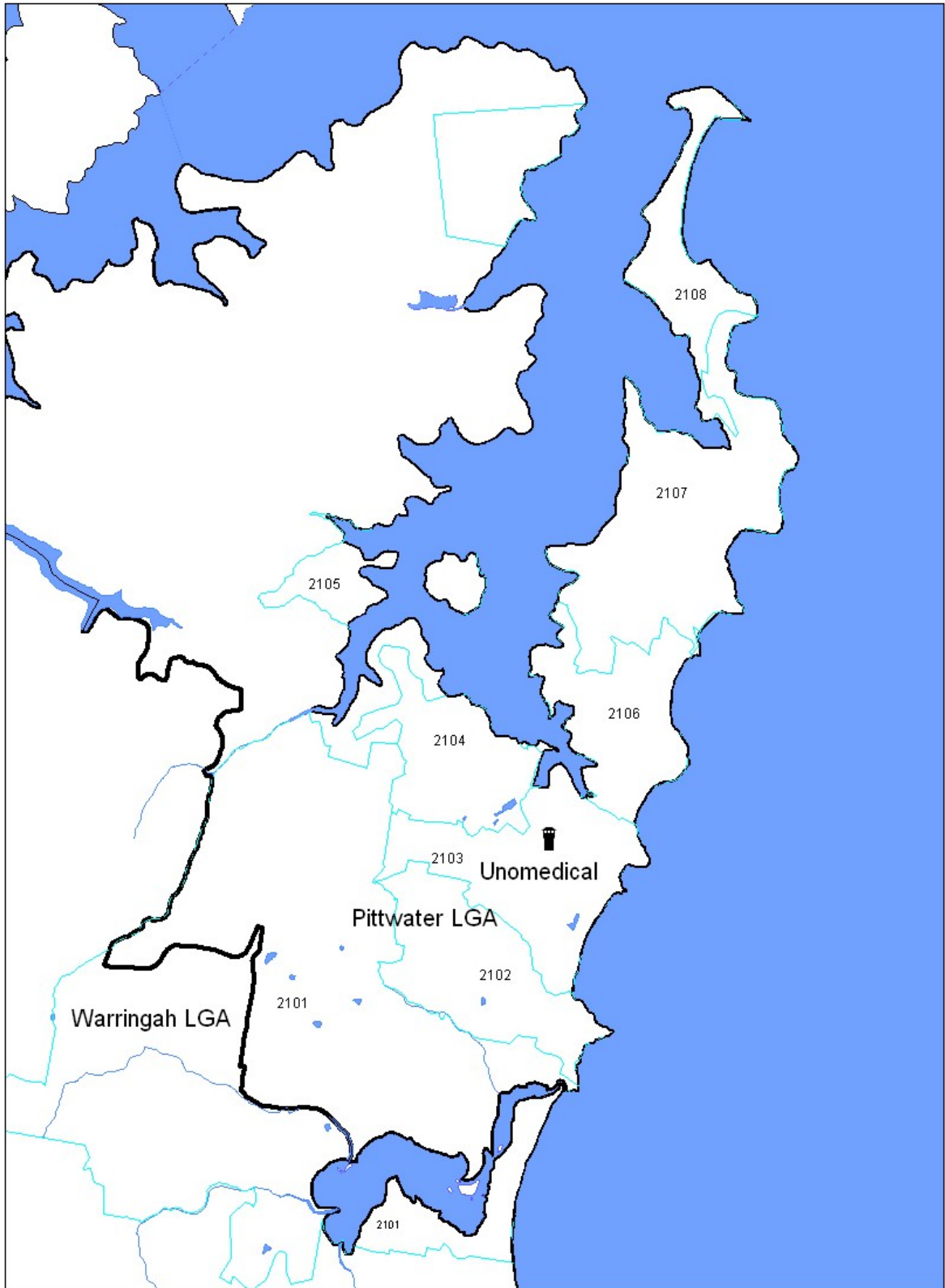
Conclusion

This study concludes that there is no evidence of increased cancer rates in the Mona Vale postcode for the period 1996 to 2005. This does not support the hypothesis that the Ethylene Oxide emitted from the Unomedical Facility has caused an increase in cancer rates.

