W. Wertelecki, M.D.

Altered Child Development Patterns *(teratogenesis)* in a Chornobyl Ionizing Radiation Impacted Region in Ukraine (Rivne Polissia)

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THIS PRESENTATION WILL BE SHORTENED TO 10-15 MINUTES

A FULLER POWER-POINT "VOICED" VERSION IS AVAILABLE UPON REQUEST

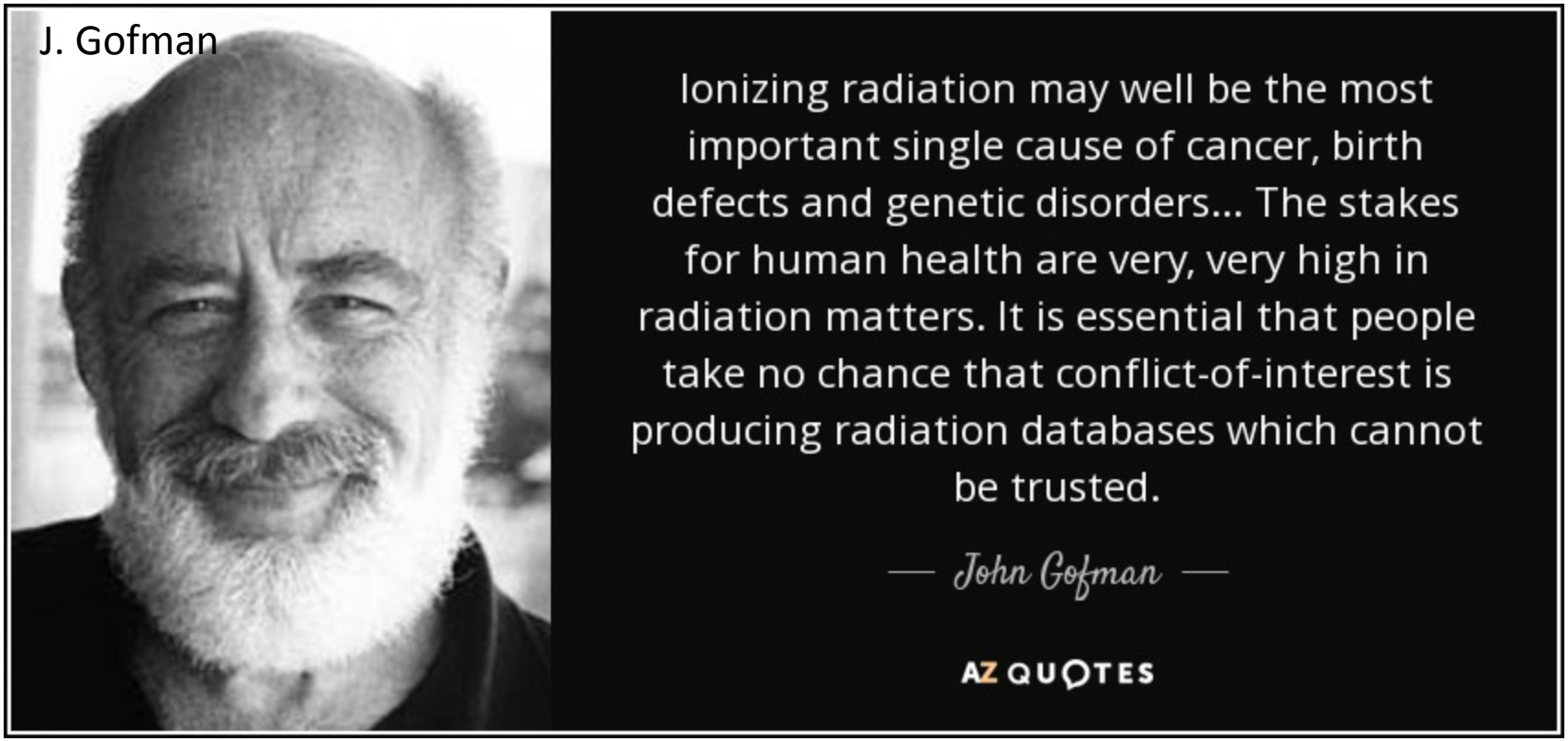
EUROPE SHOULD BE AWARE/CONCERNED
ABOUT CHORNOBYL IMPACTS ON CHILD DEVELOPMENT

1986 - Soviet (Gorbachev) Regime

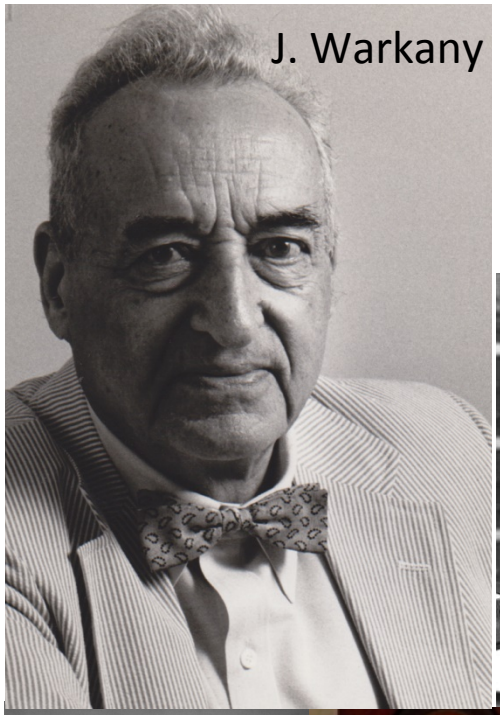
nanos gigantum humeris insidentes

Blind *Orion Searching for the Rising Sun*

1986-1998 Chornobyl … Adults > Cancer … Teratogenesis?

