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LATE EFFECTS IN SURVIVORS OF AYA CANCERS

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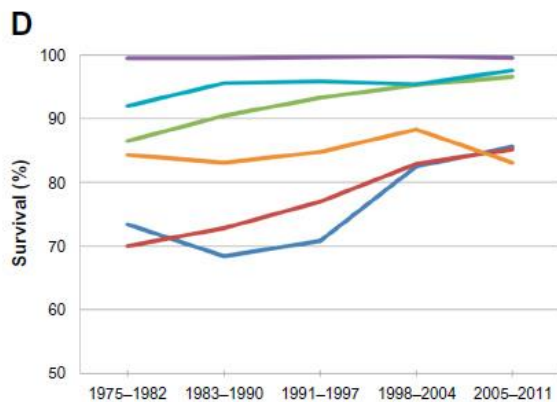
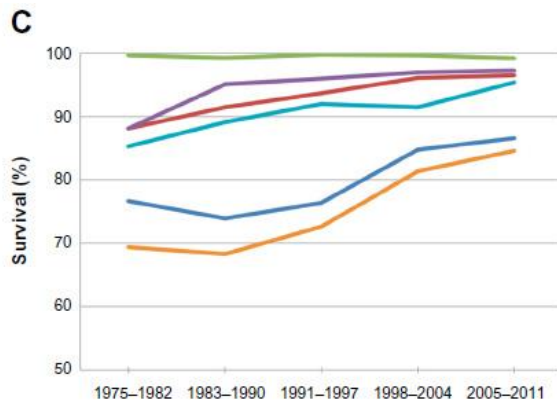
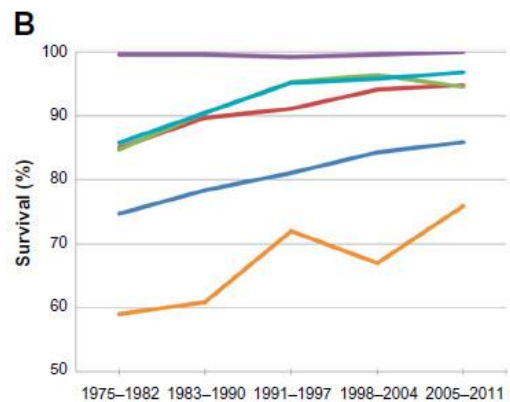
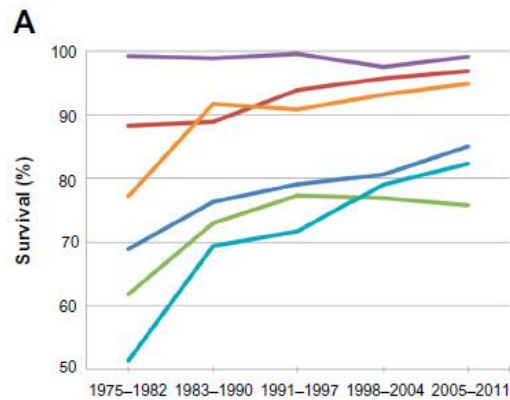


Presenter Disclosure

- **Relationships with financial sponsors:**
 - **Grants/Research Support:** N/A
 - **Speakers Bureau/Honoraria:** Windsor Regional Hospital
 - **Consulting Fees:** N/A
 - **Patents:** N/A
 - **Other:** N/A



The AYA cancer success story...



- A. 15-19 y.o.
- B. 20-24 y.o.
- C. 25-29 y.o.
- D. 30-34 y.o.



...but, AYA survivorship care lags

Our understanding and approach to AYA cancer survivorship is informed (mostly) by survivors of childhood and adolescent cancer diagnosed prior to age 21 years

