

Cancer in AYAs

Epidemiology, Mortality, Survival - USA

Policy Implications
Institute of Medicine
Washington, DC

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Archie Bleyer, MD

Department of Radiation Medicine, Knight Cancer Institute



Cancer in AYAs

Epidemiology, Mortality, Survival - USA

- Incidence Trends
- Cancer Invasive and “Non-Invasive”
- Death Trends
- Survival Trends
- Affordable Care Act Effect

Cancer in AYAs

Epidemiology, Mortality, Survival - USA

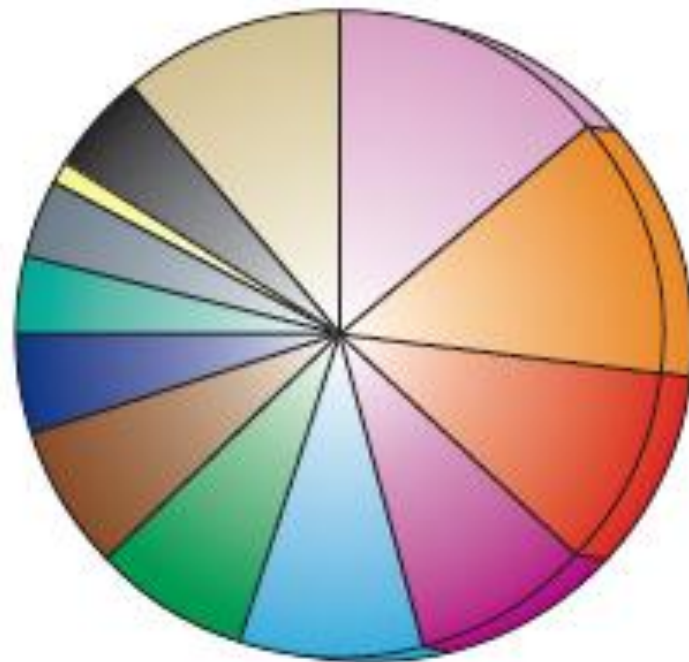
- Incidence Trends

The distinctive biology of cancer in adolescents and young adults

nature
REVIEWS

Archie Bleyer^{*,†}, Ronald Barr[§], Brandon Hayes-Lattin^{||}, David Thomas[‡],
Chad Ellis[#] and Barry Anderson^{**}, on behalf of the Biology and Clinical Trials
Subgroups of the US National Cancer Institute Progress Review Group in
Adolescent and Young Adult Oncology *Nature Reviews Cancer* 8(4):288-298, 2008.

Age 15-39

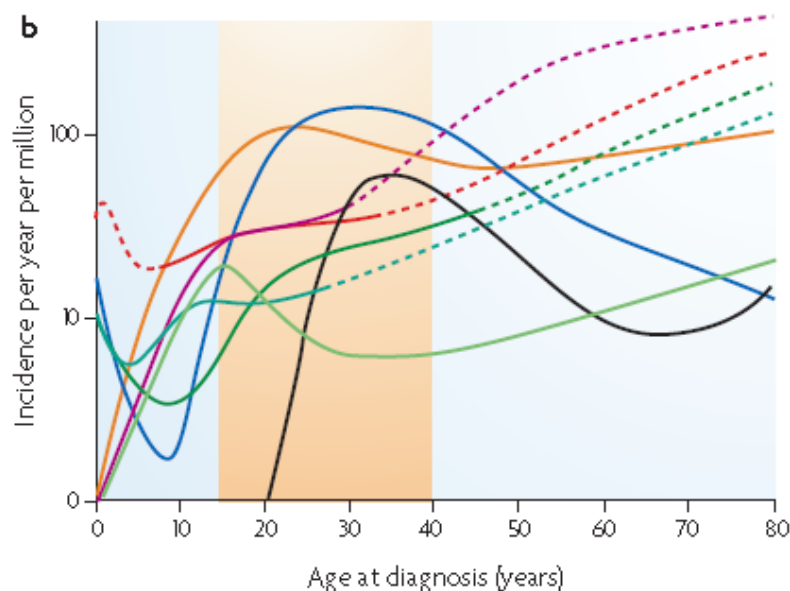


- Breast cancer 14%
- Lymphoma 13%
- Melanoma 10%
- Female genital tract cancer 9%
- Thyroid cancer 9%
- Soft-tissue sarcoma* 8%
- *Excluding Kaposi sarcoma
- Testicular cancer 7%
- Colorectal cancer 5%
- Leukaemia 4%
- CNS tumours 4%
- Bone sarcoma 1%
- Kaposi sarcoma 5%
- Other 11%

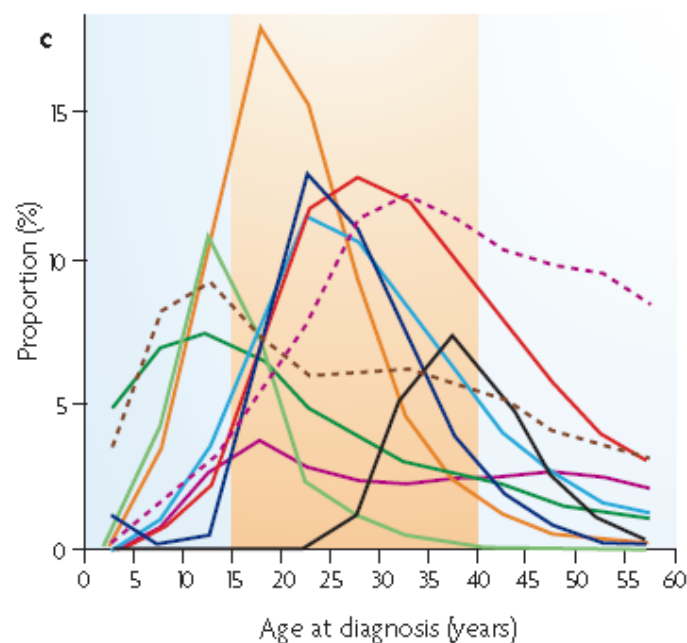
The distinctive biology of cancer in adolescents and young adults

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— Ovarian cancer (in females)	— Hodgkin lymphoma
— AML	— Bone sarcomas
— Soft-tissue sarcoma excluding Kaposi sarcoma	— Testicular cancer (in males)
— CML	— Kaposi sarcoma



— Bone sarcomas	— Testicular cancer
— Soft-tissue sarcoma excluding Kaposi sarcoma	— Thyroid cancer
— Melanoma	— Hodgkin lymphoma
— Cancer of uterine cervix	— Non-Hodgkin lymphoma
— Ovarian cancer	— Kaposi sarcoma

Average Annual % Change (APC) in Incidence of Cancers in AYAs by Age at Diagnosis 2000-2010 SEER18 (28% of U.S.)

p < .05

APC:	1-2%	2-3%	>3%
Increase in Incidence			X.X
Decrease in Incidence			X.X

Cancer	Age at Diagnosis (Years)					
	<15	15-29	30-44	45-59	60-74	75+
Thyroid carcinoma	4.2	4.0	6.2	6.7	7.3	6.0
Renal carcinoma		8.2	5.3			
Colorectal carcinoma						
* Testicular carcinoma						
Acute lymphoblastic leukemia						
** Breast cancer						
Hepatic carcinoma				5.3	3.6	
Medulloblastoma/PNET						
Astrocytoma***						
Ependymoma***					2.7	
Acute myeloid leukemia						
Acute monocytic leukemia						
Chronic myelogenous leukemia						
Hodgkin lymphoma						
Non-Hodgkin lymphoma						
Osteosarcoma						
Chondrosarcoma						
Ewing tumor						
Non-RMS-KS^ soft-tissue sarcoma	2.3					
Nasopharyngeal carcinoma	11.0				-3.7	
Tongue & salivary carcinoma						
Adrenocortical carcinoma						
** Ovarian carcinoma						
** Cervix uteri cancer		-3.1				-3.8
Melanoma						4.1
Carcinoma of lung			-4.9			

AYA

Age at Diagnosis (Years)