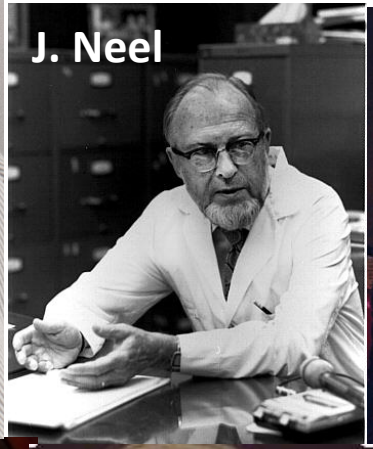


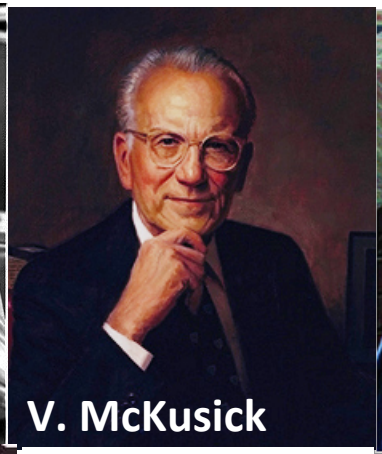
IONIZING RADIATION > MPACTS ON HUMAN EMBRYOS
LONG-TERM > LARGE POPULATION > MULTI-DISCIPLINARY

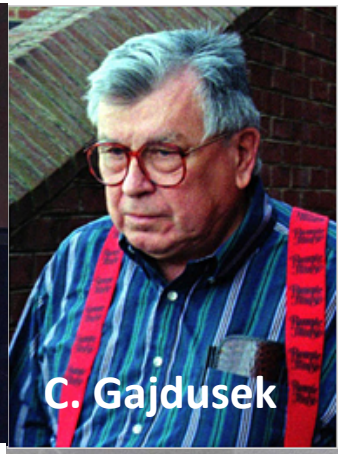


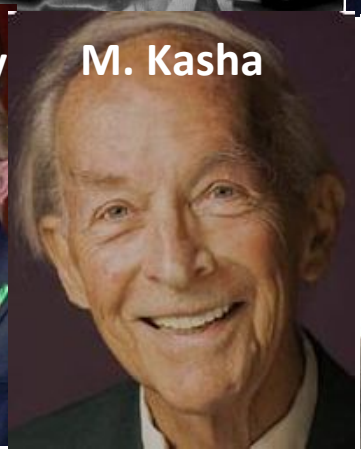
1988-9 > "LIQUIDATORS" – CANCER … ~~BIRTH DEFECTS~~

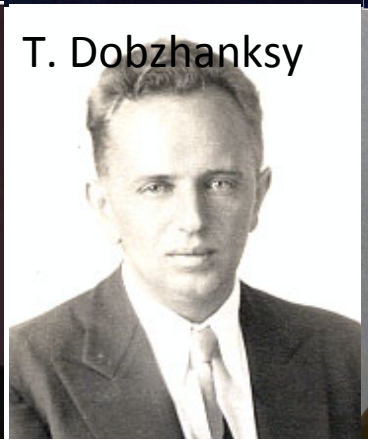
1999 > Debate over the scope of effects > Re-Ignited.

