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SECRETARY**

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May 4, 2006

Steve Pimer, Secretary
Department of Environment and Natural Resources
523 East Capitol
Pierre, SD 57501

RE: Uranium mining: concerns on cancer mortality and incidence

Dear Steve:

Overview. Cancer is a major public health problem in South Dakota and the United States. Cancer is a neoplastic disease marked by uncontrolled growth of cells, often with invasion of normal tissue. Cancer is the second leading cause of death in South Dakota. In 2004 there were 6,811 deaths reported in South Dakota, with 1,559 (23%) of these deaths due to cancer. Cancer deaths have been reported in residents of every county in South Dakota. Cancer evolves from a complicated combination of multiple exposures or risks. The most commonly attributable risk factors for cancer are tobacco use 30%, diet/obesity 30%, sedentary lifestyle 5%, occupational factors 5%, family history of cancer 5%, viruses-biological agents 5%, perinatal factors/growth 5%, reproductive factors 5%, alcohol 3%, socioeconomic status 3%, environmental pollution 2%, ionizing/ultraviolet radiation 2%, prescription drugs/medical procedures 1% and salt/food additives/contaminants 1%¹. Prevention, early detection and prompt and appropriate treatment are the keys to addressing the cancer burden.

Question: Concerns about uranium mines and radioactive pollution in western South Dakota prompted the Department of Health to review cancer death rates and cancer incidence² for counties with uranium mines and counties in the Standing Rock and Cheyenne River Reservations.

Cancer death rates. A one-year snapshot of cancer deaths would give a limited picture of the over-all cancer burden, especially in low population counties such as are common in western South Dakota. A 33-year, 1969–2002, cancer death review of the nine counties and comparisons to the state and national cancer death rates offers a larger-scope evaluation of the cancer burden in the counties under question (Butte, Corson, Custer, Dewey, Fall River, Harding, Lawrence, Pennington, and Ziebach).

The population of the nine counties at the 2000 census was 148,214, representing 20% of the states population. During the 33-year period, 1969-2002, there were 46,060 deaths due to cancer reported among South Dakota residents.

Cancer deaths and rates, 1969-2002, South Dakota select counties, (age-adjusted)

County (2000 population)	Number of cancer deaths	Cancer death rate* (±95%CI)
United States	15,500,586	206.4 (206.3-206.5)
South Dakota	46,060	187 (185.3-188.8)
Butte (9094)	623	201 (185.1-217.4)
Corson (4181)	242	209 (182.1-239.2)
Custer (7275)	389	175 (158.1-194.1)
Dewey (5972)	280	229 (202.2 – 259.1)
Fall River (7453)	744	197 (183.0-212.6)
Harding (1353)	89	166 (132.6-205.3)
Lawrence (21802)	1,258	188 (177.3-198.4)
Pennington (88565)	3,938	198 (191.3-203.8)
Ziebach (2519)	89	206 (162.7-258.8)