<15 15-29 30-44 45-59 60-74 75+

* In males ** in females
*** excluding non-malignant
^ Kaposi sarcoma

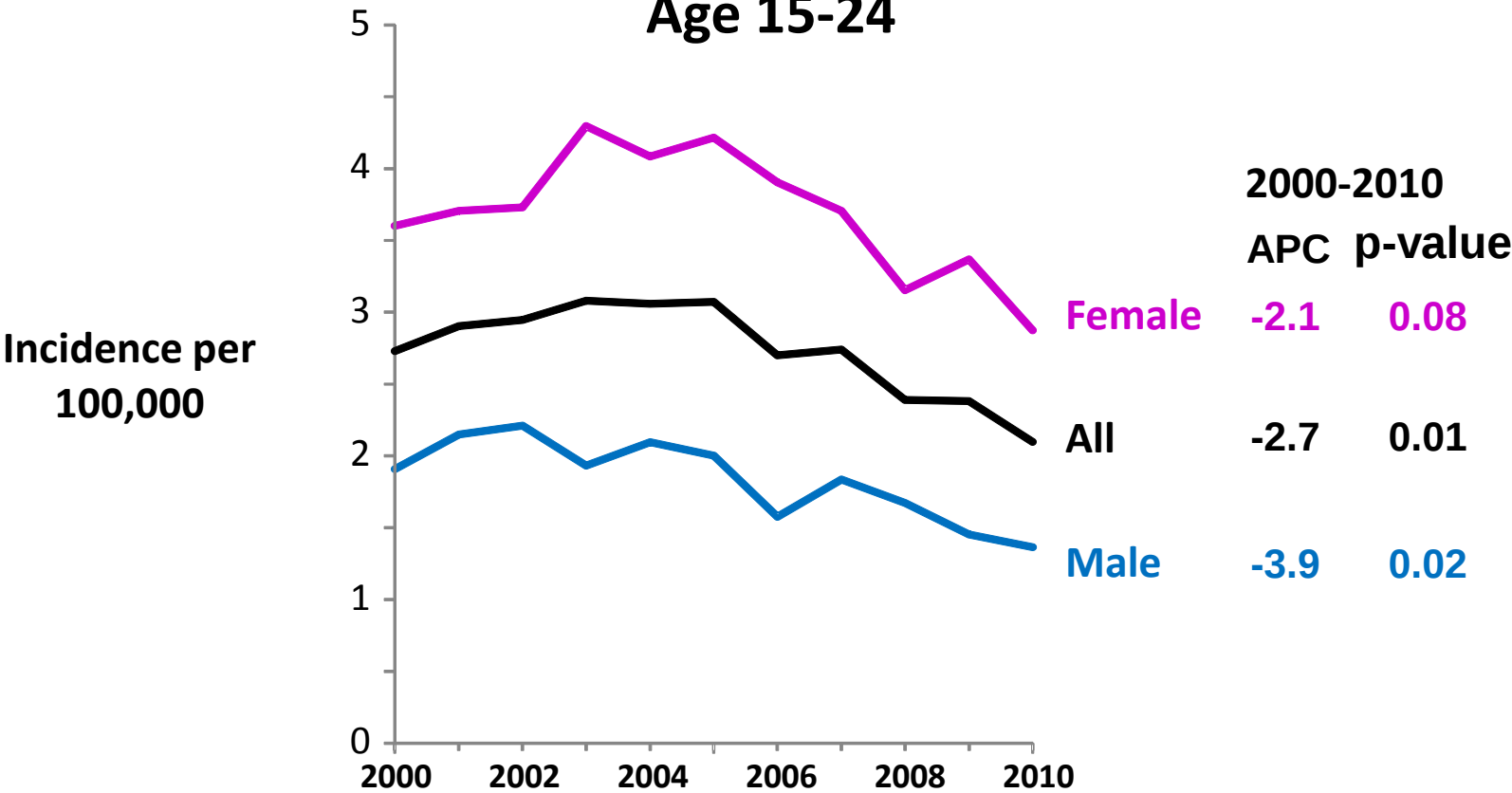
Incidence of Childhood and Adolescent Melanoma in the United States: 1973–2009

Wong JR, Harris JK, Rodriguez-Galindo C, Johnson KJ
NCI, Wash U. Dana Farber

Pediatrics 2013; 131:5 846-854; epub **April 15, 2013**, doi:10.1542/peds.2012-2520

*Pediatric melanoma increased by an average of 2% / year (95% CI, 1.4%–2.7%).
The only decreased trend observed was 15-19 y/o in high UV-B exposure sites after 1985*

Annual Incidence of Melanoma, 2000-2010, SEER18
Age 15-24



Incidence Trends: Summary

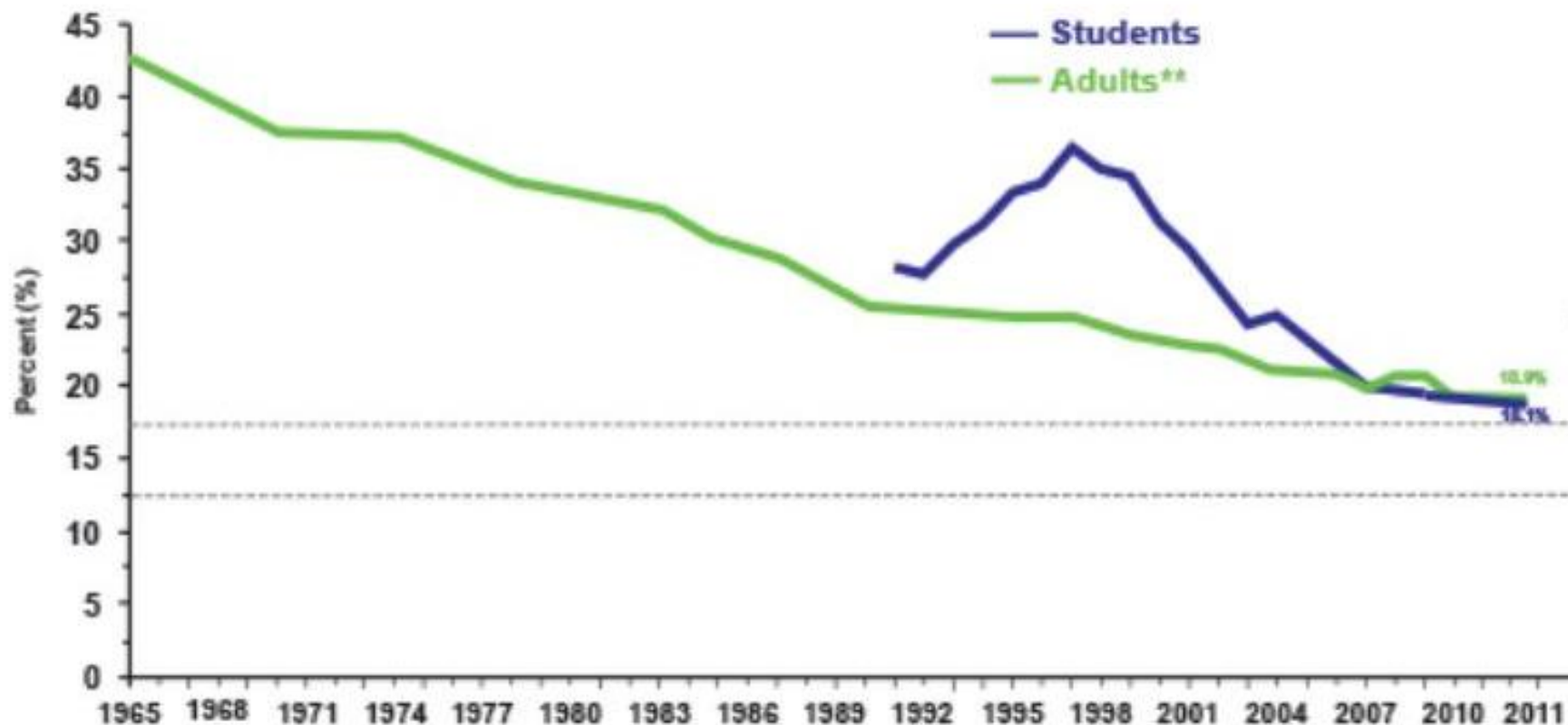
- **Thyroid and kidney carcinoma are dramatically increasing in AYAs and older adults**
 - **Kidney cancer is increasing more in AYAs than in any other age group**
 - **Thyroid cancer is also increasing in children**
- **Colorectal and testis carcinoma is increasing in young AYAs but not as rapidly as thyroid and kidney cancer.**
- **ALL was increasing in and only in AYAs.**
- **Breast cancer may be increasing in young AYAs during the past decade.**
- **Lung cancer declined in older AYAs as did melanoma and carcinoma of the cervix in young AYAs.**

Incidence Trends: Explanations?

- The good news for melanoma and lung cancer may have resulted from successful skin cancer prevention campaigns and the inclusion of the whole state of California in SEER18 and its statewide anti-tobacco initiatives.
- The dramatic increase in thyroid and kidney cancer is likely due increased ease of detection due to advances in diagnostic imaging (ultrasound, etc.).*
- The increase in colorectal carcinoma incidence may be due to an increase in HPV-associated rectal cancer and increased detection (colonoscopy).