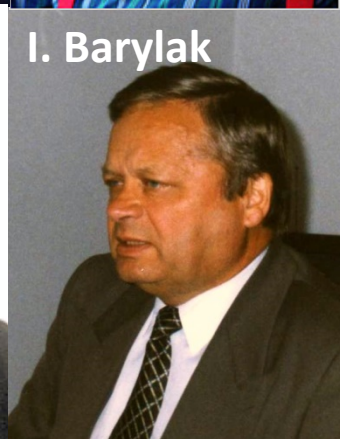










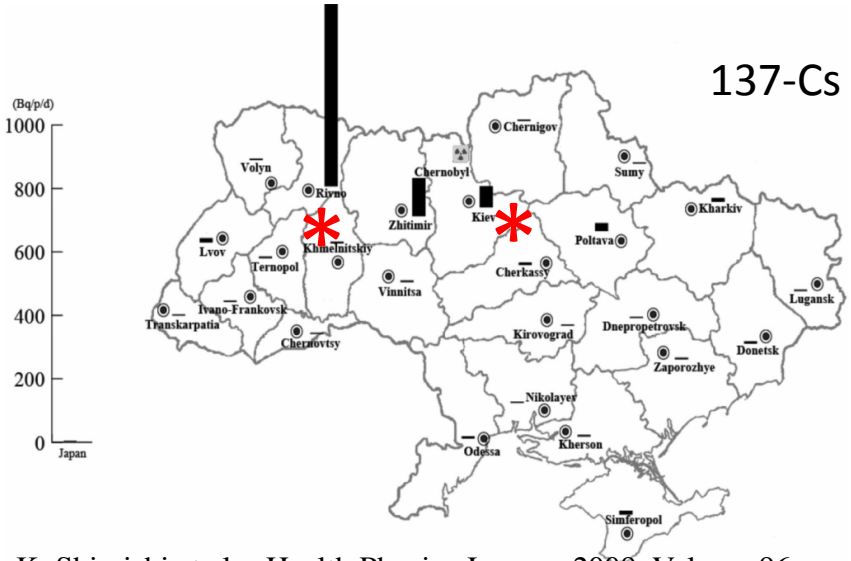


2000 - STARTED POPULATION-BASED BIRTH DEFECTS MONITORING

2016 – ongoing

Teratogenesis

POLISSIA



137-Cs

K. Shiraishi et al. - Health Physics January 2009, Volume 96,

Alcohol
Rubella
Folate deficits
…

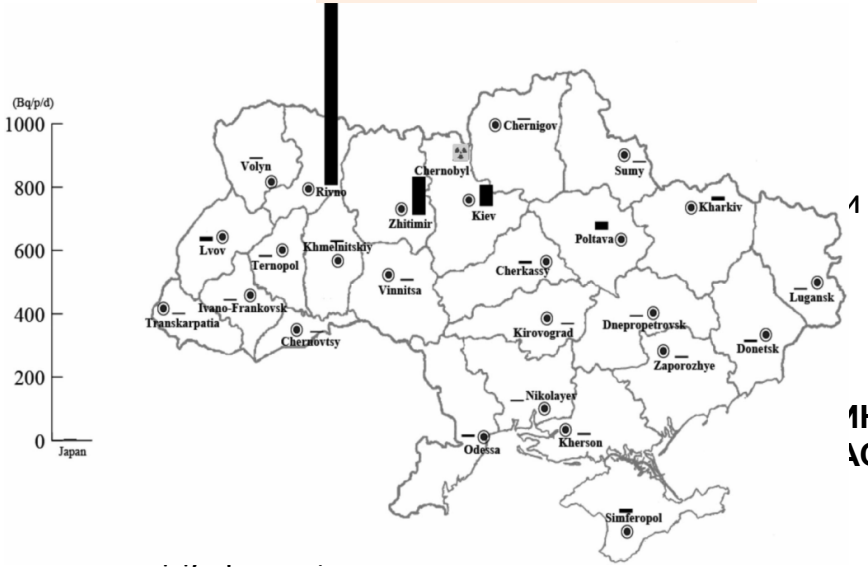
Birth Defects Prevention
Omni-Net Ukraine