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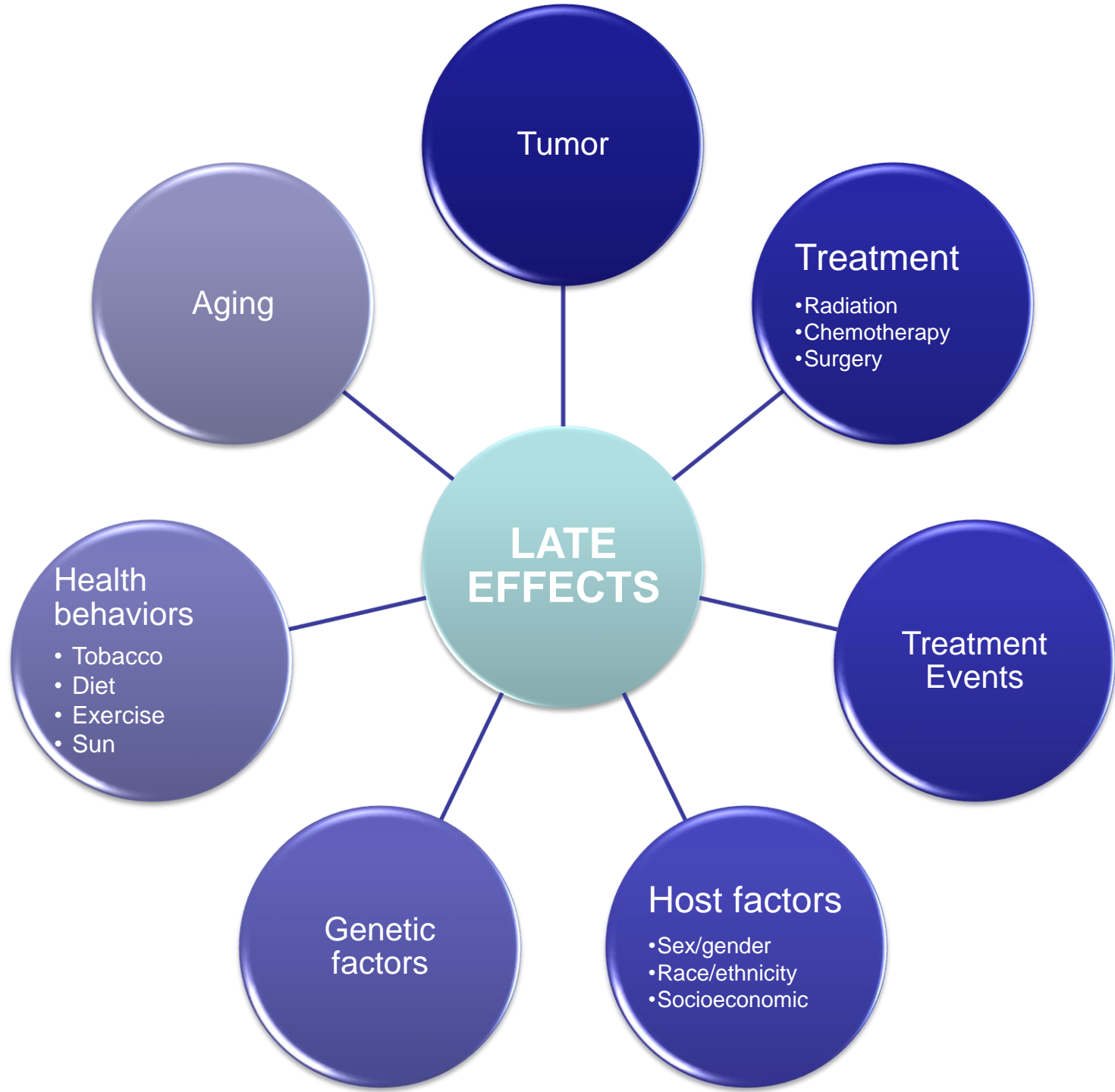


Long-term challenges faced by survivors

1. Cancer recurrence
 2. Chronic physical health conditions
 3. Premature mortality
 4. Mental health problems
 5. Reduced health-related QOL
 6. Financial toxicity
- Late effects

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Late Effects: Physical

Growth and Development

- Linear growth
- Skeletal maturation
- Emotional/social maturation
- Sexual development

Fertility and Reproduction

- Sexual functioning
- Fertility
- Health of offspring

Organ Function

- Cardiac
- Pulmonary
- Endocrine
- GI/Hepatic
- Genitourinary
- Musculoskeletal
- Neurocognitive
- Neurologic
- Neurosensory

Cancer

- Recurrent (primary)
- Subsequent cancers

Late Effects: Psychosocial

Mental Health

- Depression/mood disorders
- Cancer-related anxiety
- Post-traumatic stress

Physical/Body image

- Weight loss/gain
- Loss of organs/tissues

Chronic Symptoms

- Fatigue/ low energy
- Disrupted sleep
- Poor memory/concentration
- Chronic pain

Self-care

- Independent living

Education/Vocation

- Academic underachievement
- Vocational limitations
- Under/unemployment
- Loss of job/benefits