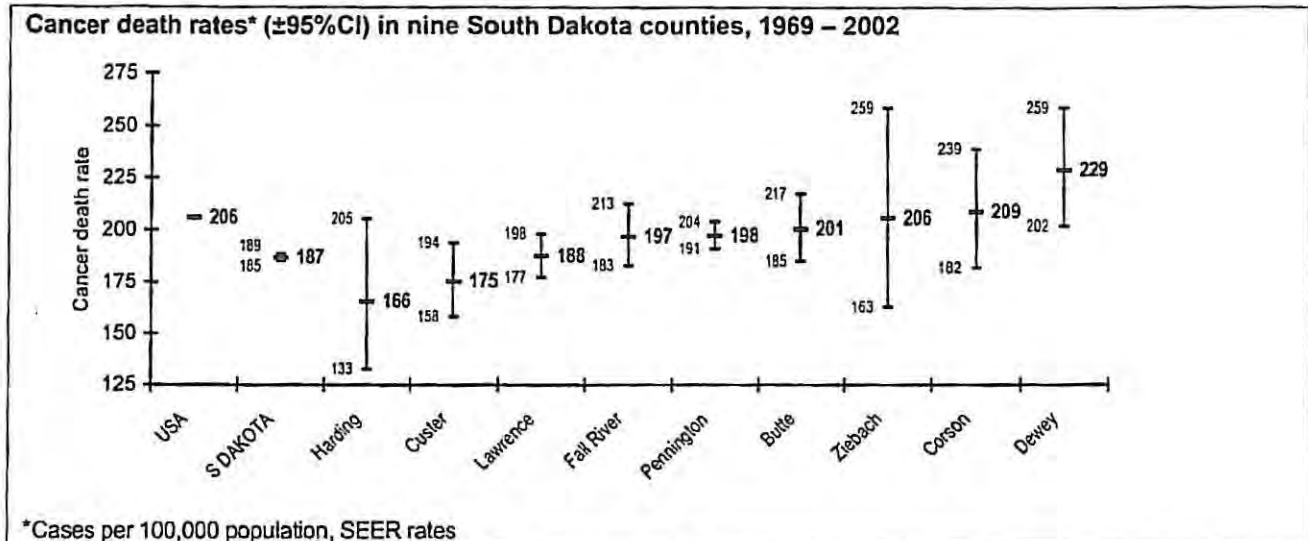
*Rates are per 100,000 persons age adjusted to the 2000 US standard population.
Source: SEER-(Surveillance, Epidemiology and End Results Program) Statistical Review, 1969-2002,

¹ Harvard Reports on Cancer Prevention, 1996, (www.hsph.harvard.edu/cancer/resources_materials/reports/HCCPreport_1fulltext.htm)

² Incidence rate is the number of new cancer cases occurring in a population over a given period of time, expressed as cases per 100,000 population.

This is expressed as a state cancer death rate of 187 deaths per 100,000. The national cancer death rate during that same period was 206 deaths per 100,000.

There were 7,652 cancer deaths reported in residents of the nine counties during the 33-year period, which is 17% of the cancer deaths in the state. The cancer rates in Custer and Harding County are below the state and national death rates. Butte, Corson, Fall River, Lawrence and Ziebach counties have death rates higher than the state rate, but are within the 95% confidence interval and are not considered statistically significant. The cancer death rates in Dewey and Pennington counties are higher than the state rate, and outside the 95% confidence interval for the state rate. None of the counties in question have cancer death rates significantly higher than the national rate. Although Pennington and Dewey counties have a higher rate of cancer deaths compared to the state rate, the data do not indicate an association between uranium mines and the cancer deaths.



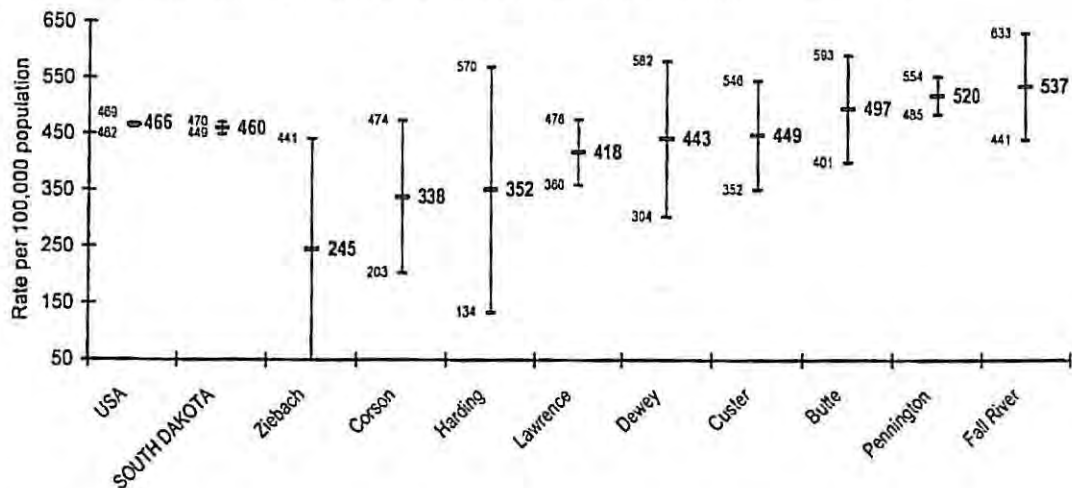
Cancer incidence. The Department of Health has been collecting data on newly diagnosed cases of cancer (not deaths) starting in 2001. The full state cancer incidence during 2001-2002 was 460 cases per 100,000 population. Cancer incidence for the United States was 466 cases per 100,000 population. Data from 2001-2002 show that six of the counties under concern have incidence rates lower than the full state. Three counties (Butte 497, Pennington 520, Fall River 537) have higher incidence, and of these Pennington County has a cancer incidence significantly higher than the state and national rates.