Polissia

137-Cs Mobility

Birth Defects Prevention
Omni-Net Ukraine

RIVNE – POLISSIA



З – Рокитненський

Інші місця

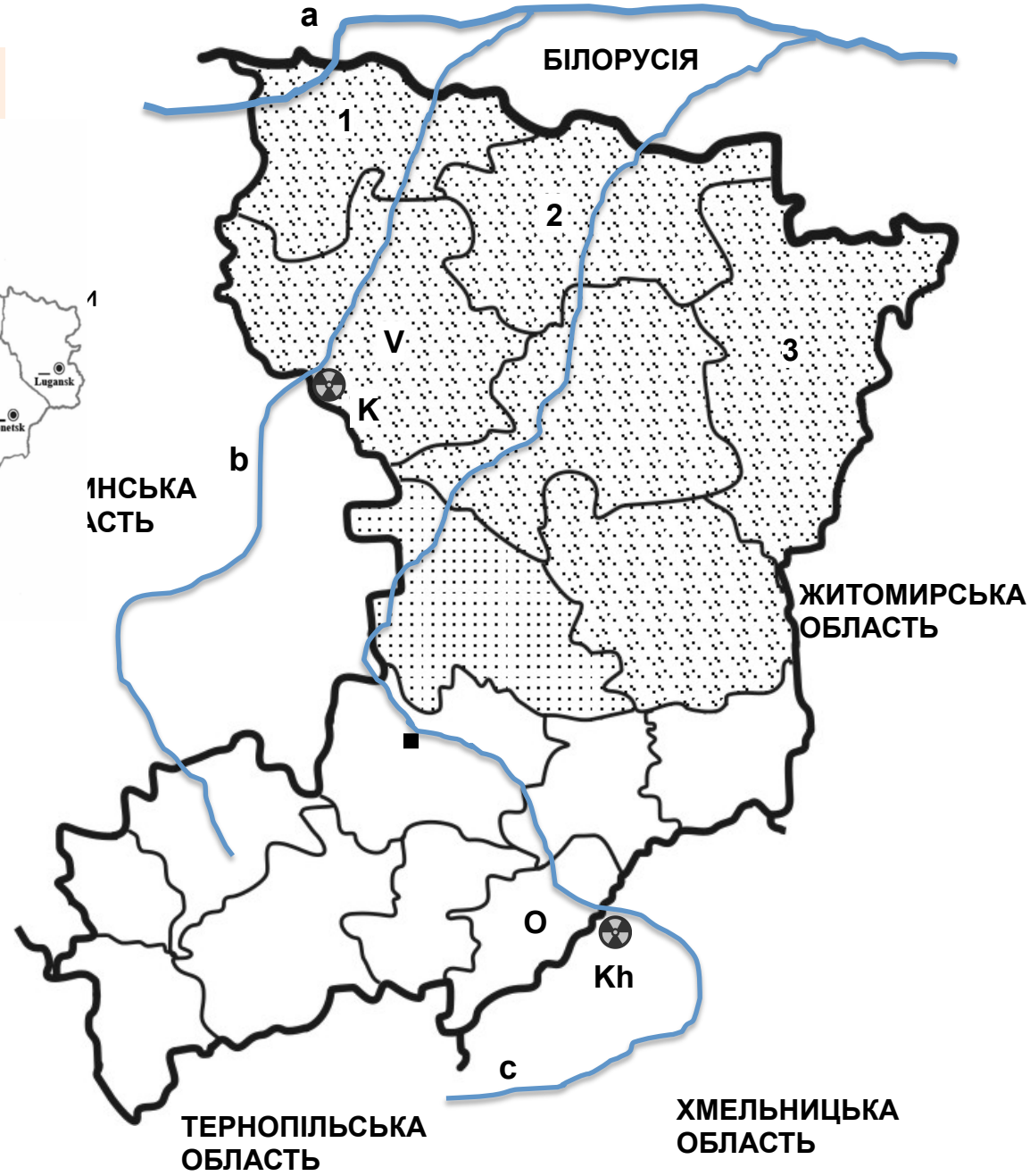
V – Володимирецький район

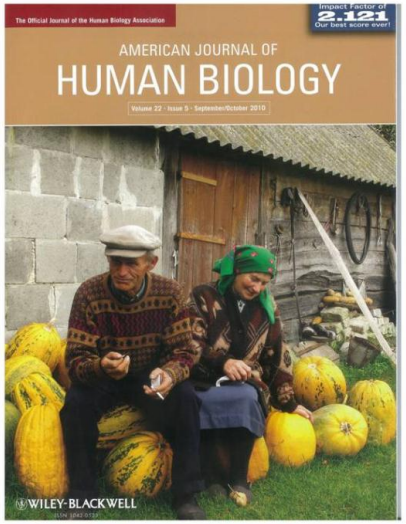
К – м. Кузнецовськ - АЕС

О – Острозький район

Kh – м. Нетішин – Хмельницька АЕС

a, b, c – річки Прип’ять, Стир і Горинь



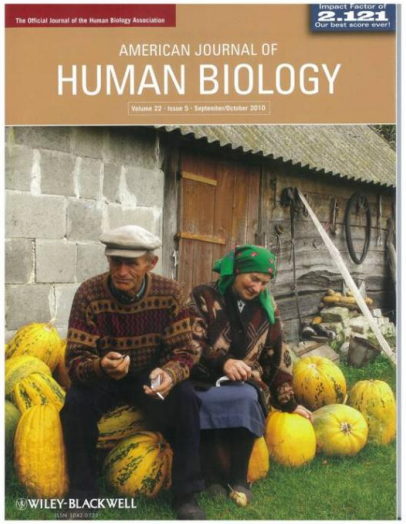


POLISSA – POLISHCHUKS
Native Population Isolate
Endogamy

Chornobyl ionizing radiation
Soils – low 137Cs binding
high transfer to BIOTA

Subsistence Life-style
High consumption of local nutrients

Chronic radiation exposure in the Rivne-Polissia region of Ukraine*: implications for Birth Defects* Am J Hum Biol. 2010 Sep-Oct; 22(5):667-74.



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NIH National Institute on Alcohol Abuse and Alcoholism
CIFASD is supported by NIAAA

Alcohol in Polissia **is not** the primary teratogenic risk

Wertelecki et al. OMNI-Net 2014

IONIZING RADIATION > prenatal - child development … cancer

(***Teratogens)***

*(**alcohol,** micro-nutrients …)*

TRANS-GENERATIONAL

Exposures

External > Internal > **incorporated**

Nuclides

137-Cs, **Sr90 … Tritium …**

Sensitivity – **Repair**

An embryo is NOT a small healthy adult

Phenotypes

gene/chromosome mutations, apoptosis, agenesis, **dysgenesis, dysplasia, neoplasia**

