

## **REPLY TO SAN LUIS OBISPO COUNTY HEALTH DEPARTMENT COMMENTS OF APRIL 11, 2014**

### **WORLD BUSINESS ACADEMY REPORT ON DIABLO CANYON NUCLEAR PLANT AND HEALTH HAZARDS**

Joseph J. Mangano, MPH MBA

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On March 3, the World Business Academy (the “Academy”), a 501(c)(3) public interest organization founded in 1987, released a report by epidemiologist Joseph Mangano, MPH, MBA, that addressed the issues of radioactive emissions into the environment from the Diablo Canyon nuclear plant in San Luis Obispo County, and potential health hazards from exposure, especially among people living close to and downwind from the reactors.<sup>1</sup> The study found relatively high levels of emissions from Diablo Canyon, high and rising levels of radioactive Strontium-90 in local baby teeth, and generally rising rates of disease and death in the county (compared to the state), especially those types of cancer most sensitive to radiation. The report concluded that these findings should be taken seriously, should be followed by more studies, which should be shared with the public.

On April 11, the San Luis Obispo County Health Department issued a response to the Academy report.<sup>2</sup> The Health Department listed 12 points with which it disagreed – and none with which it agreed. The Department accused the report of “substantial bias” that used “flawed methodology and selective exclusion of populations of interest,” and claimed that it was “irresponsible in its treatment of the subject” of the link between radiation and disease and death risk in the local area.

The following addresses the major issues raised in the Health Department criticism, along with other important points.

1. Health Department Large Omission – Refused to Address Radiation Emissions. The Health Department’s response “does not include comments . . . which deal with the potential health hazards of nuclear reactor meltdowns and amounts of radioactive emissions” (p.10) and offers no reason for this omission. It is impossible to present a full, credible response to the March 3 report while ignoring the patterns of radioactive emissions into the environment from Diablo Canyon.
2. Health Department Bias – Refused Comment on Radiation Levels in Teeth. The Health Department also refused to comment on trends and patterns of radioactive Strontium-90 in California baby teeth near Diablo Canyon and far from any nuclear reactor. The Department stated “a prior Mangano report on this concern has been previously discredited” (p.1) – without citing who “discredited” the report and what their reasons were. In fact, results of this study have not been discredited, but have been published in five peer-reviewed medical journal articles.<sup>3-7</sup> These articles show high and rising levels

of Sr-90 in baby teeth near Diablo Canyon. The Department's statement illustrates its lack of understanding of Diablo Canyon health threats. It also reflects the Health Departments lack of awareness that the *only* sources of Strontium-90 on planet earth (now that above-ground nuclear testing has been abandoned) are from the *normal and accidental operations of nuclear power plants*. This lack of awareness of the prevalence of Strontium-90 clearly being emitted by Diablo Canyon (a fact not in dispute by Diablo Canyon, PG&E, or anyone else), and the cumulative build-up which occurs with Strontium-90 over its 29-year half-life, is disturbing in its omission.

3. Health Department Falsely Claims it Has Studied Diablo Canyon Health Hazards. The Health Department calls "patently untrue" the Academy statement in the March 3 report that this was the "first known analysis of local health status patterns and trends near the Diablo Canyon nuclear power plant" (p.10). This statement *IS* true. Neither the Health Department, nor any other agency or individual, has ever conducted such a study. The only county morbidity or mortality rates in Department reports are low-weight births, infant deaths, total death rates, accidental deaths, and suicide deaths.<sup>8</sup> There have been no examinations of long-term trends in local cancer rates; radio-sensitive types of cancer; and no data of potential links between Diablo Canyon emissions and health risk in any Department report – even though the plant has operated for 30 years. That is absolutely shocking and stands as a dereliction of duty to the public health.
4. Health Department Refused to Acknowledge Author Expertise. The Health Department, which is completely inexperienced in research on potential health hazards of radiation contamination, fails to note the expertise of the study's author. Joseph Mangano, MPH, MBA, is an epidemiologist and author or co-author of 32 peer-reviewed medical journal articles and letters on this topic, along with three books. He played a major role in the study of Strontium-90 in 5,000 baby teeth, the only recent study of in-body radiation of Americans living near nuclear plants. His work has been covered by the *New York Times*, *USA Today*, *CNN*, *NPR*, and *Fox News*, along with many local media.
5. Health Department Critique Excludes Supporting Professional Publications. The Health Department's response contains no references to articles, books, and other scientific publications to support their claims. By contrast, the Mangano report contains 24 references, most of them journal articles, along with a list of 19 journal articles that found high child cancer rates near nuclear plants. The Health Department response is an opinion, lacking in supportive evidence from peer-reviewed professional publications.
6. Health Department Accusation of "Mistake" in Rates Totally Inaccurate. The Health Department's media release stated the State Cancer Registry found the Academy report "use of crude rates in analyzing cancer cases in the County distorted the true change in rates over time." ***The accusation that the report used crude rates, not adjusted for age is 100% false***, and reveals the Health Department's bias and/or lack of understanding of basic health statistics methods.