It can also be concluded that;

- on balance the total number of cancers for all ages combined is similar to that expected based upon NSA & NSW rates and there is no unusual variation in observed cancer rates across postcodes within the Pittwater region.
- there is some statistical evidence of elevated total cancer numbers among girls aged 0 to 14 years in the Pittwater region as a whole. Although the number of cases is statistically elevated this may still be within background rates. The total number of cancers among boys is similar to that expected, as is the number of Lymphoid and Haematopoietic cancers among both boys and girls.

Appendix A – Map of Study Area



Appendix B – NSW Cancer Institute Cancer Cluster Statement

http://www.health.nsw.gov.au/cancer_inst/publications/pdfs/positionstatements/2007-08-09_Position_Statement-Cancer_Clusters_in_NSW.pdf

Appendix C – Poisson Confidence Limits

Table 1: Poisson distribution 95% confidence limits.

Observed	Lower Limit	Upper Limit	Observed	Lower Limit	Upper Limit
0	0.0000	2.9957	50	37.1110	65.919
1	0.0253	5.5716	51	37.9728	67.056
2	0.2422	7.2247	52	38.8361	68.191
3	0.6187	8.7673	53	39.7006	69.325
4	1.0899	10.2416	54	40.5665	70.458
5	1.6235	11.6683	55	41.4335	71.590
6	2.2019	13.0595	56	42.3018	72.721
7	2.8144	14.4227	57	43.1712	73.850
8	3.4538	15.7632	58	44.0418	74.978
9	4.1154	17.0848	59	44.9135	76.106
10	4.7954	18.3904	60	45.7863	77.232
11	5.4912	19.6820	61	46.6602	78.357
12	6.2006	20.9616	62	47.5350	79.481
13	6.9220	22.2304	63	48.4109	80.604
14	7.6539	23.4896	64	49.2878	81.727
15	8.3954	24.7402	65	50.1656	82.848
16	9.1454	25.9830	66	51.0444	83.968
17	9.9031	27.2186	67	51.9241	85.088
18	10.6679	28.4478	68	52.8047	86.206
19	11.4392	29.6709	69	53.6861	87.324
20	12.2165	30.8884	70	54.5684	88.441
21	12.9993	32.1007	71	55.4516	89.557
22	13.7873	33.3083	72	56.3356	90.672
23	14.5800	34.5113	73	57.2203	91.787
24	15.3773	35.7101	74	58.1059	92.900
25	16.1787	36.9049	75	58.9923	94.013
26	16.9841	38.0960	76	59.8794	95.125
27	17.7932	39.2836	77	60.7672	96.237
28	18.6058	40.4678	78	61.6558	97.348
29	19.4218	41.6488	79	62.5450	98.458
30	20.2409	42.8269	80	63.4350	99.567
31	21.0630	44.0020	81	64.3257	100.676
32	21.8880	45.1745	82	65.2170	101.784
33	22.7157	46.3443	83	66.1090	102.891
34	23.5460	47.5116	84	67.0017	103.998
35	24.3788	48.6765	85	67.8950	105.104
36	25.2140	49.8392	86	68.7889	106.209
37	26.0514	50.9996	87	69.6834	107.314
38	26.8911	52.1580	88	70.5786	108.418
39	27.7328	53.3143	89	71.4743	109.522
40	28.5766	54.4686	90	72.3706	110.625
41	29.4223	55.6211	91	73.2675	111.728
42	30.2699	56.7718	92	74.1650	112.830
43	31.1193	57.9207	93	75.0630	113.931
44	31.9705	59.0679	94	75.9616	115.032
45	32.8233	60.2135	95	76.8607	116.133
46	33.6778	61.358	96	77.7603	117.232
47	34.5338	62.500	97	78.6605	118.332
48	35.3914	63.641	98	79.5611	119.431
49	36.2505	64.781	99	80.4623	120.529