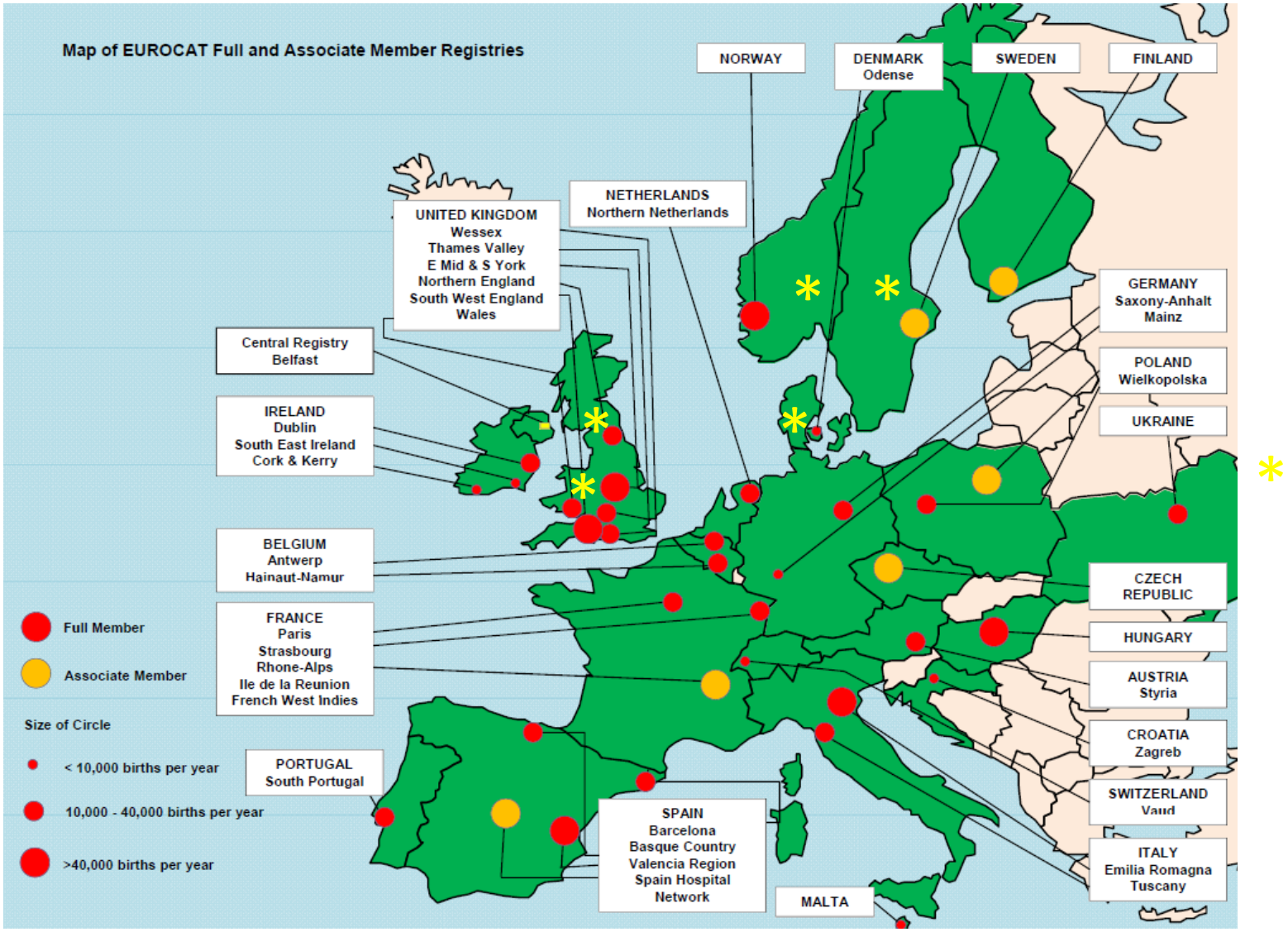
infertility/dis-fertility, "gene" disorders, mental disorders, cancer …

CONCURRENTLY OBSERVED "BIRTH-DEFECTS" **POPULATION-BASED RATES**

CREDIBILITY > METHODS > LARGE POPULATION-BASED DATA > LONG TERM TRENDS > …

eurocat
european surveillance of congenital anomalies

EUROCAT Partners
Relatively Uniform Methods



In POLISSIA

Statistically significantly **higher population rates of Congenital Anomalies** (alcohol is NOT a primary cause for the contrast with the rest of Rivne)

Statistically significantly **higher incorporated levels of 137-Cs by pregnant women** residing in in Polissia than in those residing in not-Polissia

BLASTOPATHIES – early manifesting malformations

Polissia Population Rates are among the highest in Europe

Conjoined twins, teratomas (sacrum)and tongue), Neural Tube Defect (NTD), in this instance anencephaly, not shown are microcephaly, microphthalmia, etc.

2000 START of POPULATION MONITORING and REPORTS

American Academy of Pediatrics

PEDIATRICS
OFFICIAL JOURNAL OF THE AMERICAN ACADEMY OF PEDIATRICS

Malformations in a ***Chornobyl-Impacted Region*****. 2010** Apr;125(4): e836-43.

THE JAPANESE TERATOLOGY SOCIETY

Blastopathies and microcephaly in a ***Chornobyl impacted region*** *of Ukraine.* **2014** Aug; 4(3) :125-49.