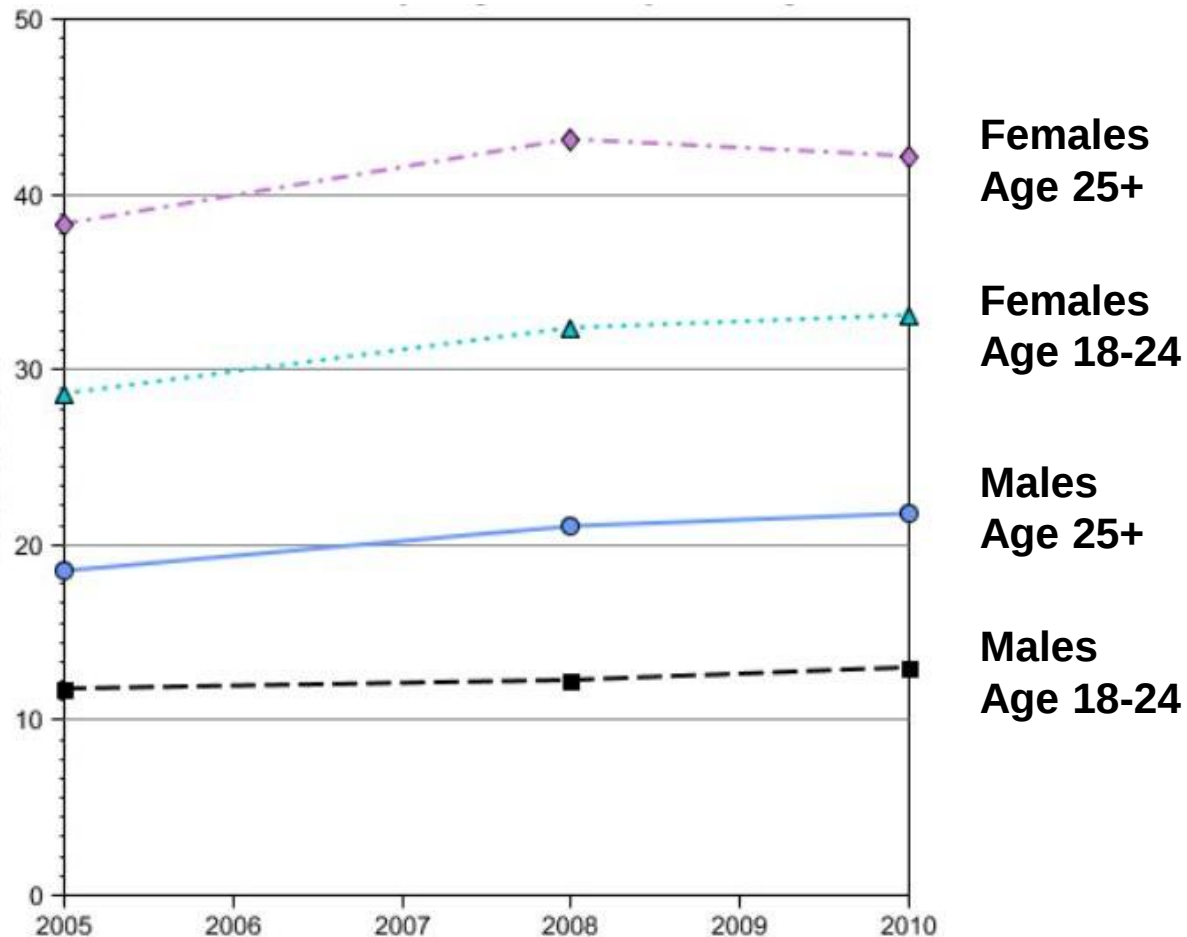
*This raises the question of **overdiagnosis** and unnecessary therapy, primarily radio-iodine for thyroid cancer and surgery for renal cancer.

Cigarette Smoking Trend in U.S. High School Students and Adults, 1965-2011



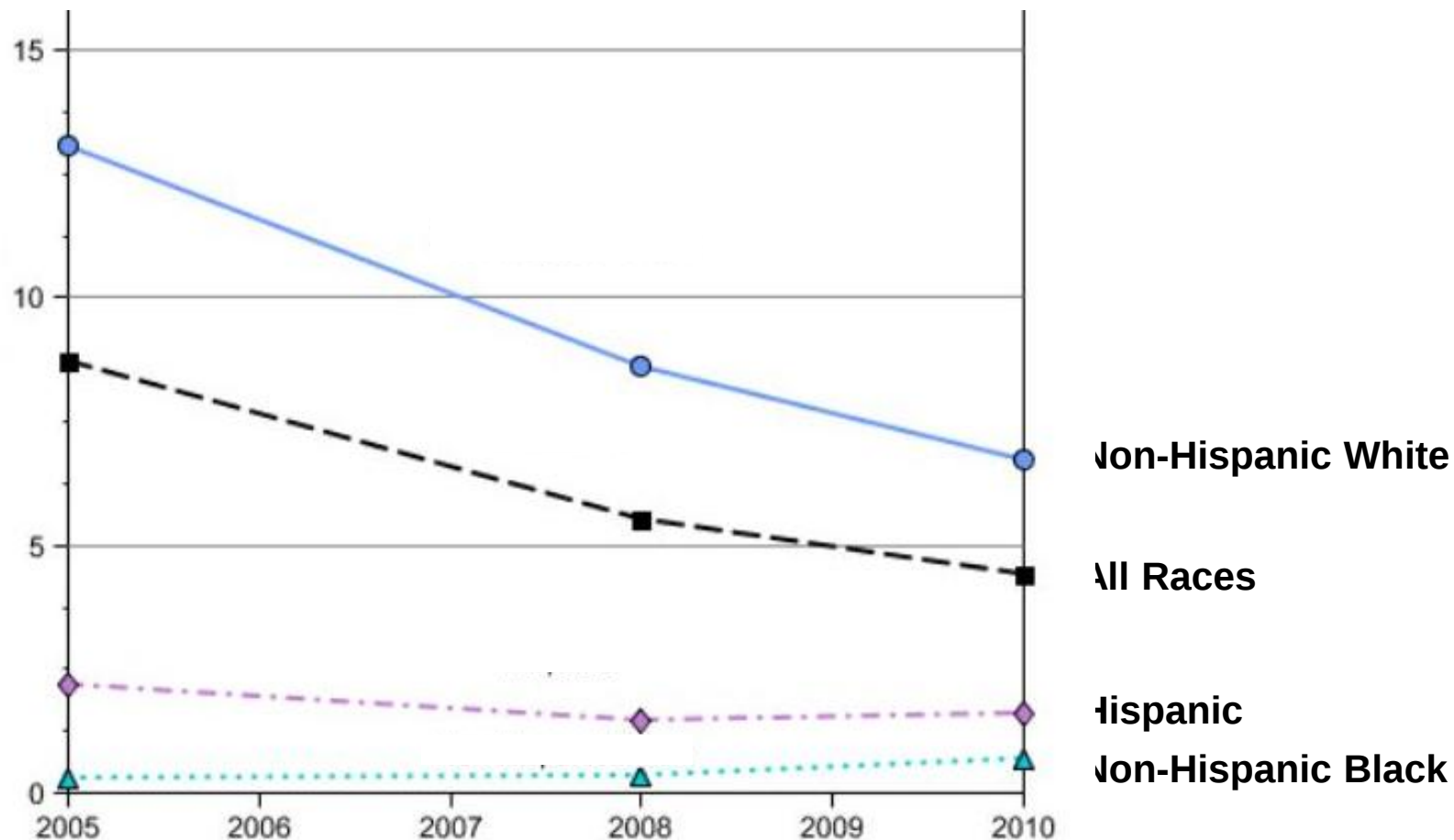
Smoking & Tobacco Use. http://www.cdc.gov/tobacco/data_statistics/tables/trends/cig_smoking/index.htm. Accessed May 25, 2013.

