The OMS Ltd.
Occupational Medicine Specialists

300 West Adams Street, Suite 835, Chicago, IL 60606
Tel: (312) 762-2959 (800) 359-1979 x362 Fax: (312) 551-2287
www.1oms.com

Shirley A. Conibear, M.D., M.P.H.
Occupational Medicine
Toxicology
Certified Medical Review Officer
Travel Medicine

Virginia A. Evans, M.D., M.P.H.
Occupational Medicine
Emergency Medicine
Certified Medical Review Officer
Travel Medicine

Date: July 9, 2015

To: Board of Education, District 107

From: Shirley A. Conibear, M.D., M.P.H.

RE: Report of the Investigation of an Apparent Cancer Cluster at Pleasantdale Elementary School

INTRODUCTION

Teachers at Pleasantdale Elementary School (the "School") in La Grange, Illinois gradually became aware of nine (9) cancers of various types (the "original cluster") that were diagnosed among current and former staff members at the School within the last five years. This apparent clustering of 9 cancer cases in a short time period at their work site raised concerns that there might be something in the School's environment that was causing these cancers. The Board of Education, District 107 commissioned this investigation at their May 20, 2015 meeting.

A cancer cluster is generally defined as a time and space clustering of cancer cases. **REF #1** A "case" is a person diagnosed with cancer. The main goal of an investigation of a cancer cluster is to determine if the cancers are independent events or if they have a common cause. The distribution and rate of occurrence of cancer cases can be affected by environmental exposure, host susceptibility factors, chance occurrence and artifacts such as case finding efforts and reporting bias.

METHOD

Information was solicited from the teachers and staff by distributing the attached letter to all School staff members in mid-May, 2015. A meeting was held with teachers and staff at the School shortly thereafter, before school had adjourned for the year, at which I spoke and answered questions. After several weeks, the Teachers' Association of Pleasantdale District 107 became actively involved in the process of collecting information from and about cancer cases at the request of the Board of Education. No attempt was made by me to independently verify the diagnosis, the date of diagnosis, age at diagnosis or the date of hire.

More than half of the information about the individuals with cancer (the "cases") was not obtained directly from the person with cancer. Many of the cases were identified only by initials in order to offer privacy.

Some of the cases were reported several times. Some of the cases' dates of diagnosis were not given, in which instance the last year worked at the School was used. This may have both under and overestimated the cancer latency. (*Cancer latency is the time elapsed between first exposure to a carcinogen and the diagnosis of the cancer.)* In some cases age at diagnosis was estimated based on available information.

Parameters of interest such as tumor type, latency period, and age at diagnosis have been displayed in this report in such a manner that individuals are less likely to be identified to preserve their privacy.

Cancer statistics used for comparison were obtained from the American Cancer Society web site and are based on the incidence of cancer in the US population in 2015. The California Teachers Study data was also used for comparison purposes because of its size and its obvious relevance to this cohort. (A cohort is a term used to describe a group of people in terms of a specific time and space or activity. The Pleasantdale Elementary School graduating 8th grade class of 2015 is an example of a cohort.)

At my request, Superintendent Mark Fredisdorf provided information about the number of staff who worked at Pleasantdale Elementary School from the 1975-76 school year to the present school year. He provided actual census numbers for each year from 1996 through 2015. The number of staff leaving each year was provided from 2004 onward. This is shown in Table A. Actual census numbers for years earlier than 1995 were not available. Superintendent Fredisdorf recommended that the best estimate was 44 as the total staff census for each prior year. This information was used to estimate the total number of staff members in the cohort of people who had worked for at least one school year at Pleasantdale Elementary School since 1975. 1975 was used to define the cohort because it is the earliest year that an identified cancer case started work there. Table A describes in detail the calculation of the cohort size.