Insurance discrimination

- Access to health care

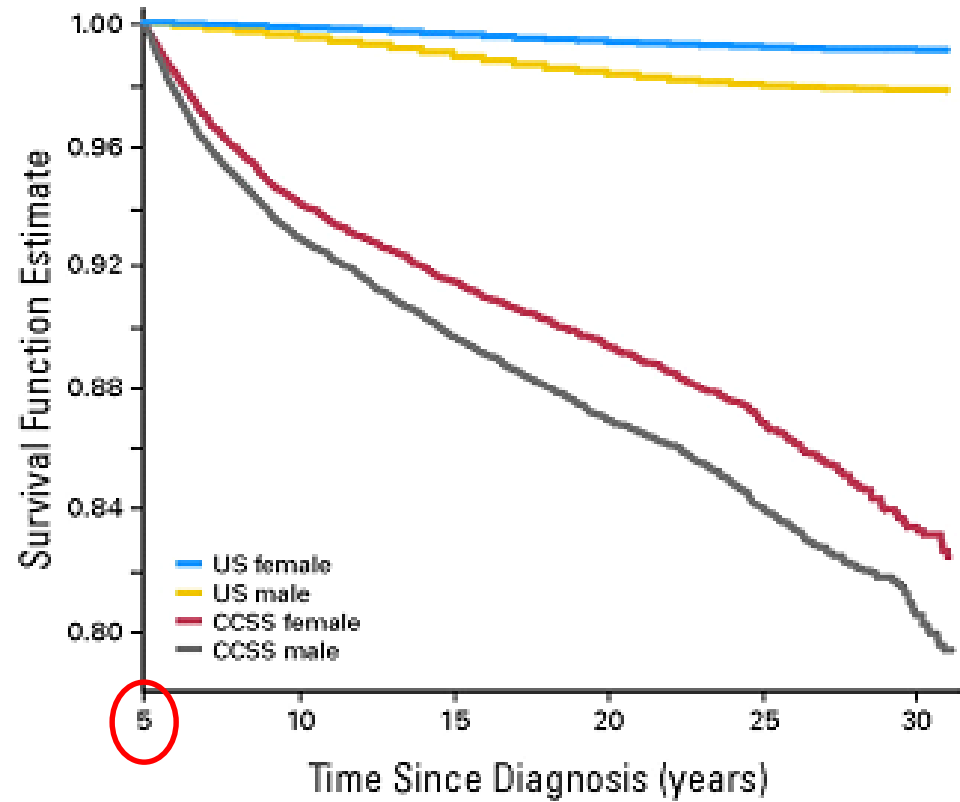
Financial/economic

- Debt (medical/other)

Social Interaction

- Family/peer relationships
- Social withdrawal/isolation
- Intimacy/marriage/family
- Cancer-related stigma

Childhood survivors: Late mortality



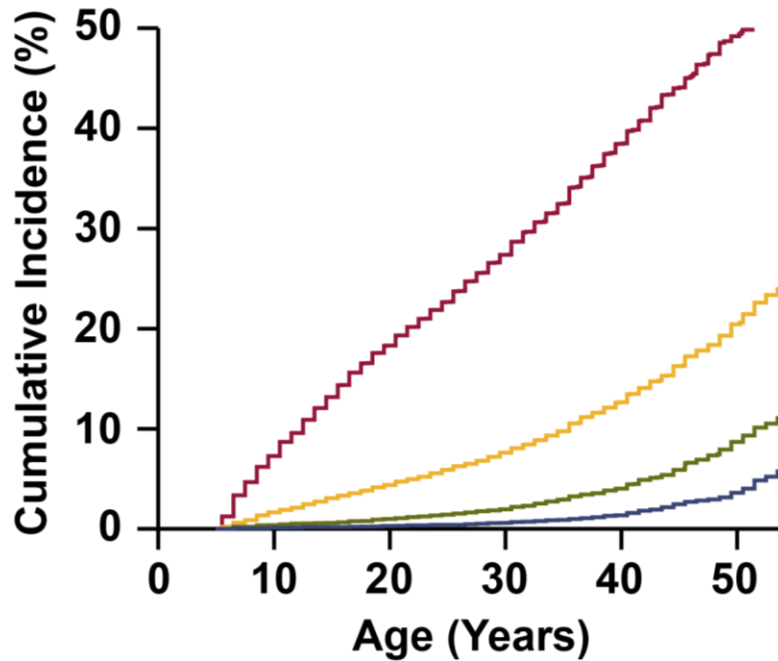
Recurrence	58%
New cancer	19%
Heart disease	7%
Lung disease	3%
External causes	7%