Sunscreen Use Trend in U.S. AYAs and Older Persons, 2005-2010



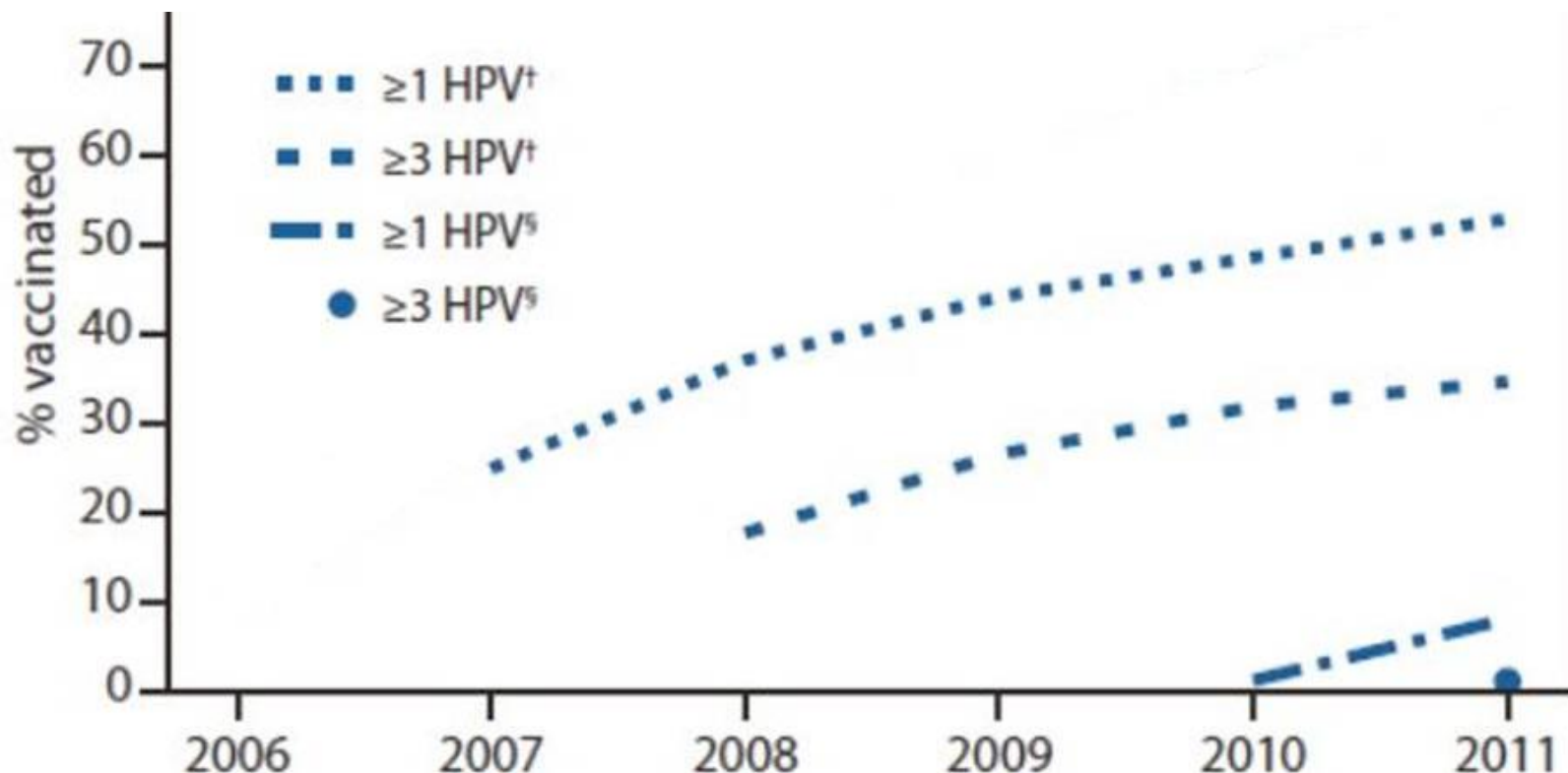
Cancer Trends Progress Report - Sun Protection. http://progressreport.cancer.gov/doc_detail.asp?pid=1&did=2009&chid=91&coid=911. Accessed May 25, 2013

Indoor Tanning Device Use Trend in U.S. Teens* by Race/Ethnicity, 2005-2010



Cancer Trends Progress Report - Sun Protection. http://progressreport.cancer.gov/doc_detail.asp?pid=1&did=2009&chid=91&coid=911. Accessed May 25, 2013

HPV Vaccination Trend in U.S. Adolescents, 2006-2011



Modified from:

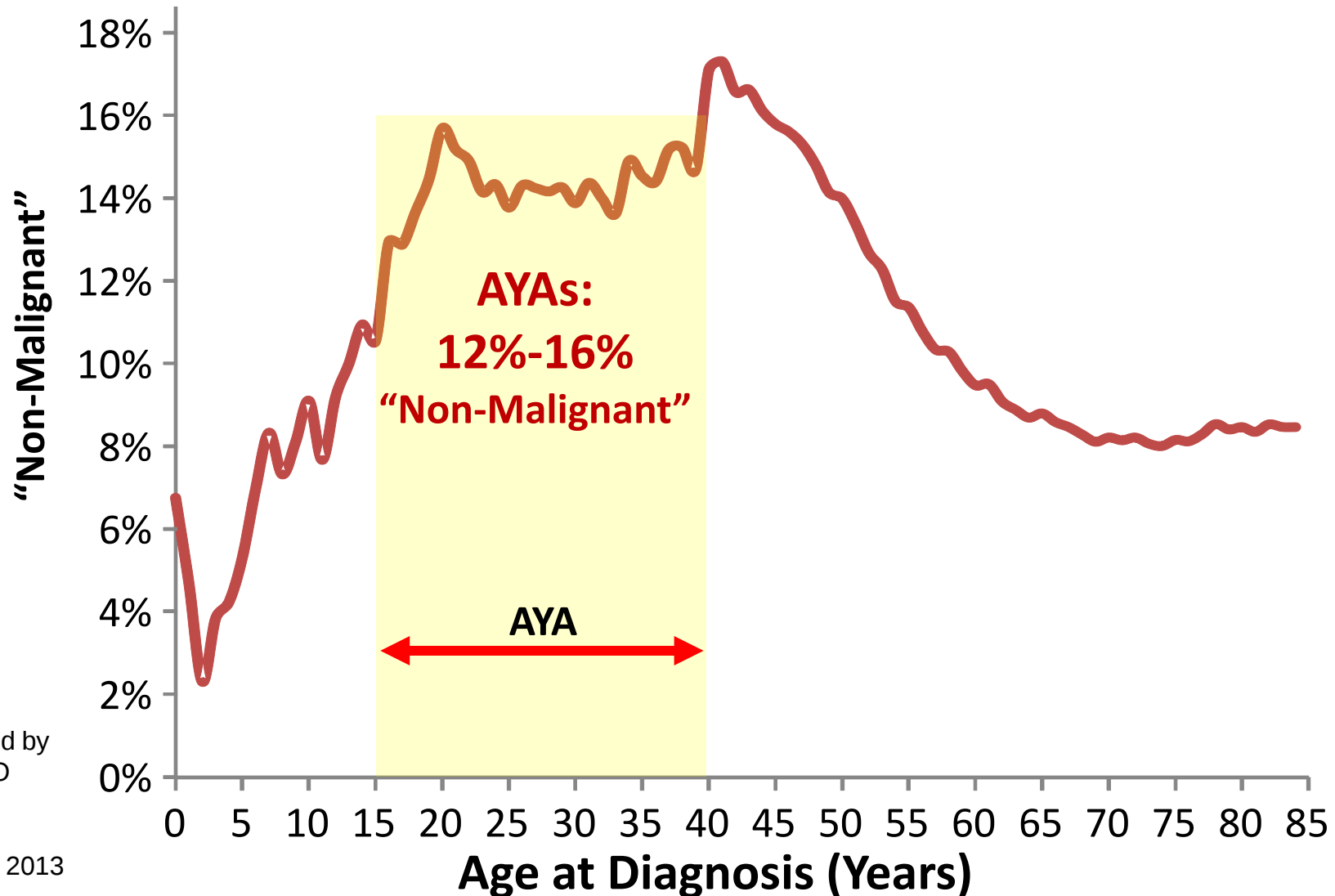
National and State Vaccination Coverage Among Adolescents Aged 13-17 Years, U.S., 2011. http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6134a3.htm?s_cid=mm6134a3_e%0d%0a. Accessed May 25, 2013.