FINDINGS

In regard to the cohort size, the total number of staff who have worked for at least one school year at Pleasantdale Elementary School since 1974 was estimated to be 248. This number is the denominator that would be used to calculate a cancer incidence rate in the School population. More information such as date of birth would be needed to do this in a meaningful way. This rate could then be compared to other population incidence rates for all cancers and for particular cancers.

In regard to the cancer cases, Table B displays the year of diagnosis and the cancer type. 14 cancers were reported in 12 cases (persons). All of the cases were female. One skin cancer was reported and is included in the Table C and pie charts in Table D, although the 2 comparison populations used exclude skin cancer from the list of ten most common cancers. The skin cancer in the School cohort occurred in

a person who was also diagnosed with another cancer. One case has an unknown cancer type. One case had a diagnosis of breast cancer on the right and subsequently the left within six years. This was treated as a reoccurrence of the first breast cancer and was counted only once in the total cancers. Persons with two different tumor types had both counted in the cancer totals. The nine cancers identified in the Original Cluster can be seen to the right of 2010 on the x axis of the graph (Table B).

Age at diagnosis was unknown for 5 cases. Given and estimated ages at diagnoses were: early 30s, 39, early 40s, 53, 56, 61, and 70. Age at breast cancer diagnoses was available for only 4 of the 6 cases. Two were in their 30s, one in their 40s and one in their 70s.

Cancer latency, summarized in Table E, ranged from 0 years (cancer occurred during the first year of employment) to 36 years. The bar graph in the table shows the distribution by under and over ten years of latency. This break point was chosen because ten years is generally considered the lower limit at which biological plausibility for cancer causation can be established for work place or environmental exposure. 6 of the 14 cancers in this cohort had a latency of 11 years or greater.

A useful way to analyze and interpret a group of cancers in a suspected cluster is to compare the proportions of each cancer type found in the cluster to the proportions found in the general US population. In the case of teachers, another more specific comparison population is available. The California Teachers Study is a cohort of over 133,000 public school teachers and administrators who have been followed and studied since 1995. The purpose of this study was to document the excess risk of breast cancer among teachers and study the determinants of this excess of breast and other cancers in this cohort. **REF #2** These comparisons are shown in Table C and the pie charts, Table D.

Tables C and D display the same data in different formats. In Table C the list of cancers in the first two columns constitute the top ten most common cancers by incidence in US females of all ages in descending order for the US population and the California Teachers Study cohort. The third column shows the cancer types and numbers of cancers found in the Pleasantdale Elementary School cohort. The yellow highlighted cancers are found in common amongst the three groups. Notice that one of the Pleasantdale cancers, liver cancer, is not found among the top ten in either of the two comparison groups. Skin cancer is not included in either the US or the Teachers' lists by convention. The asterisks by the cancers in the CA Teachers column indicate that these cancers have been found in excess in the CA Teachers study cohort compared to the general population of California women. The pie charts display the same data. They can be read like a clock face starting at noon and going in clockwise rotation from most common to least common. Notice that the colored pie chart "slices" have been placed in the same order in all three charts to allow easy comparison. The Pleasantdale cohort has only one cancer in all of the "slices" except breast cancer.

CONCLUSIONS

Are the types of cancer different from those found in the general US population in any meaningful way? The types of cancer reported in Pleasantdale Elementary School staff are all found in the top ten except for liver cancer. The same is true when compared to the CA Teachers Study cohort. In addition, breast, thyroid, NHL and Melanoma cancers are present in CA Teachers at a higher rate than expected compared to California women who are not school teachers. All of these cancers were also found in the Pleasantdale cohort. The presence of one cancer in the Pleasantdale cohort not in the top ten is not necessarily indicative of an exposure at the School and is best regarded as due to chance alone.

Do the types of cancer reported suggest any particular exposure to a carcinogen? No. The cases are consistent with types most commonly found in the US population.