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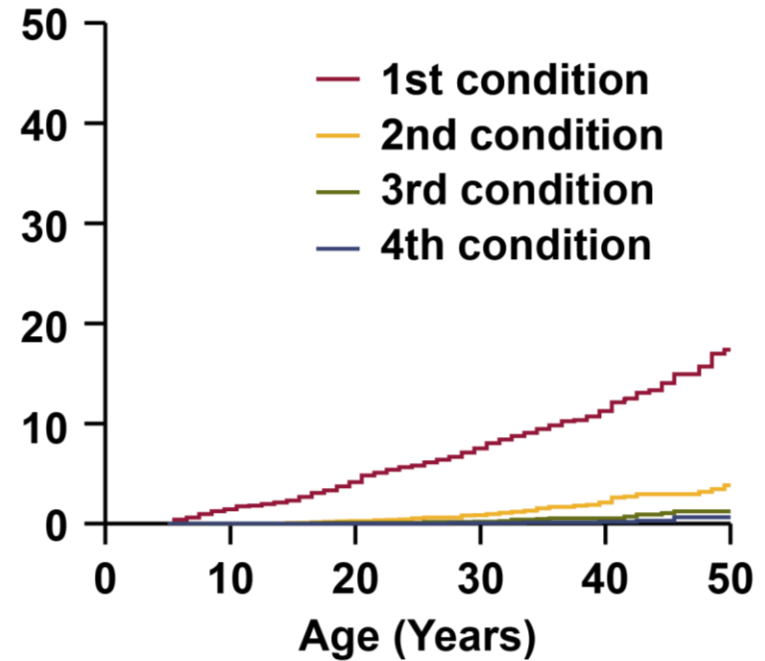


Childhood survivors: Multiple chronic medical conditions (severe, life threatening or death)

