



Update on Causes of Death among 351 Former Nuclear Workers in the United States Transuranium and Uranium Registries



Joey Zhou¹, Stacey L. McComish², and Sergei Y. Tolmachev²

¹Office of Domestic and International Health Studies, U.S. Department of Energy, 1000 Independence Avenue SW, Washington, DC; ²United States Transuranium and Uranium Registries, College of Pharmacy and Pharmaceutical Sciences, Washington State University, 1845 Terminal Drive, Richland, WA

Abstract

The year 2018 marks 50th anniversary of the United States Transuranium and Uranium Registries (USTUR). Designed as a program to improve radiation protection of nuclear workers, the USTUR studies the biokinetics and internal dosimetry of actinides (uranium, plutonium, and americium) in occupationally exposed Registrants who volunteer portions of their bodies, or their whole bodies, for scientific use posthumously. It is the longest domestic radiation health study in the U.S. The causes of death among 260 USTUR Registrants were first reported 20 years ago and this presentation updates the previous publication. It is important to emphasize that the USTUR population is not a representative sample of the U.S. nuclear workers because of the volunteer nature of the Registrants. With a few exceptions, the Registrants are died from the same kinds of diseases that affect the U.S. population.

U.S. Transuranium and Uranium Registries (USTUR)

- Human tissue study established by U.S. Atomic Energy Commission in 1968
- Since 1992, operated by the College of Pharmacy at Washington State University as a research grant funded by the U.S. Department of Energy
- Follows up occupationally-exposed individuals (volunteer Registrants) by studying the biokinetics (deposition, translocation, retention, and excretion) and tissue dosimetry of uranium and transuranium elements, such as plutonium, americium, curium, and neptunium



International Statistical Classification of Diseases and Related Health Problems (ICD)

- Published by the World Health Organization (WHO)
- International standard for reporting diseases and health conditions
- Diagnostic classification standard for all clinical and research purposes
- Classifies diseases in a hierarchical fashion
- ICD Revision 10 (ICD-10) was endorsed by the 43rd World Health Assembly in 1990
- ICD-11 was released in June 2018, and will be submitted for endorsement to the 72nd World Health Assembly in May 2019