Do the types of cancer cases found in Pleasantdale staff suggest that radon or asbestos could be the cause? No. These two known carcinogens have been found to cause lung cancer and in the case of asbestosis, also mesothelioma. No mesothelioma was found in this investigation. Only one lung cancer was reported by this cohort. Lung cancer is the second most common cancer diagnosed in women in the US population. To find one lung cancer among 14 cancers in 12 women would not be unexpected.

Do the cancer cases at Pleasantdale point to or suggest a particular exposure period when risk was present? No, the cancer cases are clustered by diagnosis date in the last 5 years but this is likely to be an artifact of the way the information was collected rather than due to some common exposure at the school that occurred ten or more years ago. Cases were either currently or recently employed at the school or were known to someone in the same group. The short latency, under 10 years, of 8 of the 14 cancers, indicates that a causal relationship of workplace exposure to these cancers is unlikely.

Are the cancer cases at Pleasantdale occurring at a younger age than expected based on national statistics? No. Based on US mortality statistics, cancer of all types becomes the leading cause of death in women at age 35 to 44 and persists as the leading cause through age 84. Breast cancer incidence rate (diagnosis) in CA teachers starts to exceed that of comparable groups of CA women who are not school teachers at age 35. The California Teachers Study has documented that teachers have a risk of breast cancer that exceeds that of other women by a multiple of 2 times. This increased risk of breast cancer is not unique to the Pleasantdale cohort.

Are there more cancer cases in the Pleasantdale cohort than expected? This question cannot be estimated based on the information collected. It is apparent that the size of the exposed population is much larger than the 44 individuals currently working there at this time. It is also apparent from Table B that information on cancer cases diagnosed prior to 1995 is missing entirely. A denominator composed of all the Pleasantdale staff since 1975 would have to be identified by searchable parameters such as date of birth, ss # and name. Cancers diagnosed in this group would be assembled and a rate would be calculated. This is a long and expensive task that is not recommended. The size of this cohort is minuscule compared to the 133,000 plus women in the CA Teachers study and would lack statistical power to detect positive findings even if they existed. The CA Teachers Study provides reassurance that

certain cancers are found in excess in teachers and that this excess is found across the entire state, making a workplace specific causal agent unlikely. The Teachers Study has studied the relationship of pesticides and fine particulate in the environment as possible causal agents without finding an association. More than 50 scientific papers have been published on this group mainly focused on personal risk factors. These papers are available online for free. The website is listed at #3 in the References section.

Respectfully submitted on July 9, 2015 by:

Shirley A. Conibear, MD, MPH
Board Certified in Occupational Medicine

REFERENCES

1. Schulte PhD, Paul. "Investigation of Occupational Cancer Clusters: Theory and Practice." *American Journal of Public Health, 1987;* 77: 52-56.
2. Bernstein, Leslie, et al., "High Breast cancer incidence rates among California teachers: results from the California Teacher Study (United States)", Cancer Causes and Control, 2002; 13: 625-635.
3. "California Teachers Study", https://www.calteacherstudy.org/publications. Accessed June 23, 2015.
4. American Cancer Society, "Facts and Figures (2015)", "Leading Sites of New Cancer Cases-2015, Estimate - Top 10 Female Cases, 2015.

Dear Staff Member of Pleasantdale Elementary School:

At the request of School District 107, I am surveying current and former staff members of Pleasantdale Elementary School, requesting information about yourself or others who have been diagnosed with cancer. If you or another staff member you know of has been diagnosed with cancer, I invite you to contact me by email at sconibear@1oms.com or fax to 312 551 2287 or call me on my cell phone at 312 617 1677with as much of the following information as you know:

- Initials of the person with cancer
- Sex
- Age at cancer diagnosis
- Year cancer diagnosed
- Year of death if deceased
- Type of cancer
- Year of cancer diagnosis
- Year the person started to work at Pleasantdale Elementary and year last worked
- Job title (example: custodian, 3rd grade teacher) at Pleasantdale Elementary
- Are you making the report for yourself or for someone you know of?
- How do you know this information?

