Department of Radiation Sciences, Institute of Radiation Protection
Research Group “Radiation risk”

Comparison of ProZES and IREP

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Appendix 3 of the final ProZES report (edited in April 2016)
Details on the program comparison

IREP
NCI version 5.6.1 (run in July 2015 – April 2016)

ProZES
version 2—2.3 (run in May 2015 – April 2016)

Comparison scenarios:

• Diagnose groups in ProZES and matching diagnoses in IREP
• Attained age 70
• Males and females
• Single acute 1-Sv-exposure (low-LET) at ages 20 and 50
• $30 \times 33$-mSv-exposures (low-LET) at ages 20...49
• 100-, 300-, 700-WLM-exposures to radon at ages 20, 40 , and 60
Statistical support for modelling radiation risk of cancer

- BCNS group – 281 cases (5% attr.)
- DIG group – 4083 cases (2.8% attr.)
- GNF1 group (cervical) – 978 cases (0.45% attr.)
- GNF2 group (other female genital) – 479 cases (2.7%)
- GNM group – 403 cases (1.1—1.6% attr.)
- Leukemia L1 (ALL and other) – 39 cases
- Leukemia L2 group (CLL+lymphomas) – 448 cases
- Leukemia L3 group (AML and related) – 173 cases
- Leukemia L4 group (CML) – 73 cases
- Leukemia L5 group (MM) – 136 cases
- SKIN group (non-melanoma) – 330 cases (11.7% attr.)
- Thyroid – 471 cases
- URI group – 741 cases (7.9%)
BCNS – eye, brain and central nervous system (ICD10:C69-C72)
Male, single 1-Sv-exposure at ages 20 or 50
BCNS – eye, brain and central nervous system (ICD10:C69—C72)
Female, single 1-Sv-exposure at ages 20 or 50
BCNS – eye, brain and central nervous system (ICD10:C69—C72)
Male, 30 × 33-mSv-exposures at ages 20...49
BCNS – eye, brain and central nervous system (ICD10:C69—C72)
Female, 30 × 33-mSv-exposures at ages 20...49
DIG – organs of digestive tract (C00-C14, C15, C17, C19-C26)
Male, 30 × 33-mSv-exposures at ages 20...49

Male (DIG) multiple exposures

Assigned share

Probability

- ProZES(LDR) DIG
- IREP-NCI (chronic) Oral Cavity, Pharynx
- IREP-NCI-(chronic) Esophagus
- IREP-NCI-(chronic) Rectum
- IREP-NCI-(chronic) Liver
- IREP-NCI-(chronic) Gallbladder
- IREP-NCI-(chronic) Pancreas
DIG – organs of digestive tract (C00-C14, C15, C17, C19-C26)
Female, 30 × 33-mSv-exposures at ages 20...49
GNF1, GNF2 – female genital organs, excl. breast (ICD10:C51-C58)
Female, single 1-Sv-exposure at age 20
GNF1, GNF2 – female genital organs, excl. breast (ICD10:C51-C58)
Female, single 1-Sv-exposure at age 50
GNF1, GNF2 – female genital organs, excl. breast (ICD10:C51-C58)
Female, 30 × 33-mSv-exposures at ages 20...49

Female (ICD10: C53, C51-52, C54-58)
multiple exposures

- ProZES(LDR) GNF1
- ProZES(LDR) GNF2
- IREP-NCI (chronic) Ovary
- IREP-NCI(chronic) Female Genitalia*
GNM – male genital organs, excl. testes (ICD10:C60, C61, C63)
Male, Single 1-Sv-exposure at ages 20 or 50
GNM – male genital organs, excl. testes (ICD10:C60, C61, C63)
Male, 30 × 33-mSv-exposures at ages 20…49
Leukemia group L1
ALL, prolymphocytic leukemia of B-cell type, lymphoid leukemia
Male, single acute 1-Sv-exposure at ages 20 or 50
Leukemia group L1
ALL, prolymphocytic leukemia of B-cell type, lymphoid leukemia
Female, single acute 1-Sv-exposure at ages 20 or 50
Leukemia group L1
ALL, prolymphocytic leukemia of B-cell type, lymphoid leukemia
Male, 30 × 33-mSv-exposure at ages 20...49
Leukemia group L1
ALL, prolymphocytic leukemia of B-cell type, lymphoid leukemia
Female, 30 × 33-mSv-exposure at ages 20...49
Leukemia group L2
CLL, Hodgkin- and non-Hodgkin lymphomas, hairy cell leukemia
Male, single acute 1-Sv-exposure at ages 20 or 50
Leukemia group L2
CLL, Hodgkin- and non-Hodgkin lymphomas, hairy cell leukemia
Female, single acute 1-Sv-exposure at ages 20 or 50
Leukemia group L2
CLL, Hodgkin- and non-Hodgkin lymphomas, hairy cell leukemia
Male, 30 × 33-mSv-exposure at ages 20...49
Leukemia group L2
CLL, Hodgkin- and non-Hodgkin lymphomas, hairy cell leukemia
Female, 30 × 33-mSv-exposure at ages 20...49