Cancer in AYAs

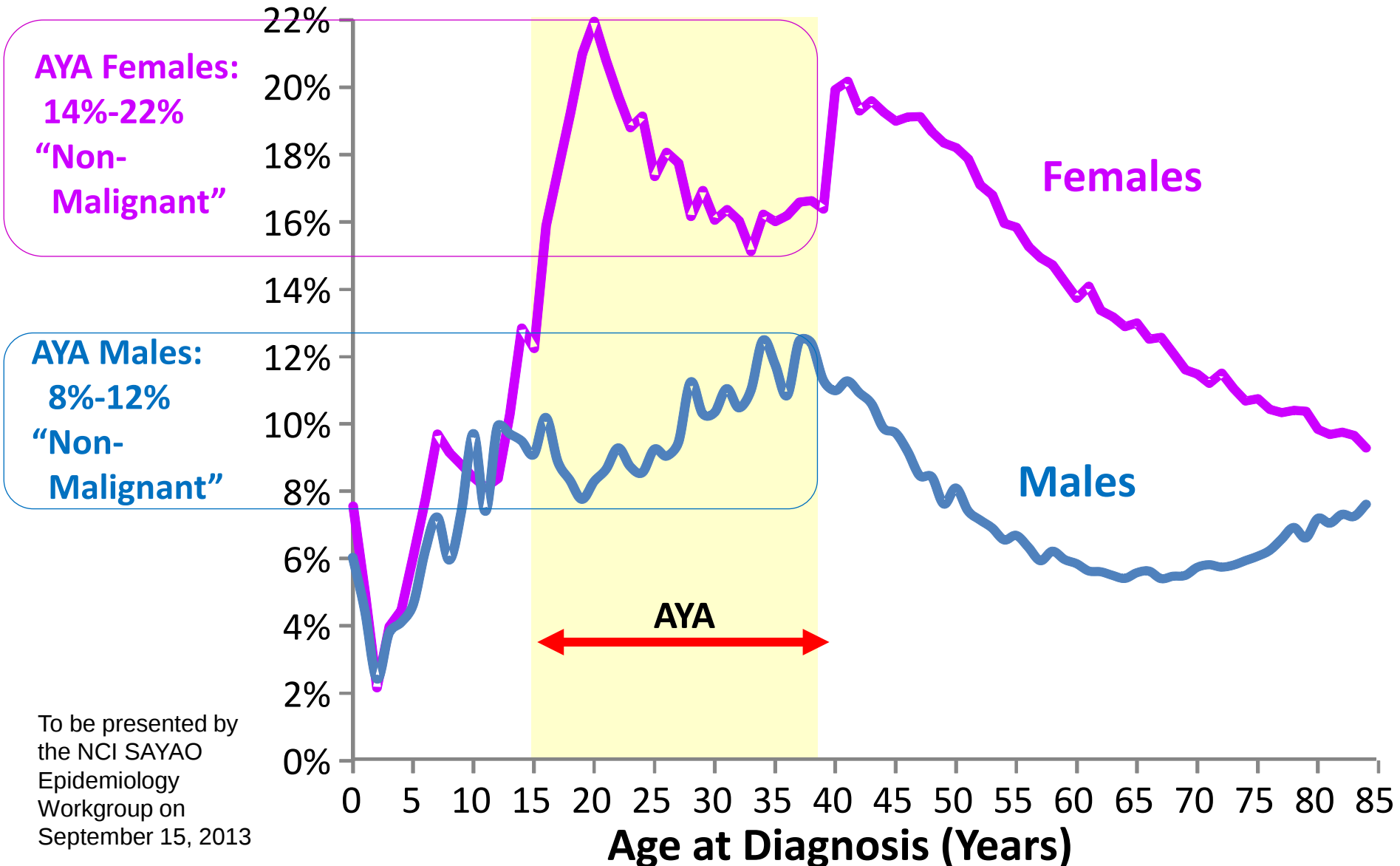
Epidemiology, Mortality, Survival - USA

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- Cancer Invasive and “Non-Invasive”

Proportion of All Cancer that is not Reported as Malignant, by Individual Year at Diagnosis, SEER18, 2000-2009



Proportion of All Cancer that is not Reported as Malignant, by Individual Year at Diagnosis and Sex, SEER18, 2000-2009



Cancer Reported as Non-Malignant

- **Benign** brain tumors
 - Gliomas
 - Craniopharyngioma
 - Meningioma
- **In situ** cervix and breast cancer
- Lymphohemangiomas
- Hamartomas

Cancer in AYAs

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- Death Trends
 - #2 Disease Killer
 - #1 Natural Disease Killer

Top 10 Causes of Deaths

Age 15-19 years

2008

Male			Female		
		per 100,000			per 100,000
1	Accidents	35.5	Accidents		15.2
2	Homicide	16.5	Suicide		3
3	Suicide	11.6	Neoplasms		2.7
4	Neoplasms	4	Homicide		2.7
5	Heart Disease	2.2	Heart Disease		1.1
6	Congenital Anomalies	1.3	Congenital Anomalies		0.8
7	Cerebrovasc Disease	0.4	Cerebrovasc Disease		0.3
8	COPD	0.4	Pneumonia, Influenza		0.3
9	Septicemia	0.3	COPD		0.3
10	Other Infections	0.3	Pregnancy, Childbirth		0.3

Top 10 Causes of Deaths

Age 20-24 years

2008

Male

per 100,000

1	Accidents	60.8
2	Homicide	25.7
3	Suicide	20.7
4	Neoplasms	5.8
5	Heart Disease	4.5
6	Congenital Anomalies	1.3
7	Diabetes	0.9
8	Pneumonia, Influenza	0.8
9	HIV	0.7
10	Cerebrovasc Disease	0.6