You need not identify yourself in any of these communications but I would appreciate a way to contact you if I need clarification. I expect that multiple people will report the same cancer case which is the reason I am asking for initials.

I will be producing a written report summarizing this information and but will not provide enough information in the report such that any single person can be easily identified. My report will organize and describe this information in terms of cancer rates, cancer latency (time between first worked at Pleasantdale Elementary and diagnosis), calendar time and duration worked and types of cancer. Cancer rates at the school will be estimated based on current and prior staff census. I will present a summary of the published epidemiologic literature on cancer in school teachers and put the cancer survey information collected at Pleasantdale Elementary into perspective. I will not be

conducting any other data analysis at this time. All information collected for this survey will be used strictly for this purpose and not be re-released to anyone else or used for any other purpose.

The period for collection of information will last for 3 to 4 weeks after which I will assemble my report. I appreciate your help with this project.

If you have questions about this process as outlined above, feel free to call me. The need for environmental testing if any will be determined based on the results of my survey. Questions about this process should be addressed to Mark Fredisdorf.

Respectfully submitted by

Shirley Conibear MD, MPH

TABLE A

Pleasantdale Elementary School
Staff census data provided by Superintendent Mark Fredisdorf in June, 2015

School Year	Number of Staff	Number who Left *	Number added
1996-97 &	44	2	2
1997-98	48	2	6
1998-99	47	2	1
1999-00	48	2	3
2000-01	51	2	5
2001-02	50	2	1
2002-03	53	2	5**
2003-04	52	2	1
2004-05	55	4	7
2005-06	58	None	3
2006-07	56	5	3
2007-08	57	1	2
2008-09	57	3	3
2009-10	58	4	5
2010-11	61	2	5
2011-12	61	4	4
2012-13	64	5	8
2013-14	69	3	8
2014-15	70	TBD	1
Total		47	73

*Actual numbers not available before the 2003-004 school year. Estimated number who left is based on the average percent leaving from 2004-05 school year through current, calculated as average # leaving divided by average census (3/60) equals 5%.

**Calculated as the number of staff in the school year minus the staff in the previous year plus the number who left in the same school year.

& For 1996- 97 and previous for which no information is available, a staff size of 44 was used with two entering and 2 leaving each year for a total of 4.

For the period 1975-76 to 1995-96, a period of 21 years, the total number who added and left was estimated as 4 with a constant census of 44. 21 X 4 = 84 staff.

Adding 84 plus 47 plus 73 plus the original 44 in 1975 equals 248 persons. This is the size of the cohort defined as staff who worked at Pleasantdale Elementary School for at least a year from the date the first cancer case identified, 1975 to date.