THE TERATOLOGY SOCIETY

Birth Defects Research Part A | Clinical and Molecular Teratology

Research Article

Elevated congenital anomaly rates and incorporated cesium-137 in the Polissia region of Ukraine **2016** March;106,194-200.

Table R1 Infant Mortality Rates*

Period	North Polissia	Central Polissia	Not Polissia
1981-1985	17.89	15.51	15.52
1986-1990	15.93	13.65	14.50
1991-1995	16.55	13.69	13.50
1996-2000	14.05	12.96	13.80
2001-2005	12.10	9.27	10.57
2006-2010	11.57	8.82	9.53

Table R2 Congenital Anomalies (CA)[1] in Polissia and not-Polissia in Rivne Province (2000-2014) *2016-03-04sl*

Categories	Polissia	Rate	Not Polissia	Rate	Polissia vs. Not Polissia		
					OR	P-value	CL
Core CA							
NTD[2]	244	**21.3**	179	**15.3**	1.39	<0.001	1.14, 1.70
Cephalad[3]	99	**8.6**	74	**6.3**	1.36	<0.05	0.99, 1.87
Microcephaly[4]	80	**7.0**	61	**5.2**	1.34	<0.05	0.95, 1.90
Isolated	24	**2.1**	19	**1.6**	-	n/s	-
Microphthalmia[5]	24	**2.1**	10	**0.9**	2.45	<0.01	1.13, 5.73
Isolated	12	**1.0**	7	**0.6**	-	n/s	-

Table R6: Congenital Anomalies Rates in Rivne and Europe. *2016-01-26*

Categories[a]	Births[c]	ceph-NTD	MIC	mOPH
Rivne (2000-2014)	232770	~~7.43~~	~~6.19~~	~~1.98~~
Polissia	115246	8.59	7.12	2.86
Not-Polissia	117524	6.30	5.28	1.11
EUROCAT Registries (2005-2012) (b)*				
NORTHERN ENGLAND (UK)	266965	6.18	1.46	0.67
Wales (UK)	279411	4.97	4.80	1.54
East Midlands & South Yorkshire (UK)	586611	5.22	1.07	0.32
Wessex (UK)	237933	5.88	1.34	0.63
Thames Valley (UK)	240687	5.11	1.04	0.71
South West England (UK)	395882	4.47	4.34	1.06
All 34 EUROCAT Full Member Registries	6680502	3.63	2.81	1.00

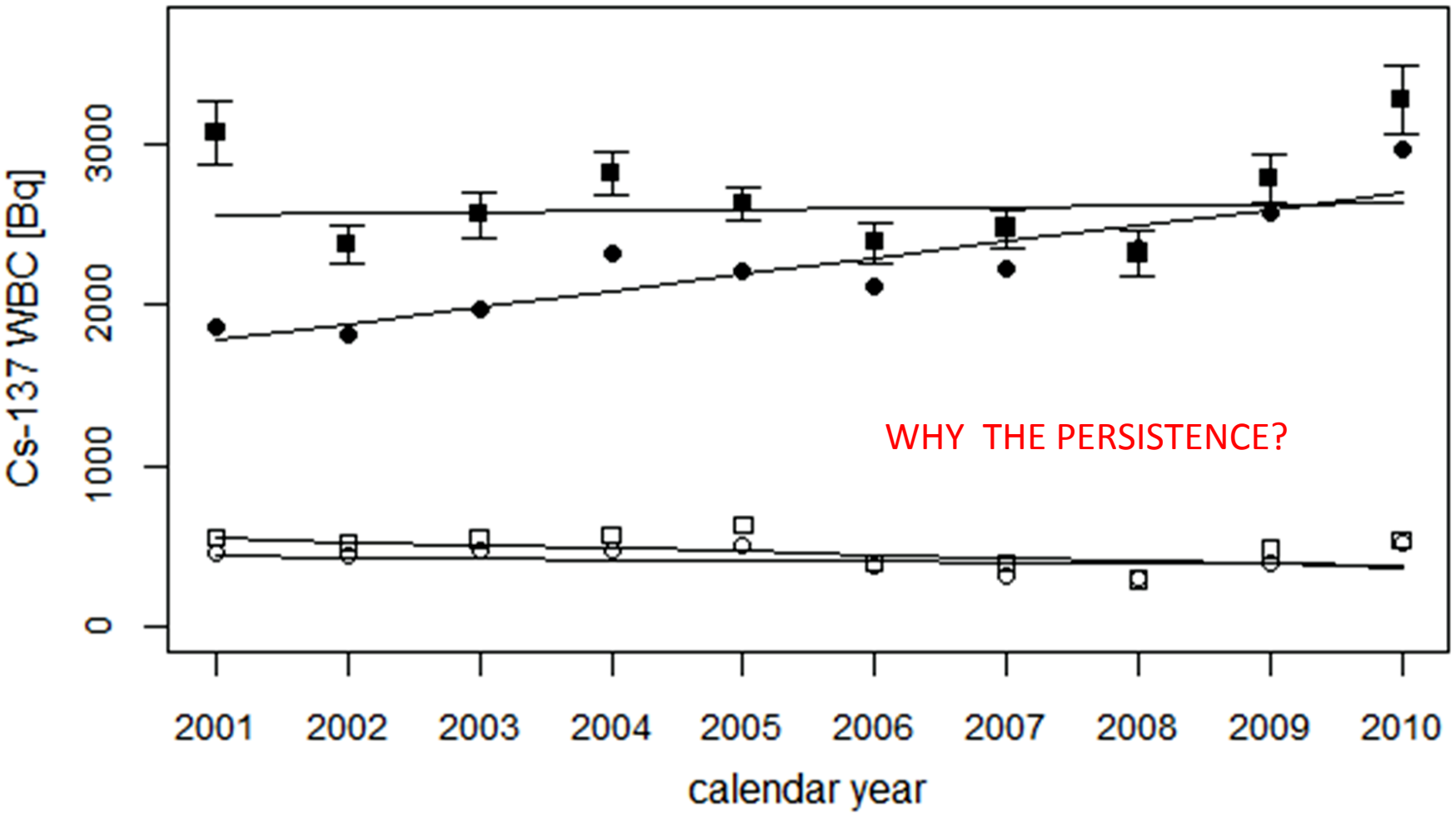
Table 4. Mean WBCs of Pregnant Women by Region and Season, 2011-2013, Rivne Province[1]