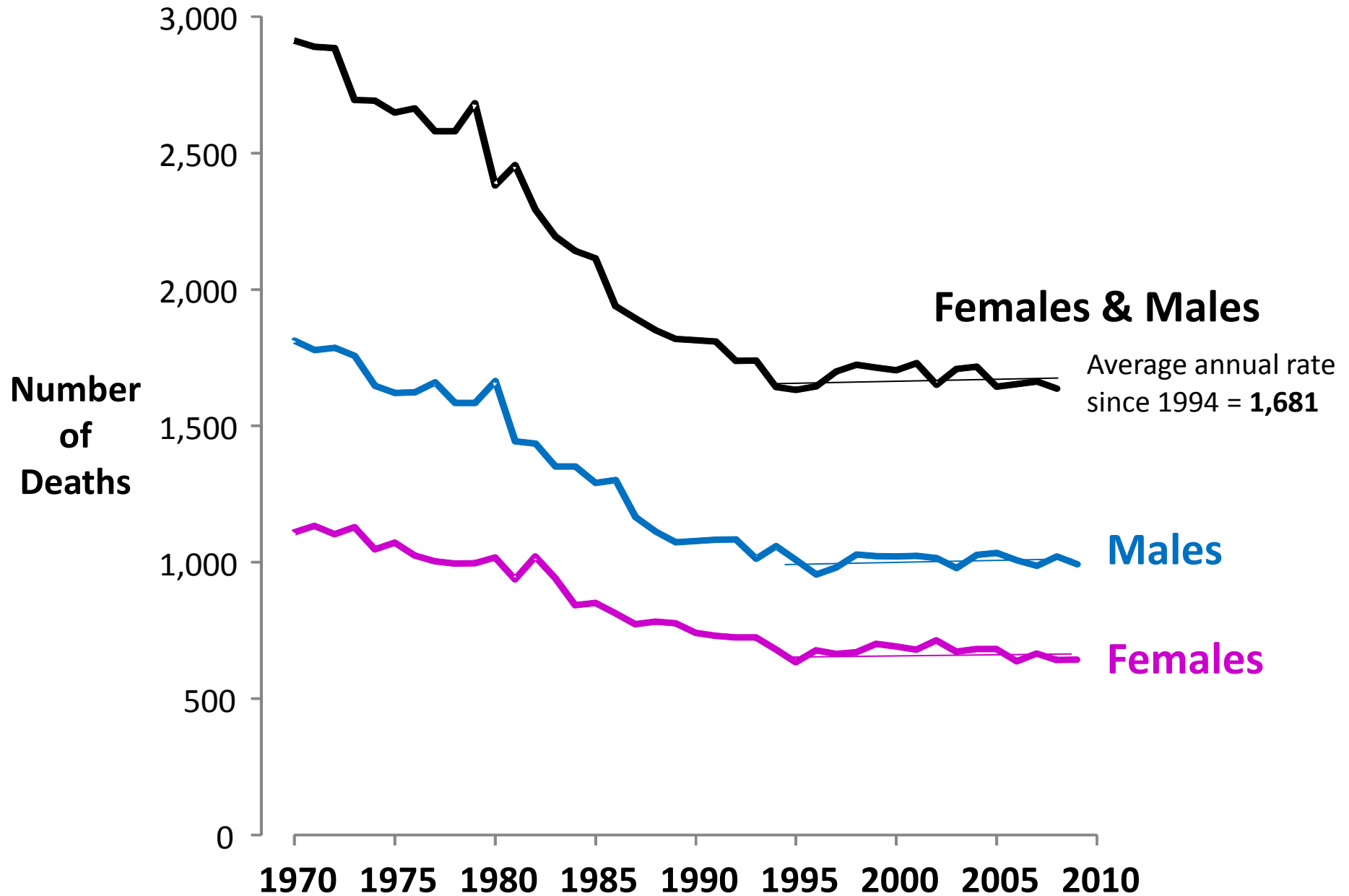
Female

per 100,000

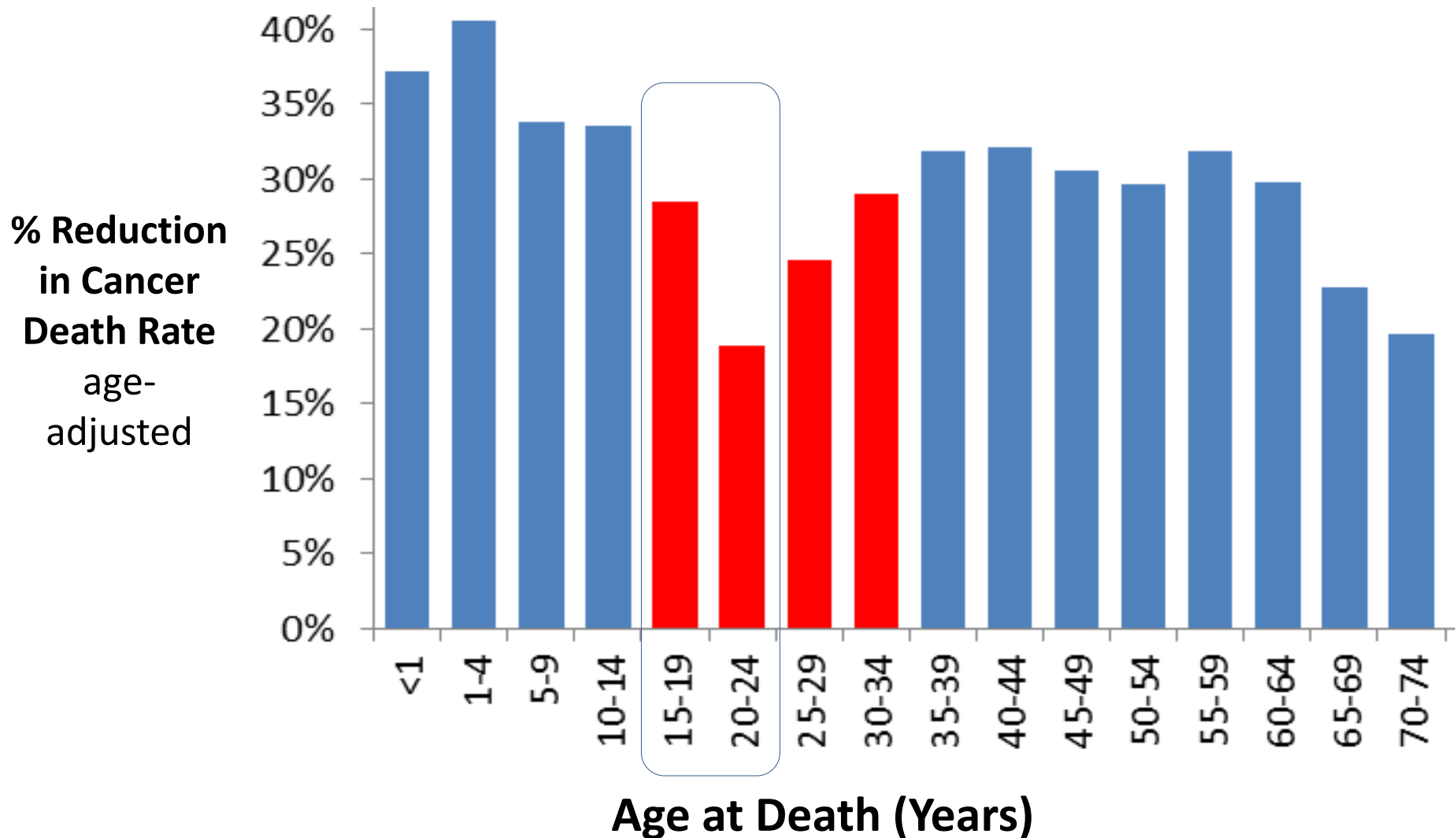
Accidents	18
Suicide	4
Homicide	4
Neoplasms	3.8
Heart Disease	2
Pregnancy, Childbirth	1
Congenital Anomalies	0.9
HIV	0.6
Septicemia	0.5
Diabetes	0.5

Annual Cancer Deaths, Age 15-24, U.S., 1970-2009

21



↓ in National Cancer Death Rate by Age at Death
During Past 2 Decades, as of most recent year of available data
1989 → 2009



Cancer in AYAs

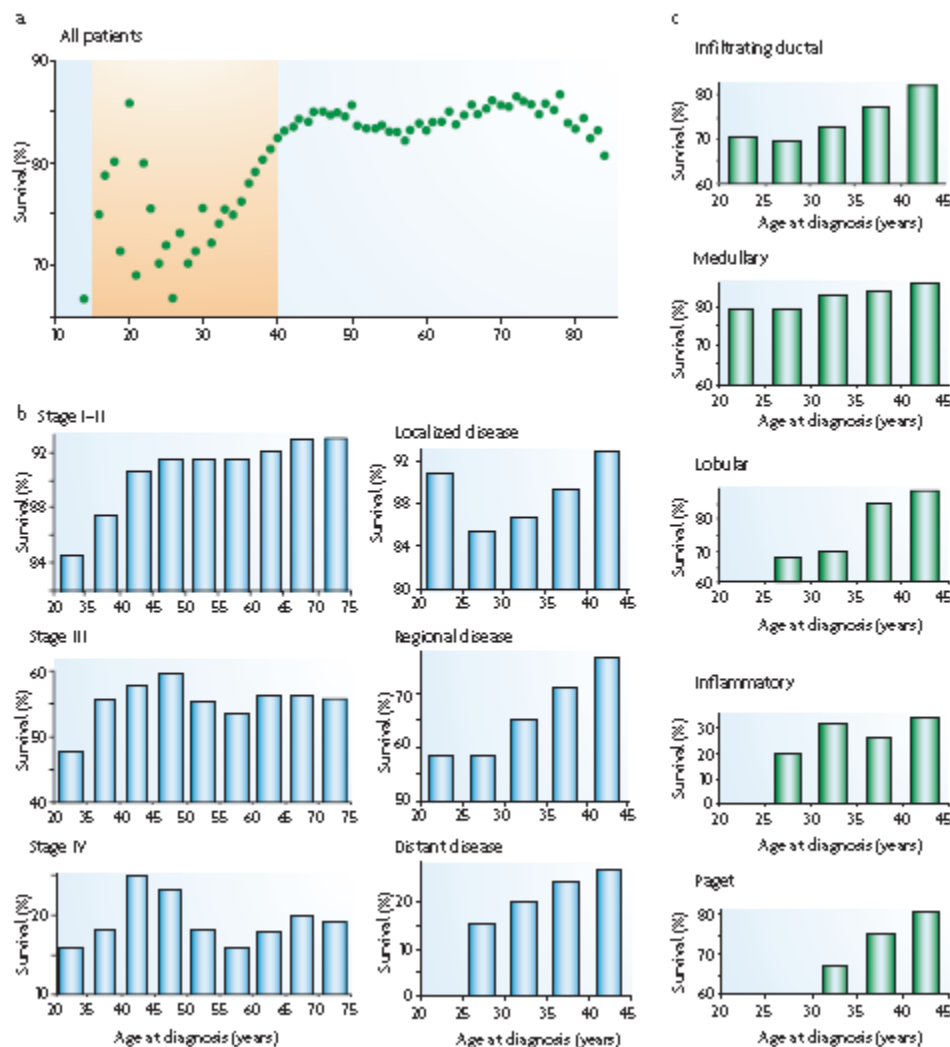
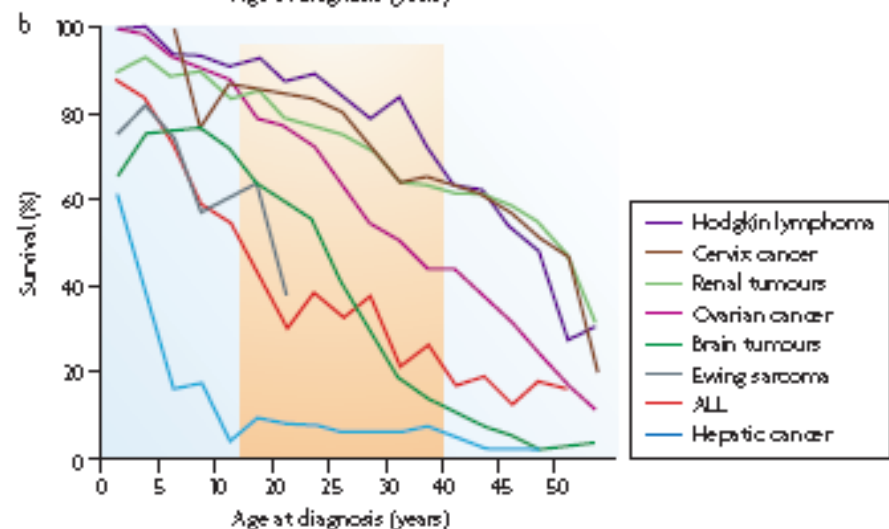
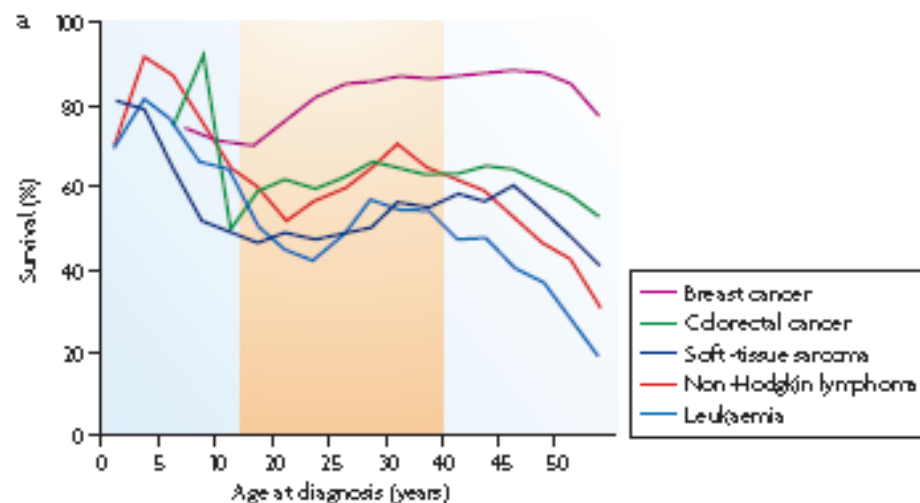
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- Death Trends
- **Survival Trends**