TABLE B

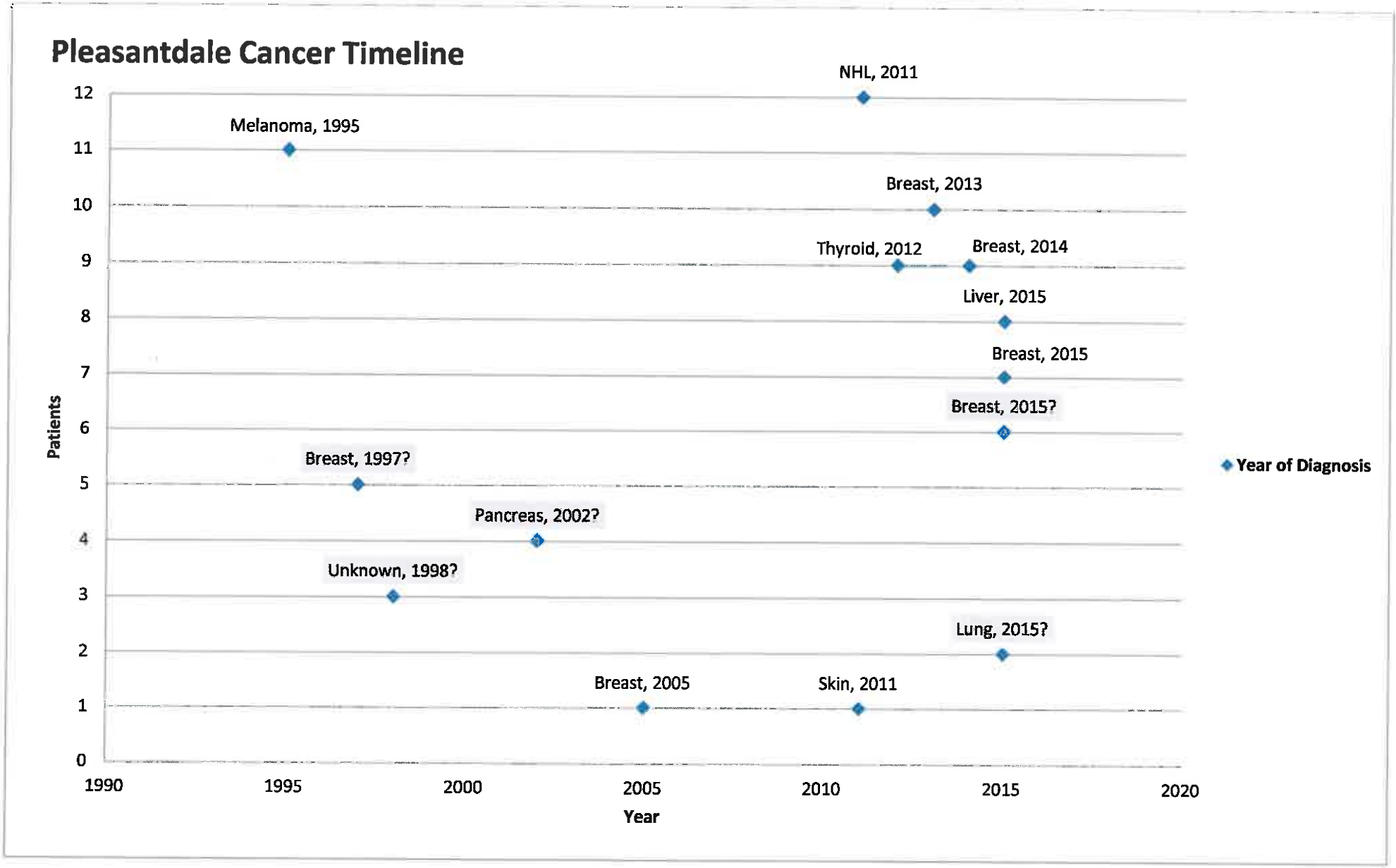

Pleasantdale Cancer Timeline
NHL, 2011
Melanoma, 1995
Breast, 2013
Thyroid, 2012
Breast, 2014
Liver, 2015
Breast, 2015
Breast, 2015?
Breast, 1997?
Pancreas, 2002?
Unknown, 1998?
Lung, 2015?
Breast, 2005
Skin, 2011
Patients
0
1
2
3
4
5
6
7
8
9
10
11
12
1990
1995
2000
2005
2010
2015
2020
Year
Year of Diagnosis

TABLE C

Comparison of Top 10 US Cancers, California Teachers Study cancer findings, Pleasantdale School cancer