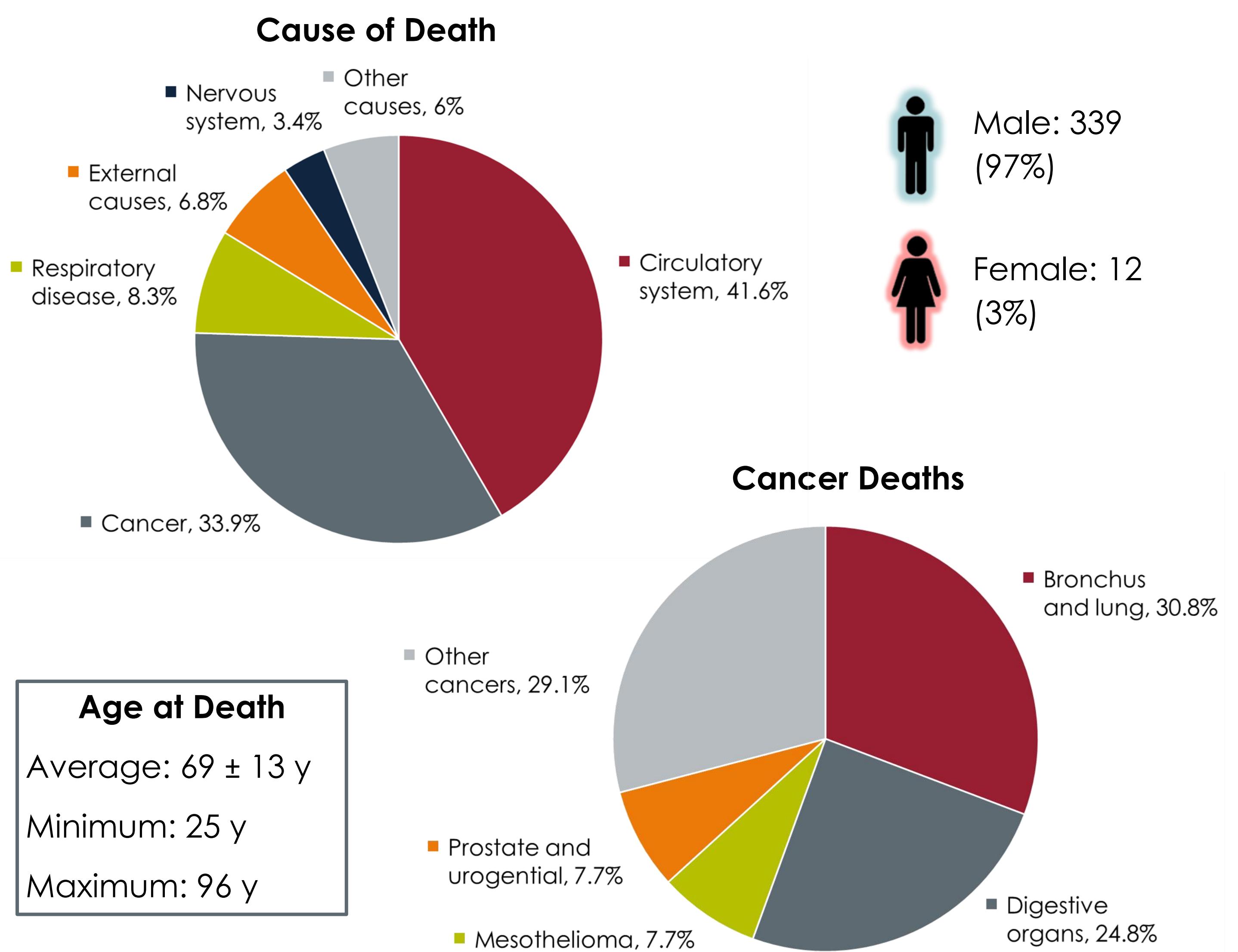
Assigning ICD Codes for USTUR Cases

- Since 2007, a professional nosologist has coded USTUR Registrant deaths using both ICD-9 and ICD-10
 - ✓ Underlying cause of death
 - ✓ Top seven contributing causes of death
- ICD codes are determined based upon causes of death in the
 - ✓ Autopsy reports
 - ✓ Death certificates

Underlying Causes of Death Among USTUR Registrants

Cause of Death	ICD-10 codes	Number of Cases
All Causes		351
Septicaemia	A41	2
Malignant Neoplasms	C00-C75	117
Lip, oral cavity and pharynx	C00-C14	4
Digestive organs	C15-C26	29
Esophagus	C15	4
Stomach	C16	4
Colon	C18	6
Rectosigmoid junction	C19	2
Rectum	C20	1
Liver and intrahepatic bile ducts	C22	6
Other and unspecified parts of biliary tract	C24	1
Pancreas	C25	5
Respiratory and intrathoracic organs	C30-C39	36
Bronchus and Lung	C34	36
Bone and articular cartilage	C40-C41	2
Skin	C43-C44	4
Mesothelioma	C45	9
Breast	C50	1
Female genital organs	C51-C58	1
Male genital organs	C60-C63	9
Urinary tract	C64-C68	6
Eye, brain and other parts of central nervous system	C69-C72	7
Malignant neoplasms of ill-defined, secondary and unspecified sites	C76-C80	3
Malignant neoplasms, stated or presumed to be primary, of lymphoid, haematopoietic and related tissue	C81-C96	6
Neoplasms of uncertain or unknown behavior	D37-D48	2
Aplastic anaemia	D61	1
Diabetes mellitus, unspecified	E14	2
Mental and behavioural disorders	F00-F99	4
Diseases of the nervous system	G00-G99	12
Diseases of the circulatory system	I00-I99	146
Chronic rheumatic heart diseases	I05-I09	4
Acute myocardial infarction	I21	70
Chronic ischaemic heart disease	I25	39
Pulmonary embolism	I26	4
Cardiomyopathy	I42	6
Cerebrovascular diseases	I60-I69	13
Other circulatory	I00-I99	10
Diseases of the respiratory system	J00-J99	29
Pneumonia	J12-J18	9
Emphysema	J43	11
Other chronic obstructive pulmonary disease (COPD)	J44	3
Other respiratory system diseases	J00-J99	6
Diseases of the digestive system	K00-K93	8
Diseases of the musculoskeletal system and connective tissue	M00-M99	1
Diseases of the genitourinary system	N00-N99	2
Congenital malformations, deformations and chromosomal abnormalities	Q00-Q99	1
External causes of morbidity and mortality	V01-Y98	24

Summary Statistics



Not an Epidemiological Study

As stated by Gold and Kathren, "rigorous statistical comparison of causes of death in [the USTUR] cohort with the general population, or indeed with any other group is clearly inappropriate."

- Self-selected, typically in advance of death, but sometimes having been received a terminal diagnosis such as cancer
- Healthy worker effect
- Some Registrants enrolled post-mortem

References

- Gold and Kathren. Health Phys 75(3): 236-240; 1998
- World Health Organization. <http://www.who.int/classifications/icd/en/>. Accessed August 29, 2018.

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