Cancer deaths by site. In the next sequence of analysis 33-years, 1969-2002, of cancer death data were examined for any unusual occurrences of site-specific cancers. A recent international scientific literature review³ cites examples of links between radiation and cancers of the bladder, bone, brain, breast, liver, lung, ovary, skin and thyroid, as well as leukemia and myeloma. This analysis summary includes the following cancer sites in South Dakota (see Table for detail):

- oral cavity and pharynx,
- respiratory system,
- soft tissue including heart,
- breast,
- male genital system,
- eye and orbit,
- endocrine system,
- lymphoma,
- leukemia
- digestive system,
- bones and joints,
- skin excluding basal and squamous,
- female genital system,
- urinary system,
- brain and other nervous system,
- thyroid,
- myeloma,

³ Clapp, R, et al. 2005. Environmental and Occupational Causes of Cancer: A Review of Recent Scientific Literature. Lowell Center for Sustainable Production, University of Massachusetts Lowell.

Cancer incidence rates* ($\pm 95\%CI$) in nine South Dakota counties, 2001 – 2002



*Cases per 100,000 population, age-adjusted for 2000 US standard population. SD Dept of Health and SEER-Stat

The most commonly reported cancers deaths in South Dakota are of the digestive system (primarily colon and rectum, pancreas and stomach) and respiratory system (primarily lung and bronchus) in men and women. Cancers of the digestive and respiratory systems account for 50% of cancer deaths in South Dakota. Among male-only cancers, genital system cancer deaths (primarily prostate) are most common. Among women breast cancer deaths are most common.

South Dakota, select counties cancer deaths and rates 1969-2002 by cancer sites, age-adjusted rates