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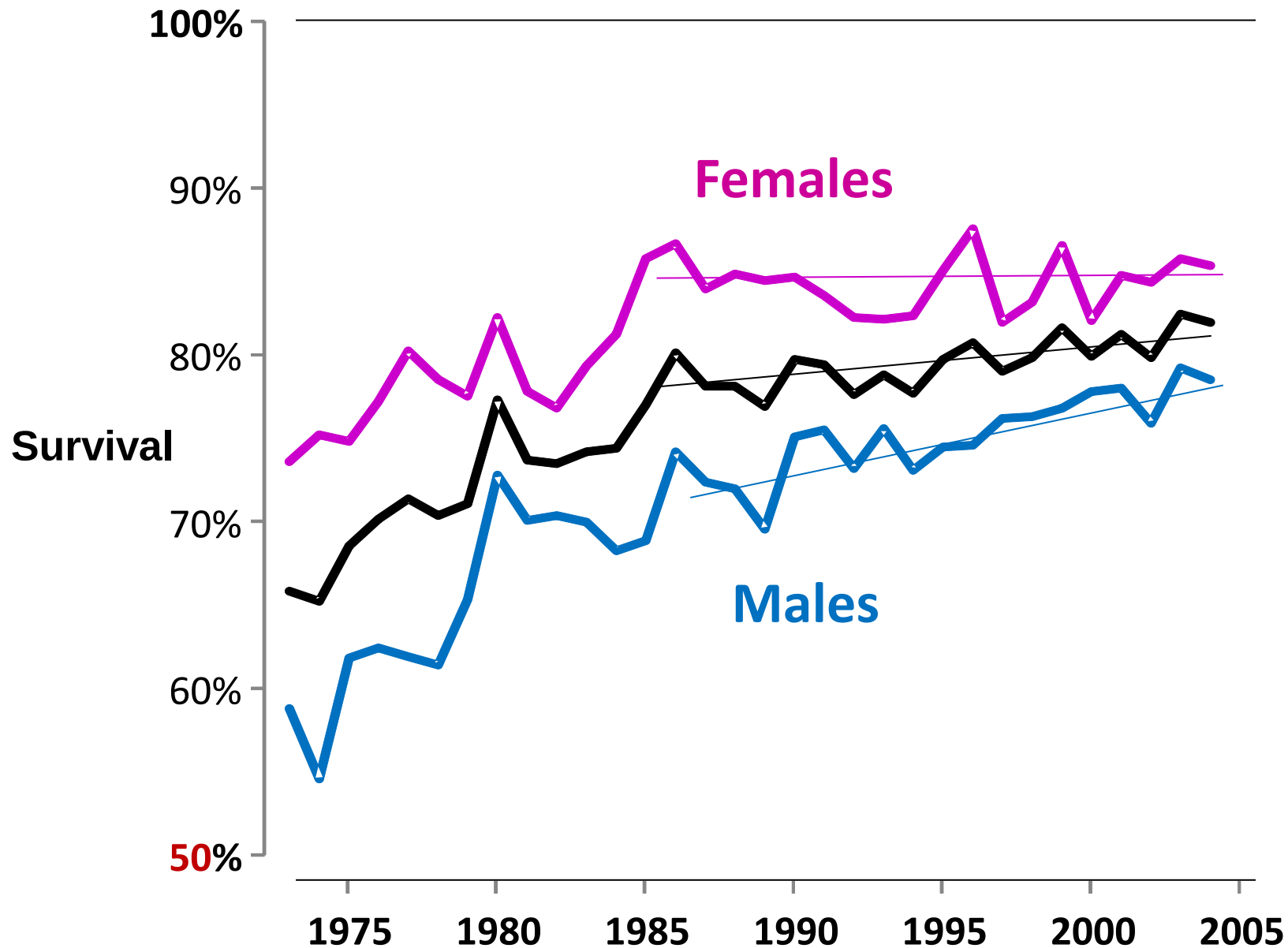
Archie Bleyer^{*†}, Ronald Barr[§], Brandon Hayes-Lattin^{||}, David Thomas[¶],



5-Year Survival, Cancer, SEER9|13|18

Age 15-24 at Diagnosis

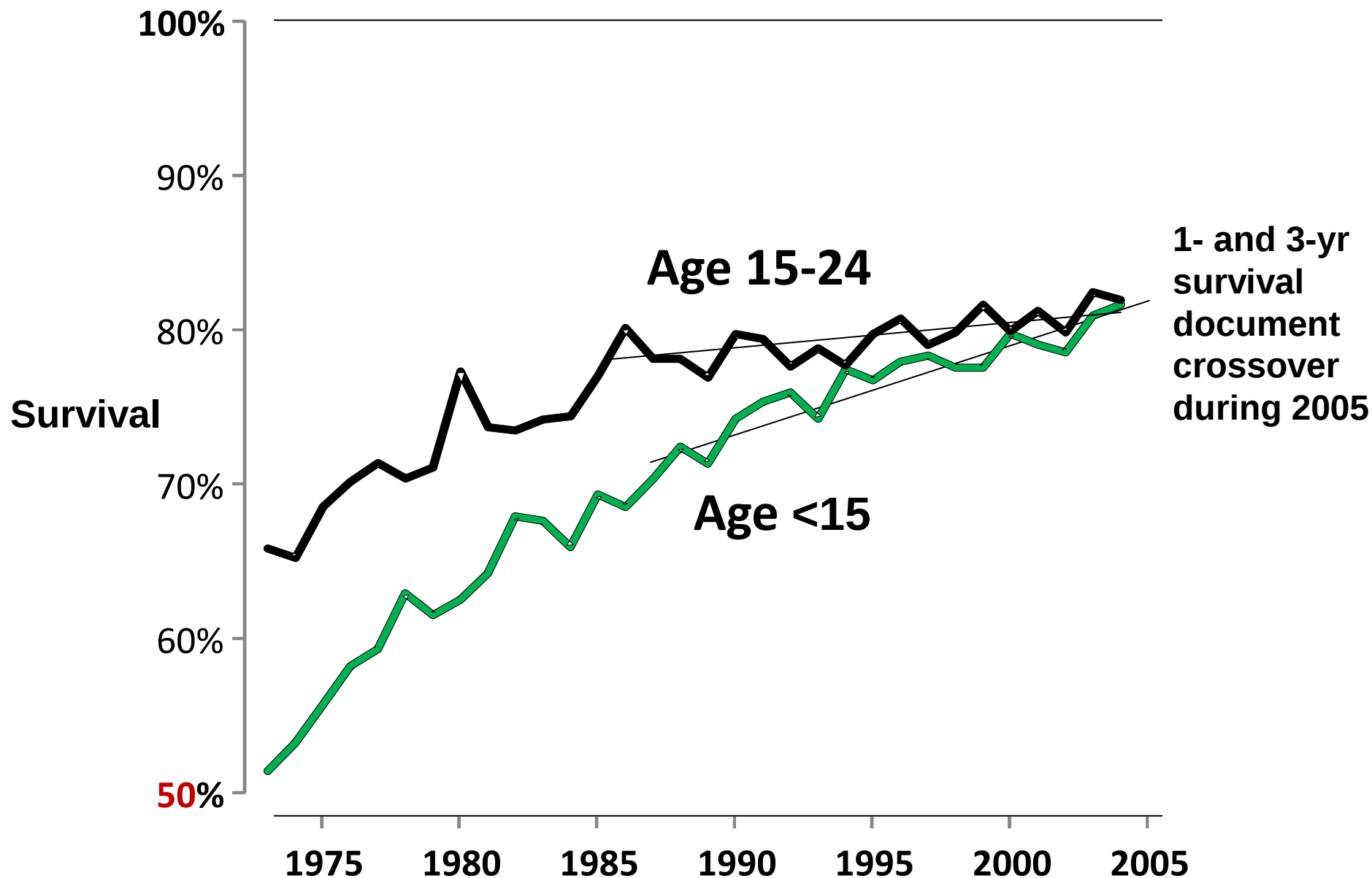
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5-Year Survival, Cancer, SEER9|13|17