A crude rate is never used for any analysis of populations with multiple age groups. The accepted approach is to account for the age distribution by age-adjusting the rates, allowing “apples to apples” comparisons across time periods and geographic areas. Put simply, using crude rates would likely mean Florida would have the highest rates of many diseases and deaths due to its high proportion of elderly, who have higher rates than non-elderly. But age-adjustment accounts for this, and allows an appropriate state-by-state analysis. The technique used for age-adjustment, which is used not just in the health field but in other disciplines, can be found in any basic statistics textbook. The Health Department report (p. 2) defines adjusted rates, and uses age-adjustment as an example – only to ignore and/or misinterpret the rates presented in the Academy report, incorrectly calling them “crude rates.”

The Academy report states, for example, that in the most recent (2003-2010) period, the San Luis Obispo County cancer incidence rate is 6.9% greater than the California rate. Looking at the table below from the California Cancer Registry web site shows this to be true, using the age-adjusted rate in the column furthest to the right:

San Luis Obispo County rate	468.65 cases per 100,000 population
California rate	438.99 cases per 100,000 population

Dividing 468.65 by 438.99 equals 1.068, meaning the county rate is 6.8% above the state rate. (Since the Academy report data were collected, the California Cancer Registry added small numbers of cancer cases to recent years, accounting for the difference between 6.9% and 6.8%).

Using crude rates would have meant dividing the county rate (545.13) by the state rate (413.88), meaning the county rate would have been 31.7% above the state. But this rate does not account for the higher proportion of old people in San Luis Obispo County, and was not used in the Academy report. See the table below from the California Cancer Registry for 2003-2010 crude and adjusted cancer incidence rates for each county.

<b>Invasive Cancer Incidence Rates by County in California</b>				
<b>All Sites, 2003-2010</b>				
<u>County</u>	<u>Population at Risk</u>	<u>Cases</u>	<u>Crude Rate</u>	<u>Age-adjusted Rate</u> ▼
Mariposa - Tuolumne	595307	4301	722.48	497.83
Shasta	1408232	8691	617.16	495.23
Napa	1061142	6243	588.33	494.96
Marin	1975906	12471	631.15	490.42
Lake	511260	3354	656.03	484.77
Butte	1732402	9707	560.32	480.97
Del Norte - Humboldt	1283397	6732	524.55	479.52
Sonoma	3769062	20047	531.88	474.83
Solano	3275923	14720	449.34	470.26
Placer	2588897	13930	538.07	470.08
San Luis Obispo	2098014	11437	545.13	468.65

El Dorado	1410210	7635	541.41	468.44
Mendocino	701569	3974	566.44	464.26
Siskiyou - Trinity	465016	3124	671.80	463.67
Sierra - Yuba	575450	2415	419.67	462.63
Contra Costa	8102793	38583	476.17	462.15
Colusa - Glenn - Tehama	878939	4547	517.33	462.14
Santa Cruz	2041083	9085	445.11	456.16
San Diego	23894549	103211	431.94	455.33
San Mateo	5594372	27873	498.23	455.02
Sacramento	11014136	47127	427.88	454.38
Ventura	6421399	27861	433.88	451.49
Alpine - Amador - Calaveras	677424	4476	660.74	449.24
Santa Barbara	3302346	14935	452.25	446.30
Nevada	780267	4950	634.40	443.96
Yolo	1536464	5661	368.44	441.90
Stanislaus	4028463	15645	388.36	438.96
San Francisco	6236238	30669	491.79	437.21
Orange	23637400	97508	412.52	436.43
San Joaquin	5294642	20142	380.42	435.57
Santa Clara	13697624	55259	403.42	433.67
Kern	6290363	21876	347.77	433.01
San Bernardino	15715127	53512	340.51	431.81
Riverside	16106951	65531	406.85	430.07
San Benito	437113	1571	359.40	428.78
Alameda	11730418	47994	409.14	428.63
Fresno	7124769	25742	361.30	426.15
Merced	1964941	6511	331.36	424.35
Monterey	3260453	12389	379.98	424.13
Los Angeles	78134415	297910	381.28	423.13
Madera	1148907	4545	395.59	422.60
Kings	1183761	3548	299.72	412.99
Tulare	3341779	11114	332.58	409.80
Lassen - Modoc - Plumas	519917	2488	478.54	408.93
Inyo - Mono	257527	1251	485.77	403.10
Sutter	727070	2883	396.52	401.33
Imperial	1297518	4381	337.64	389.74
<b>STATE</b>	<b>289830955</b>	<b>1199559</b>	<b>413.88</b>	<b>438.99</b>