Top 10 Female Cancers by incidence[1] (# of cases)	**CA Teachers Study**[2] (# of cases)	**Pleasantdale Elementary**[3] (# of cases)
Breast (231,840)	Breast (1374)*	Breast (6)
Lung and Bronchus (105,590)	Lung (212)	Lung/trachea (1)
Colon and Rectum (63,610)	Colon and Rectum (233)*	Thyroid (1)
Uterine Corpus (54,870)	Uterine Corpus (256)*	Non-Hodgkin Lymphoma (1)
Thyroid (47,230)	Thyroid (52)*	Melanoma (1)
Non-Hodgkin Lymphoma (32,000)	Non-Hodgkin Lymphoma (126)*	Pancreas (1)
Melanoma (31,200)	Melanoma (134)*	Liver (1)
Pancreas (24,120)	Leukemia (55)*	Skin (1)
Leukemia (23,370)	Ovary (124)	Unknown (1)
Kidney/Renal pelvis (23,290)	Uterine Cervix (22)*	

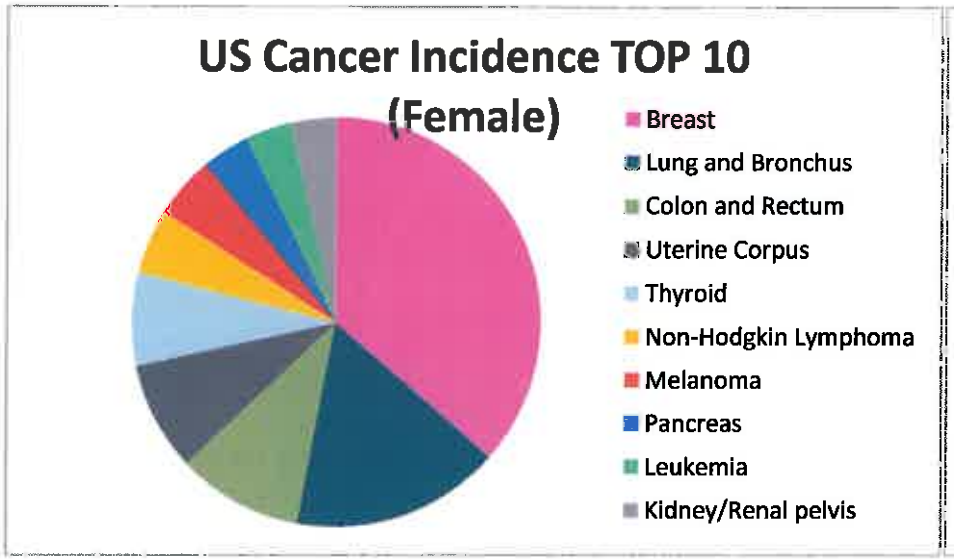
References:

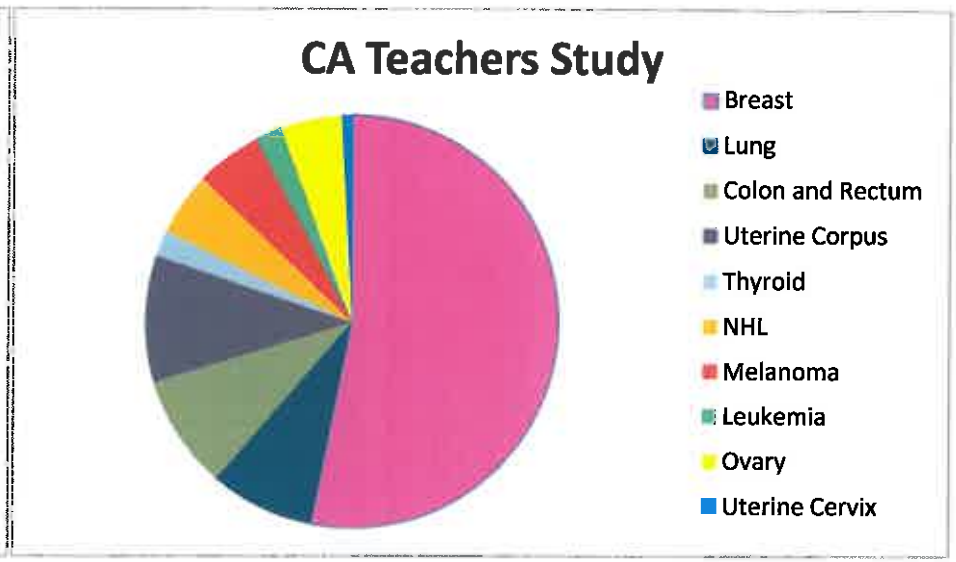
1 –American Cancer Society - Cancer Facts and Figures (2015) – Leading Sites of New Cancer Cases -2015 Estimate – Top 10 Female Cases (excludes skin cancer and in situ carcinoma)