Female (ICD10:C81-85,C88,C91.1,C91.4)
multiple exposures

Assigned share

Probability
Leukemia group L3
AML and related
Male, single 1-Sv-exposure at ages 20 or 50
Leukemia group L3
AML and related
Female, single 1-Sv-exposure at ages 20 or 50
Leukemia group L3
AML and related
Male, 30 × 33-mSv-exposures at ages 20...49
Leukemia group L3
AML and related
Female, 30 × 33-mSv-exposures at ages 20...49
Leukemia group L4
CML
Male, single 1-Sv-exposure at ages 20 or 50
Leukemia group L4
CML
Female, single 1-Sv-exposure at ages 20 or 50
Leukemia group L4
CML
Male, 30  33-mSv-exposures at ages 20...49
Leukemia group L4
CML
Female, 30 33-mSv-exposures at ages 20...49
SKIN – non-melanoma skin cancer (ICD10:C44)
Male, single 1-Sv-exposure at ages 20 or 50
SKIN – non-melanoma skin cancer (ICD10:C44)
Female, single 1-Sv-exposure at ages 20 or 50
SKIN – non-melanoma skin cancer (ICD10:C44)
Male, 30 × 33-mSv-exposures at ages 20...49

Graph showing probability against assigned share for different exposure scenarios:
- ProZES(LDR) SKIN
- IREP-NCI (chronic) 173(Basal)
- IREP-NCI (chronic) 173(Squamous)
SKIN – non-melanoma skin cancer (ICD10:C44)
Female, $30 \times 33$-mSv-exposures at ages 20...49
Thyroid (ICD10:C73)
Male, single 1-Sv-exposure at ages 20 or 50
Thyroid (ICD10:C73)
Female, single 1-Sv-exposure at ages 20 or 50

Female (ICD10:C73)
single 1-Gy-exposure
Thyroid (ICD10:C73)
Male, 30 × 33-mSv-exposures at ages 20...49
Thyroid (ICD10:C73)
Female, 30 × 33-mSv-exposures at ages 20...49
Group URI – cancers of urinary organs (ICD10:C64—68)
Male, single 1-Sv-exposure at ages 20 or 50

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**Assign share vs Probability**

- ProZES (HDR, e=20 a) URI
- ProZES (HDR, e=50 a) URI
- IREP-NCI (acute, e=20 a) Bladder
- IREP-NCI (acute, e=50 a) Bladder
- IREP-NCI (acute, e=20 a) Urinary organs
- IREP-NCI (acute, e=50 a) Urinary organs

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Helmholtz Zentrum München
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ProZES
Group URI – cancers of urinary organs (ICD10:C64—68)
Female, single 1-Sv-exposure at ages 20 or 50
Group URI – cancers of urinary organs (ICD10:C64—68)
Male, 30  33-mSv-exposures at ages 20...49
Group URI – cancers of urinary organs (ICD10:C64—68)
Female, 30  33-mSv-exposures at ages 20...49
Group LUNG—cancers of trachea, bronchus and lung (ICD10: C33-34)
Male, exposure to radon at 100 WLM
Group LUNG—cancers of trachea, bronchus and lung (ICD10: C33-34)
Male, exposure to radon at 300 WLM
Group LUNG—cancers of trachea, bronchus and lung (ICD10: C33-34)
Male, exposure to radon at 700 WLM
Group LUNG—cancers of trachea, bronchus and lung (ICD10: C33-34)
Female, exposure to radon at 100 WLM
Group LUNG—cancers of trachea, bronchus and lung (ICD10: C33-34)
Female, exposure to radon at 300 WLM
Group LUNG—cancers of trachea, bronchus and lung (ICD10: C33-34)
Female, exposure to radon at 700 WLM