**Note: All rates are per 100,000. Rates are age-adjusted to the 2000 U.S. Standard Population.**

**Data accessed April 22, 2014. Based on October 2013 Extract (Released December 13, 2013).**

**Source: California Cancer Registry. [www.cancer-rates.info/ca/index.php](http://www.cancer-rates.info/ca/index.php)**

Another illustration uses death rates for all cancers combined in the period 2008-2010. The county adjusted rate (159.27) was 1.4% greater than the state's (157.14), which was given in the Academy report. The crude rate for the county (197.36) was 31.5% above the state rate (150.09), but was not used, again, because differences in age proportions (such as the large number of elderly in San Luis Obispo) affects crude rates – but not age-adjusted rates. The table below is again from the California Cancer Registry.

<b>Cancer Mortality Rates by County in California</b>				
<b>All Sites, 2008-2010</b>				
<u>County</u>	<u>Population at Risk</u>	<u>Deaths</u>	<u>Crude Rate</u>	<u>Age-adjusted Rate</u> ▼
Shasta	531834	1405	264.18	201.41
Siskiyou - Trinity	175651	515	293.20	195.82
Lake	193558	511	264.00	191.14
Sierra - Yuba	225541	376	166.71	190.86

Del Norte - Humboldt	486892	1009	207.23	185.22
Solano	1233387	2136	173.18	179.84
Butte	658811	1463	222.07	179.05
Napa	406213	891	219.34	176.00
Colusa - Glenn - Tehama	337266	670	198.66	175.41
Sacramento	4225133	6920	163.78	172.14
San Bernardino	6059722	7938	131.00	170.35
Mendocino	263002	581	220.91	169.67
Sonoma	1437282	2859	198.92	169.40
Stanislaus	1535988	2307	150.20	168.71
San Joaquin	2037089	3019	148.20	168.41
Kern	2491277	3217	129.13	167.75
San Benito	164223	223	135.79	162.78
Riverside	6459415	9957	154.15	162.48
Placer	1031611	2013	195.13	161.79
Sutter	283080	460	162.50	161.73
San Diego	9188434	14297	155.60	161.10
El Dorado	540756	1007	186.22	161.01
Tulare	1309779	1670	127.50	159.75
Merced	759594	939	123.62	159.63
San Luis Obispo	804615	1588	197.36	159.27
Alpine - Amador - Calaveras	255723	634	247.92	159.21
Yolo	598050	784	131.09	156.67
Mariposa - Tuolumne	222277	538	242.04	156.52
Contra Costa	3113839	5064	162.63	155.69
Fresno	2764276	3649	132.01	155.00
Alameda	4488790	6573	146.43	153.66
Madera	449061	633	140.96	153.56
Los Angeles	29349320	41200	140.38	153.27
Ventura	2446928	3639	148.72	151.83
San Francisco	2398414	4169	173.82	150.18
Kings	457488	475	103.83	149.34
Santa Cruz	779409	1149	147.42	148.70
Orange	8962368	12813	142.96	148.01
Santa Barbara	1260845	2002	158.78	147.88
San Mateo	2137051	3550	166.12	146.37
Nevada	295556	657	222.29	144.10
Lassen - Modoc - Plumas	194612	334	171.62	143.09
Santa Clara	5292368	6894	130.26	140.34
Marin	752049	1414	188.02	140.05
Imperial	515061	619	120.18	138.72
Monterey	1232651	1559	126.48	138.24
Inyo - Mono	97475	135	138.50	114.34
<b>STATE</b>	<b>110903764</b>	<b>166455</b>	<b>150.09</b>	<b>157.14</b>

**Note: All rates are per 100,000. Rates are age-adjusted to the 2000 U.S. Standard Population.**

**Data accessed April 22, 2014. Based on October 2013 Extract (Released December 13, 2013).**

**Source: California Cancer Registry. [www.cancer-rates.info/ca/index.php](http://www.cancer-rates.info/ca/index.php)**

*The accusation that the Academy report used only crude (and not age-adjusted) rates are not only false, but calls into question the competency and/or integrity of the San Luis Obispo County Health Department.*

7. Health Department Contention (County Cancer Rates Not Rising, Not High) Incorrect. The Health Department media release states that “age adjusted cancer rates have remained unchanged or declined” in San Luis Obispo County, and claimed the Academy report finding that SLO is now a high-cancer county to be “incorrect” (p. 3). These

statements are contradicted by data, are misleading, and reveal a Health Department bias in claiming that there are no unusual patterns of cancer in the county.