Cancer site	South Dakota		USA	Harding		Custer		Lawrence		Fall River		Pennington		Butte		Ziebach		Corson		Dewey	
	Count	Rate	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate	Count	Rate
All Malignant Cancers	48,060	187	206	89	166	369	175	1,258	188	744	107	3,938	198	823	201	89	206	242	206	280	229
Oral cavity & pharynx	612	2.5	3.6	0	0	3	1.3	18	2.6	16	4.2	58	2.8	8	2.5	2	6	2	2.7	5	4.0
Digestive system	12,476	50.3	52.6	29	53.9	82	37.2	311	48.5	173	45.3	915	45.5	145	45.9	27	81.1	62	50.7	74	63.3
Respiratory system	10,505	42.6	54.7	17	31.3	122	52.8	323	47.8	197	50.6	1,054	51.9	184	58.4	20	50.7	53	45.8	81	63
Bones and joints	163	0.7	0.6	0	0	0	0	4	0.5	3	0.9	14	0.7	1	0.3	1	0.6	4	3.2	2	1.6
Soft tissue including heart	306	1.3	1.3	1	2.3	5	2.4	0	1.3	5	1.6	37	1.8	6	1.9	0	0	6	4.5	2	1.4
Skin, excluding basal & squamous	714	3	3.4	1	1.4	7	3.7	19	2.8	16	4.3	63	3	10	3.1	2	5.6	1	0.9	0	0
Breast (female)	3,831	28.5	30.0	6	22.5	24	20.9	105	29.8	60	36.4	335	29.8	44	26.2	0	25.1	20	34.9	20	30.4
Female genital system	2,409	18.1	10.1	4	14.0	28	24.6	63	17.7	36	20.9	180	15.0	29	17.0	2	9.2	13	19.9	9	12.7
Male genital system	3,522	35.1	34.6	10	43.8	29	31.0	82	32	74	30.1	277	28.4	52	40.7	8	40.0	19	46.7	13	27.2
Urinary system	2,235	8	9.0	1	1.9	18	8.2	68	9.7	27	8.8	186	9.6	35	11.2	4	7.5	0	8.6	17	15
Eye and orbit	43	0.2	0.1	0	0	0	0	2	0.3	1	0.3	6	0.3	0	0	0	0	0	0	0	0
Brain and other nervous system	1,179	8	4.5	3	5.5	0	3.9	31	4.8	12	3.1	114	5.4	17	8	2	3.7	9	6.4	8	5.2
Endocrine system	218	0.9	0.8	1	1.9	1	0.5	6	0.8	3	0.7	18	0.9	2	0.6	0	0	0	0	0	2.4
Thyroid	158	0.6	0.5	0	0	1	0.5	4	0.6	2	0.5	10	0.5	1	0.3	0	0	0	0	0	2.4
Lymphoma	2,183	8.8	8.2	4	7.1	12	5.4	52	7.7	32	9.4	183	9.6	25	8.1	0	0	9	8.7	11	8.8
Myeloma	878	3.5	3.5	2	4	0	4.2	24	3.5	17	4.3	72	3.7	14	4.3	2	4.3	5	3.8	2	1.4
Leukemia	2,078	8.4	8.0	8	14.8	12	5.7	55	8.2	22	8.2	163	7.9	17	5.4	5	8.9	12	10.5	7	5.5
Misc. malignant cancer	2,693	10.8	14.5	2	3.8	29	12.6	88	13.2	50	13.6	251	12.9	33	10.7	8	20.2	18	13.6	25	22.4

Rates are per 100,000 and age-adjusted to 2000 US Standard Population. Underlying mortality data provided by NCHS (www.cdc.gov/nchs). Source: SD Department of Health, SEER Statistics Review 1969-2002

The respiratory system cancer death rate in Dewey County and bone/joint cancer death rate in Corson County were substantially higher than the state rate (outside the 95% confidence interval) for these particular cancer sites.

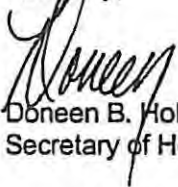
Over the 33-year period there were 81 respiratory system cancer deaths in Dewey County, rate 63.0 (95%CI $\pm 49.7-79.5$) per 100,000, compared to 10,505 respiratory cancer deaths in the whole state, rate 42.6 (95%CI $\pm 41.8-43.4$). The Dewey County rate is not statistically higher than the national rate for respiratory system cancer deaths (54.7). In Corson County there were 4 bone/joint cancer deaths, rate 3.2 (95%CI $\pm 0.9-10.1$), compared to 163 bone/joint cancer deaths statewide, rate 0.7 (95%CI $\pm 0.6-.08$).

Summary. This review of cancer rates in nine South Dakota counties shows:

- these counties have 20% of the state's population and account for 17% of the state's cancer deaths;
- increased cancer death rates in Pennington and Dewey counties compared to the state, but not increased over the national cancer death rate;
- increased cancer incidence in Pennington County compared to state and national rates;
- increased respiratory system cancer death rate in Dewey compared to the state rate, but not higher the national death rate;
- increased bone/joint cancer death rate in Corson County compared to state and national rates;
- these data do not indicate an association between uranium mines and cancer deaths;
- a more detailed study would be necessary to account for tobacco use, access to health care, obesity, lifestyle and other contributions to the local cancer burden.

Thank you for the opportunity to respond to these question and concerns. I hope this information is helpful. If you have further questions please let us know.

Sincerely,



Doneen B. Hollingsworth
Secretary of Health

cc: Dr. Sara Dye, MD, Chief Medical Officer, Aberdeen Area Indian Health Service
Dr. Beverly S. Kingsley, PhD, MPH, National Center for Environmental Health, Division of Environmental Hazards and Health Effects, Centers for Disease Control and Prevention