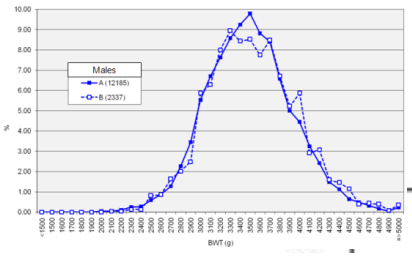
Category	N	Mean WBC (Bq)	SD	SE[4]
Rivne	3492	1943	2326	39.36
Polissia	2073	2767	2666	58.55
non-Polissia	1419	738	696	18.48

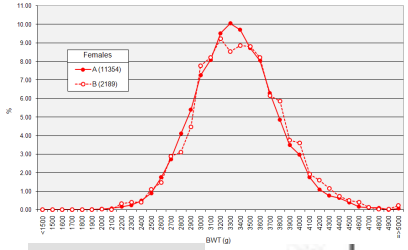
(1) Whole body counts of cesium-137 (WBC). (2) November-April.
(3) May-October. (4) SE = SD/sqrt(N).

Table R13: Mean Whole Body Counts (WBC Bq) of 137-Cs.

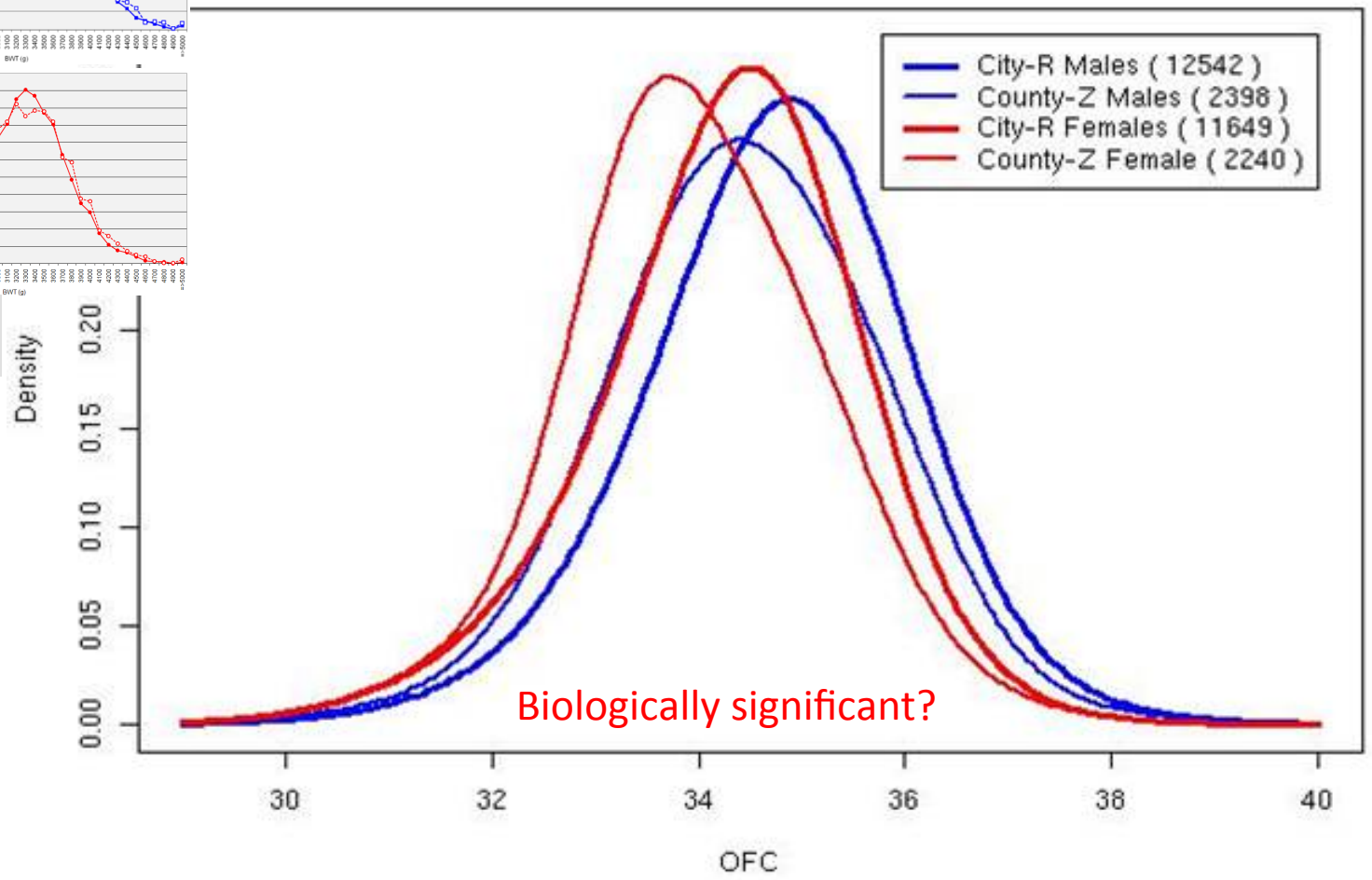
Area	WBC, Bq[1]			
	Women[2]		Pregnant[3]	
	N	Mean	N	Mean
North Polissia	**5054**	**4365**	**1036**	**3808**
Central Polissia	13196	1403	1882	1856
Not-Polissia	7344	435	1877	713
~~**Rivne province**~~	25594	~~1710~~	~~4795~~	~~1830~~