For cancer incidence, only rates beginning in 1988 are available, when the state cancer registry was created. **Cancer rates have both fallen and risen over time**, rather than remaining “unchanged or declining.” Moreover, since 2002, the county cancer incidence rate is consistently above the state, contradicting the Health Department report. Thus, the Health Department statements are INCORRECT and MISLEADING. Below are rates for three-year periods, using state cancer registry data.

Yr. Diagnosis	Annual Cases/100,000		% County is +/- State	% Ch. County
	SLO County	California		
1988-1990	462.76	464.74	- 0.4	---
1991-1993	497.94	488.12	+ 2.0	+ <b>7.6</b>
1994-1996	458.14	465.98	- 1.7	- <b>8.0</b>
1997-1999	470.22	465.70	+ 1.0	+ <b>2.6</b>
2000-2002	448.16	458.40	- 2.2	- <b>4.7</b>
2003-2005	488.87	441.93	+ <b>10.6</b>	+ <b>9.1</b>
2006-2008	469.97	442.60	+ <b>6.2</b>	- <b>3.9</b>
2009-2011	437.22	424.17	+ <b>3.1</b>	- <b>6.9</b>

Source: California Cancer Registry. [www.cancer-rates.info/ca/index.php](http://www.cancer-rates.info/ca/index.php)

8. Health Department Accusation of Ignoring Race-Specific Cancer Rates.. The Health Department accuses the Academy report of not adjusting cancer rates for age and race/ethnicity. As seen previously, all rates in the Academy report were adjusted for age. Race and ethnicity were not used to adjust data, but not deliberately. The 30-page report included an enormous amount of data, and ended by strongly suggesting that it be followed by other reports; adjusting for race and ethnicity is one of the many types of approaches that can be explored in the future.

It is paradoxical that the Health Department criticizes a lengthy report on Diablo Canyon for not adjusting for all potential confounding factors (race/ethnicity being only one) – when the Department has conducted **absolutely no studies of their own** examining Diablo Canyon radioactive emissions and potential effects on the local population in 30 years.

If the Health Department believes that race- and ethnic-specific analysis of cancer incidence and mortality would show no unusual patterns in San Luis Obispo County, they should conduct such an analysis – instead of simply criticizing this pioneering report. Instead, they present no statistical evidence that their statements are true.

9. Health Department Incorrectly Denies Melanoma, Breast, and Thyroid Cancer Increases. The Health Department critique claims that “by not controlling for race-ethnicity in the report, an invalid conclusion is reached” (p. 4) – namely, that county rates of radiation-sensitive breast and thyroid cancer are rising faster than state rates. It also claims that not using race-specific and ethnic-specific rates creates a “significant distortion of risk” for melanoma (p. 6). Once again, the Health Department offers no data to support its claim.

Below are county and state rates for these three types of cancers, for the baseline period (1988-1990) and the follow-up period (1991-2010). Only white non-Hispanics, who account for the large majority of San Luis Obispo County cancers, are included.

<u>Yr. of Diagnosis</u>	<u>SLO County Cases/100,000 (cases)</u>	<u>California Cases/100,000</u>	<u>% County vs. State</u>
<b>Melanoma</b>			
1988-1990	15.24 ( 83)	18.13	- <b>15.9%</b>
1991-2010	28.38 (1297)	26.66	+ <b>6.5%</b>
<b>Thyroid Cancer</b>			
1988-1990	4.20 ( 22)	5.43	- <b>22.7%</b>
1991-2010	7.89 ( 323)	8.33	- <b>5.3%</b>
<b>Female Breast Cancer (Invasive)</b>			
1988-1990	121.61 ( 367)	142.16	- <b>14.5%</b>
1991-2010	137.06 (3436)	145.71	- <b>5.9%</b>
<b>Female Breast Cancer (In Situ)</b>			
1988-1990	16.53 ( 45)	19.12	- <b>13.5%</b>
1991-2010	27.32 ( 652)	29.01	- <b>5.8%</b>

Source: California Cancer Registry. [www.cancer-rates.info/ca/index.php](http://www.cancer-rates.info/ca/index.php)

For each of the four types of cancer, the 1988-1990 county rate for white non-Hispanics was considerably below the state rate. But in the next two decades, the county rate was only slightly below the state for thyroid cancer, invasive breast cancer, and in situ breast cancer. In the case of melanoma, later rates were higher than the state. Thus, San Luis Obispo County is no longer a very low-cancer area for the most radiation-sensitive cancers, as it was in the early days of Diablo Canyon – even when the rates are specific to race and ethnicity. The once-large gap between county and state rates for white non-Hispanics is closing. In addition, the white non-Hispanic county incidence rate nearly doubled after 1988-1990 for three of the four types of cancers shown (melanoma, thyroid cancer, and female breast cancer in situ).