26

Females and Males



Cancer in AYAs

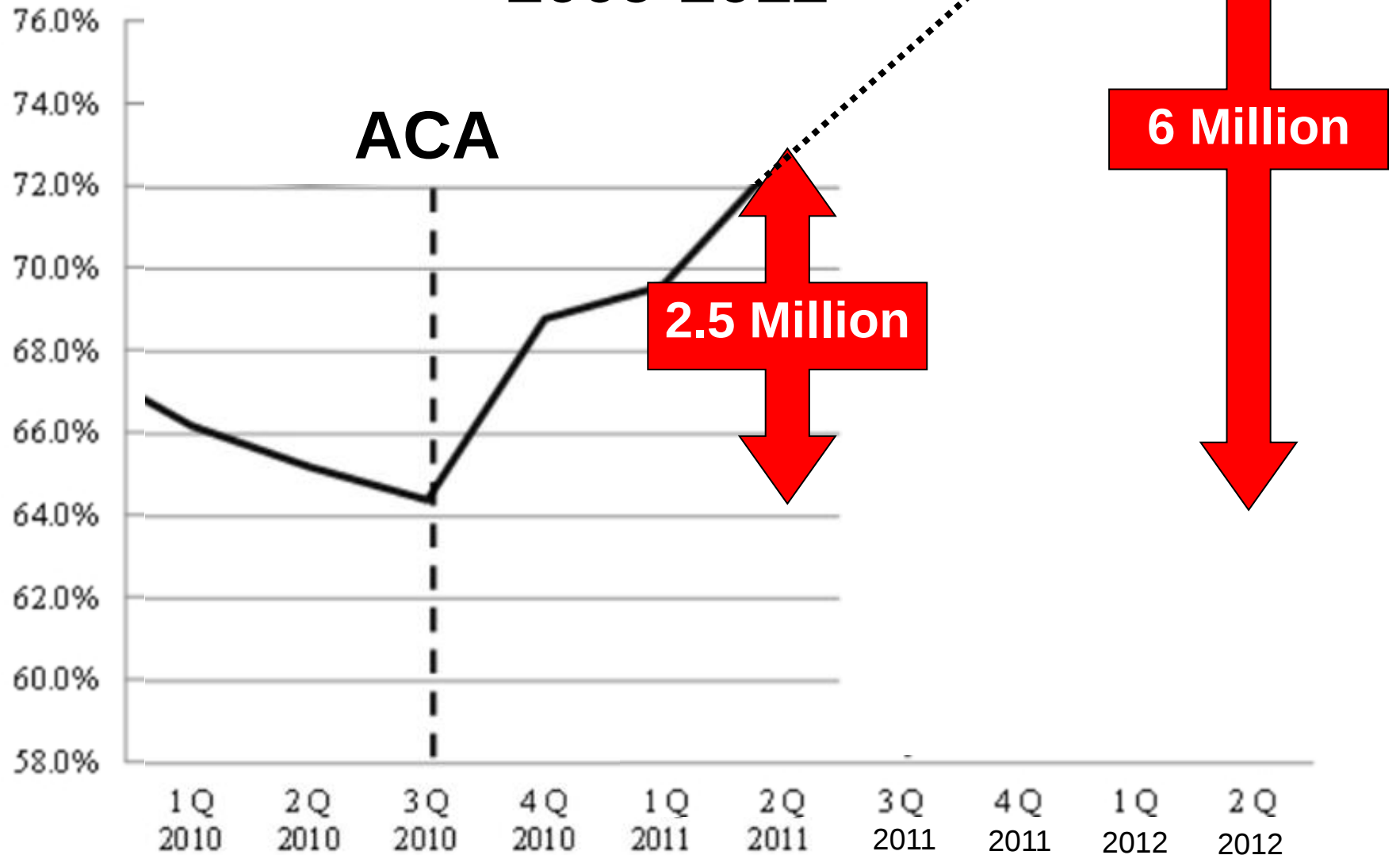
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- **Affordable Care Act Effect**

New Cases of Invasive Cancer in Newly Insured 19-25 Year-Olds Within 15 Months of ACA Passage on September 23, 2010

Age (Years)	Newly Insured 15 months after ACA	Diagnosed with Invasive Cancer							Total
		2011	2012	2013	2014	2015	2016	2017	
19	378,382	95	-	-	-	-	-	-	95
20	362,494	134	138	-	-	-	-	-	273
21	349,084	114	116	118	-	-	-	-	348
22	344,525	133	136	137	137	-	-	-	543
23	344,525	137	139	141	140	138	-	-	695
24	361,158	155	158	159	158	156	152	-	937
25	359,830	175	180	183	184	183	179	181	1,264
Total	2,500,000	942	867	738	620	477	331	181	4,155

19-25 Year-Old Americans with Health Insurance 2009-2012



New Cases of Invasive Cancer in

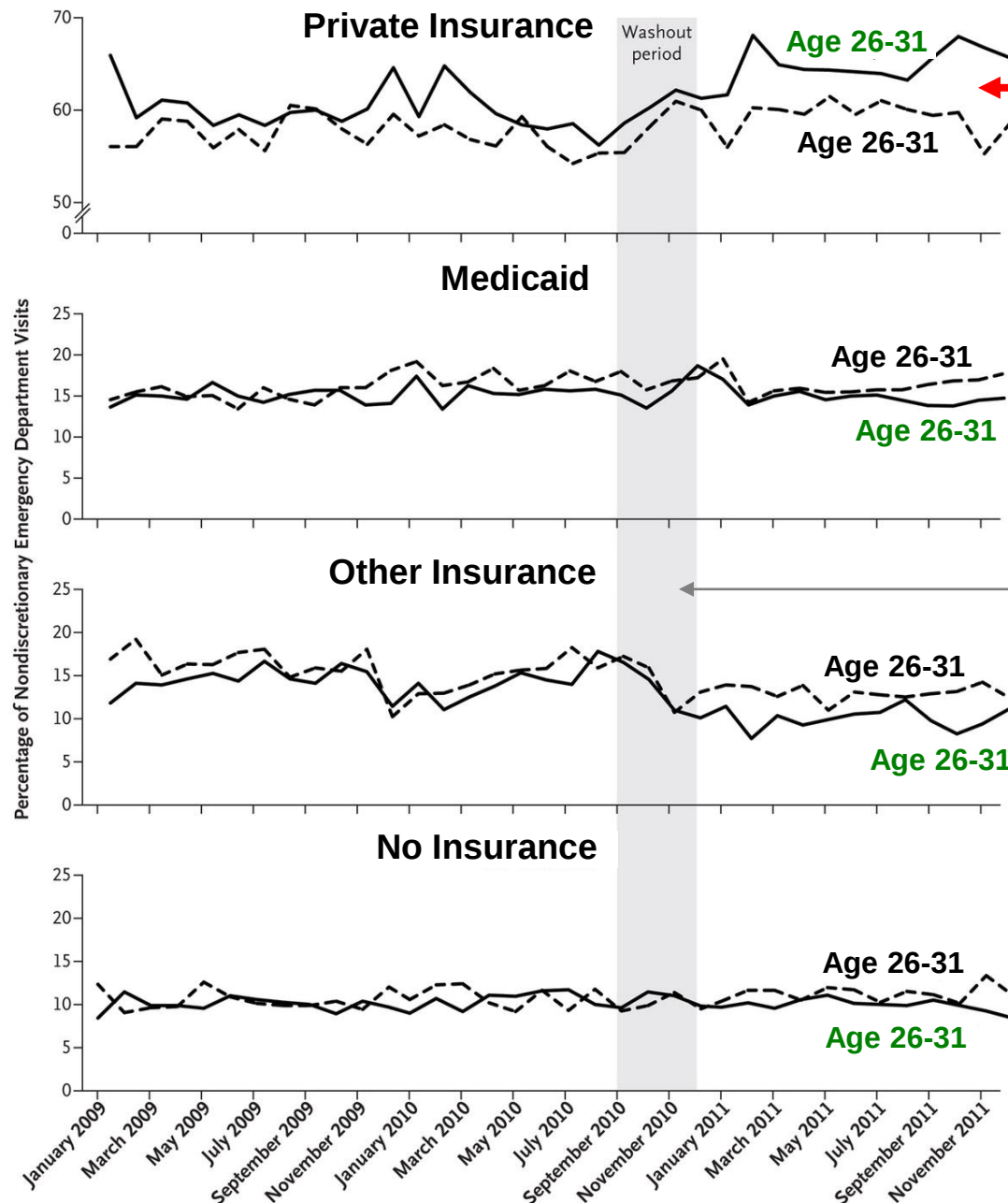
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25	359,830	175	180	183	184	183	179	181	1,264
Total	6,000,000	942	867	738	620	477	331	181	4,155

A year ago

Percentage of Nondiscretionary Emergency Department Visits Covered by Various Types of Payers before and after Implementation of the Dependent-Coverage Provision.



Mulcahy A et al. NEJM
2013;368:2105-2112.

Childhood & AYA Cancer Survivors' Familiarity with and Opinions of the ACA

JCO online July 9, 2013

Warner EL, et al.

**Huntsman Cancer Institute; Utah Cancer Registry,
University of Utah, Mongan Institute for Health Policy;
MGH/Harvard Medical School, Boston, MA**

Methods

- **53 adult survivors recruited from the Utah Cancer SEER Registry.**
- **Randomly selected from sex, age, rural/urban strata**
- **<21 years at time of diagnosis.**

Results

- 49 (of 52) participants had heard of the ACA.
- Most survivors unaware of ACA provisions beyond the insurance mandate.
- Few knew about coverage up to age 26 or pre-existing insurance options.
- Although 1/3 believed the ACA could potentially benefit them via expanded insurance coverage, many were concerned that the ACA would lead to rising health care costs and decreasing quality of care.
- Survivors had concerns specific to their cancer history, including fears of future health care rationing if they developed subsequent health problems.



How IOM can Help

- Increase awareness of favorable incidence trends
- *Ditto re:* unfavorable trends
- Promote clinical trial participation
- Plug favorable impact on AYAs of *Affordable Care Act (ACA)*
- Advocate for an ACA amendment that raises the age of *aging out*
- *Ditto re:* fertility preservation