Cs-137 WBC [Bq]
0
1000
2000
3000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
calendar year
WHY THE PERSISTENCE?



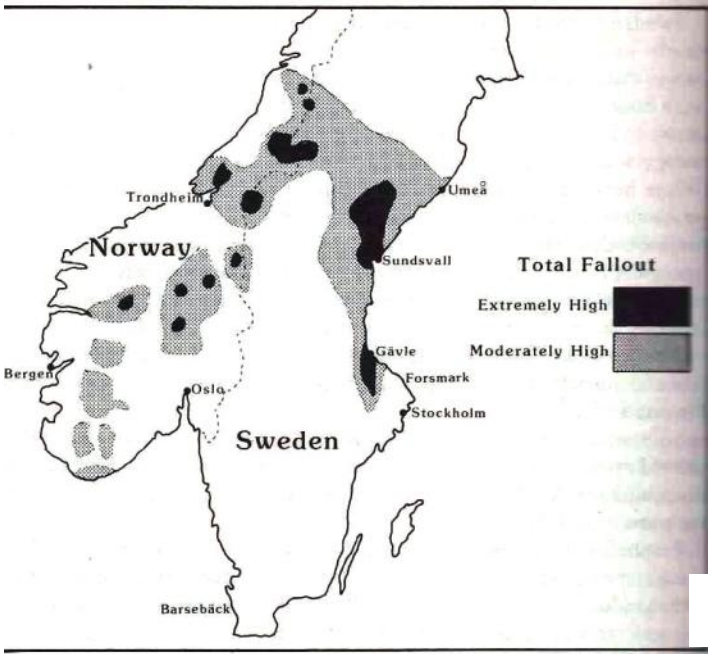


M : F A
city 1.07
B county 1.07



Distributional differences permutation test - differences p-value <0.0001

2011-09-23a



igure 4 The general pattern of Chernobyl's fallout over Sweden and Norway. The areas of moderate and high intensity match the patterns of rainfall almost exactly.

COGNITION
MENTAL STABILITY

DOUGLAS ALMOND
LENA EDLUND
MÅRTEN PALME

CHERNOBYL'S SUBCLINICAL LEGACY: PRENATAL EXPOSURE TO RADIOACTIVE FALLOUT AND SCHOOL OUTCOMES IN SWEDEN*

The Quarterly Journal of Economics, November 2009

Heiervang, K. S., Mednick, S., Sundet, K. & Rund, B. R. (2010). *Effect of low dose ionizing radiation exposure in utero on cognitive function in adolescence.* Scandinavian Journal of Psychology, 51, 210–215.

PAN-EUROPEAN ISSUE

COLLABORATIVE INTERNATIONAL STUDIES
causes – effect

MORE PARTNERS ARE NEEDED

PREVENTION
Radiation exposures and rates of malformations CAN be reduced
MORE PARTNERS ARE NEEDED

CURRENT PROJECT
Publish multi-lingual Report (data + perspectives)
MORE PARTNERS ARE NEEDED

Birth Defects Prevention
Omni-Net Ukraine

omninet@gmail.com
http://www.ibis-birthdefects.org/start/uabdp.htm

Запобігання вродженим вадам
ОМНІ-Мережа Україна