2 – California Teachers Study (2002) – Table 3, top 10 cancers. * denotes statistically significant, higher rate ratio comparable US population standardized for race, age, and sex

3 – Pleasantdale Elementary Staff – reports of cancer. 12 patients, 14 cancer diagnoses (two patients had two different cancers – unknown if metastatic)

TABLE D


US Cancer Incidence TOP 10 (Female)
Breast
Lung and Bronchus
Colon and Rectum
Uterine Corpus
Thyroid
Non-Hodgkin Lymphoma
Melanoma
Pancreas
Leukemia
Kidney/Renal pelvis


CA Teachers Study
Breast
Lung
Colon and Rectum
Uterine Corpus
Thyroid
NHL
Melanoma
Leukemia
Ovary
Uterine Cervix

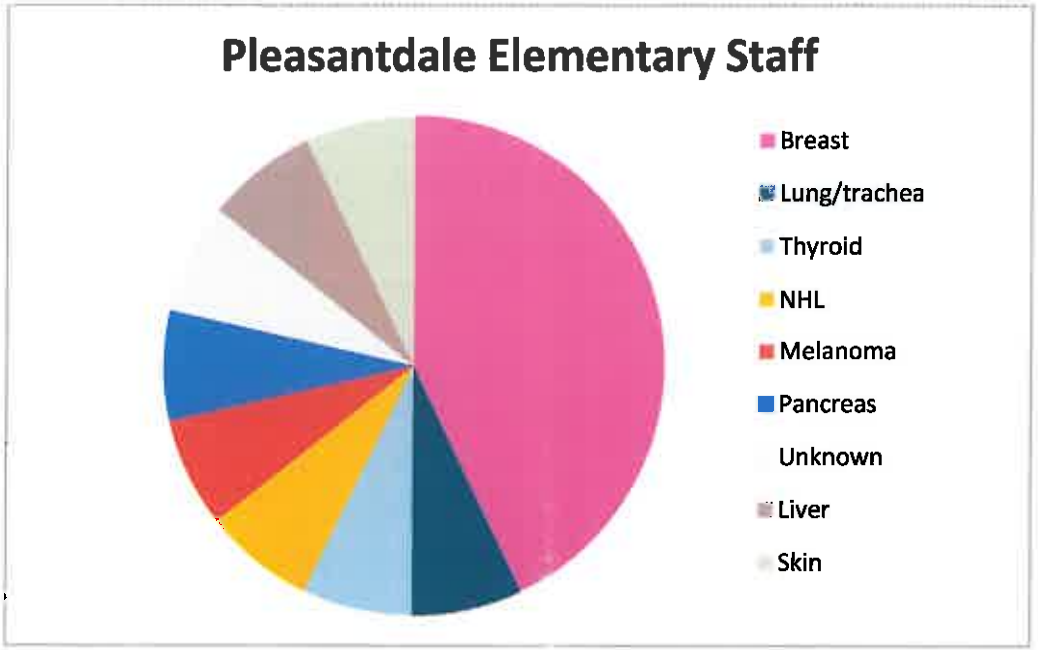

Pleasantdale Elementary Staff
Breast
Lung/trachea
Thyroid
NHL
Melanoma
Pancreas
Unknown
Liver
Skin

TABLE E

CANCER LATENCY IN YEARS (DATE STARTED WORK UNTIL CANCER DIAGNOSIS)