While there is more research that needs to be done, the above demonstrates that the Health Department claims that Academy conclusions are “invalid” and “distorted” are not supported by evidence.

10. Health Department Takes “Rising Infant Mortality” Out of Context. In its critique, the Health Department refers to the Academy report conclusion that “after Diablo Canyon began operating, infant mortality in San Luis Obispo County rose significantly” (p. 5) and claims it to be “incorrect.”

The Health Department again refuses to acknowledge statistical evidence, in this case from the U.S. Centers for Disease Control and Prevention, showing that the ratio of infant mortality (deaths under age one) rose compared to the state for

- Two years before vs. two years after plant startup (23.7% below to 14.9% below CA)
- Five years before vs. 27 years after plant startup (26.7% below to 14.0% below CA)

While long-term infant mortality in San Luis Obispo County is declining over decades, it is not declining as rapidly as the rest of the state. There are reason(s) for this trend; and the fact that the county-state ratio of infant mortality is rising since Diablo Canyon startup is yet more suggestive evidence that releases from the reactors may be harming local residents – especially those most sensitive to radiation (the fetus and infant).

11. Health Department Claims Selected Zip Codes Not More Exposed. The Academy report also includes analyses of zip code areas in San Luis Obispo County that are closest to and downwind (southeast) of Diablo Canyon, and thus more likely to be exposed to higher levels of radioactivity released from the plant. The Health Department’s response includes criticism that zip code 93420 should be included as a “proximate” area, while zip code 93454 should be excluded as a “proximate” area.

This type of criticism is pointless, because, while the analysis is helpful, it can never be a perfect one. Zip code areas are not perfect squares or rectangles, and the southeast direction can be defined using a wide or narrow path. The nine zip code areas used in the Academy report (as closest and downwind) approximate the area most exposed. They were selected not just by Mangano, but by members of the Santa Barbara-based Academy staff and the local citizen group Mothers for Peace – without first knowing results of health analyses. The greater rises in infant deaths and low-weight births in this area found over the past 20 years should be treated with concern, rather than just including and excluding other zip codes.

In conclusion, it is highly unfortunate that the San Luis Obispo County Health Department has elected to disregard or attempted to rebut ALL of the many issues of concern revealed in the unique Academy report, rather than taking them seriously and following up with more studies.



This reaction is consistent with the total silence from the Health Department over the past 30 years about Diablo Canyon's toxic emissions into the environment and potential health consequences. The policy of total silence of the past three decades has been replaced by a policy of total denial.

There is precedent in the field of radioactivity in which public officials who deny any harm from radiation exposure are later proven wrong. Perhaps the best-known example is that of the U.S. and state governments, which for decades denied that fallout from atmospheric atomic bomb tests caused any harm to Americans. Even after President John F. Kennedy signed the 1963 treaty banning above-ground tests because of the rapidly-growing presence of fallout in the environment, the party line of "no harm" was not changed for many years. Finally, in 1999, the Institute of Medicine and the National Research Council estimated that up to 212,000 Americans exposed to Nevada bomb fallout before age 20 later developed thyroid cancer from radioactive iodine (one of many toxic chemicals found in fallout), ending the contentions that no American had been harmed by bomb tests.<sup>9</sup>

A county health department is mandated to protect its people from health hazards. Nuclear reactors, like the two at Diablo Canyon, produce and release perhaps the most powerful poisons known in history, a cocktail of chemicals created only in reactors and when atomic bombs explode. A local health department should display total vigilance, along with competence and a commitment to take seriously any potential evidence of harm, in addressing this matter. The San Luis Obispo County Health Department has historically shown neither, and is continuing this irresponsible and dangerous policy, by attacking the messenger without deeply exploring the message.

The Health Department is accountable to its people, who have a right to know if its water, food, and air are posing a health risk. The enormous threat posed by Diablo Canyon – which, on any given day, contains the radioactive equivalent of hundreds of Hiroshima bombs and several Chernobyls - and the highly biased and uninformed response issued by the Department earlier this month mean that the issue must be taken directly to the people. Therefore, it is proposed that one or more public discussions on this issue be held immediately, to include members of the Health Department and those who helped produce the Academy report.

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