Survivors

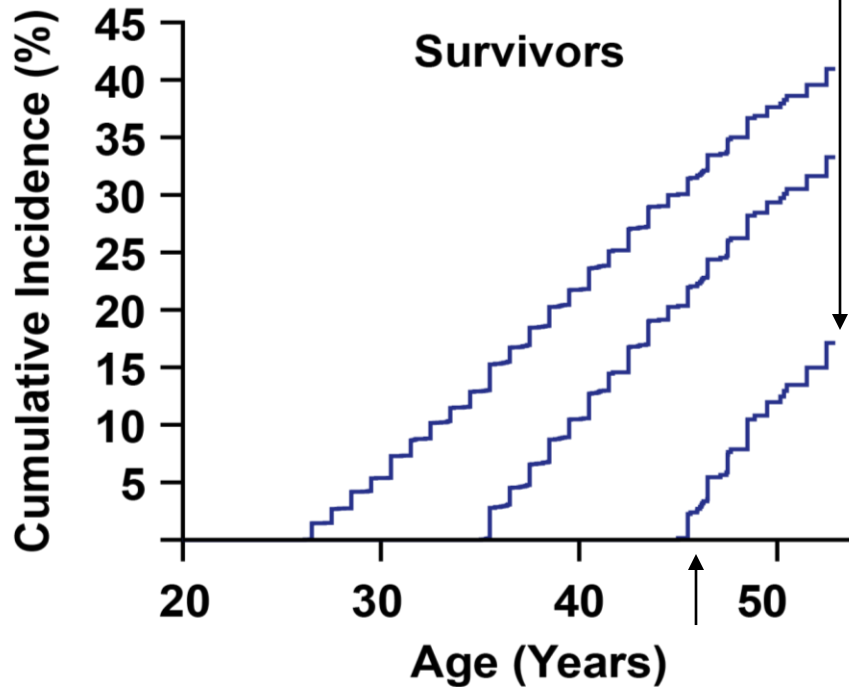


Siblings

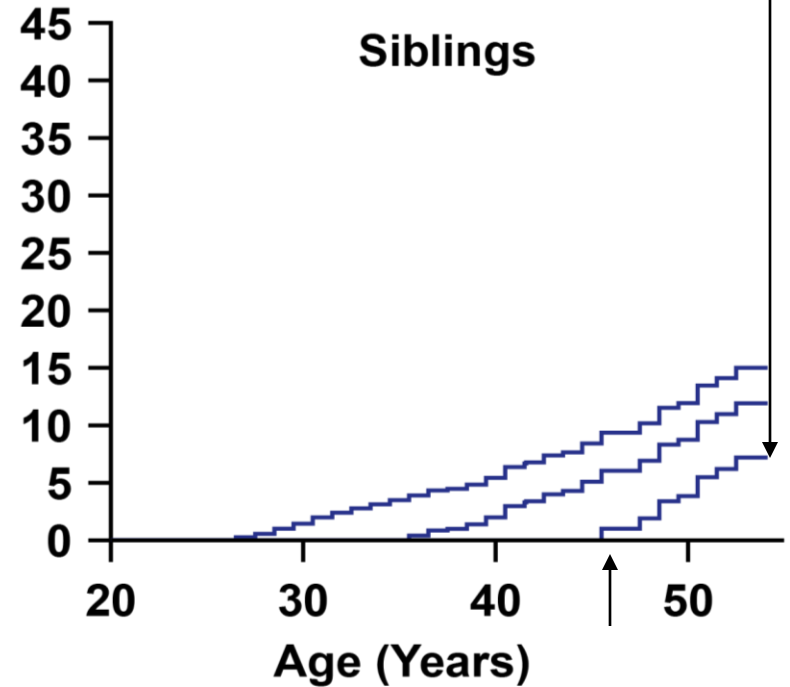


Childhood survivors: Conditional Cumulative Incidence

1/5 healthy survivors aged 45 will develop a severe/life-threatening event or die within 10 years



1/14 healthy siblings aged 45 will develop a severe/life-threatening event or die within 10 years



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AYA survivors: Premature mortality

Risk elevated, but lower than childhood survivors:

- Scottish (SMR 4.7 vs 11) and Finnish data
- Cancer-related death primary cause: relapse, SMN
- Infection, cardiovascular follow
- Lower cause-specific mortality (respiratory, cardiac)

Brewster DH et al. EJC, 2013

Kero AE et al. Int J Cancer, 2015

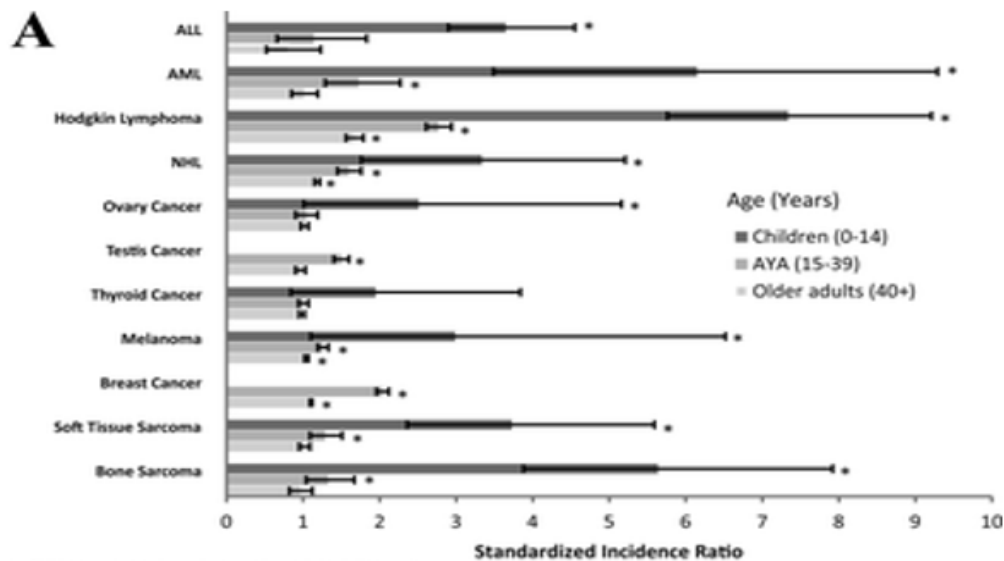
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Subsequent Neoplasms

Risk elevated, but less than observed in childhood cancer survivors

- SIR 1.6 in AYA; 4.3 in children (SEER)
- Breast cancer risk in Hodgkin lymphoma survivors (UK):
 - 15-19 y.o. 3x more likely than 25-29 y.o. to develop breast cancer



Lee JS et al. Cancer, 2016

Bright CR et al. Lancet Oncol, 2018

Reulen et al. JAMA, 2011

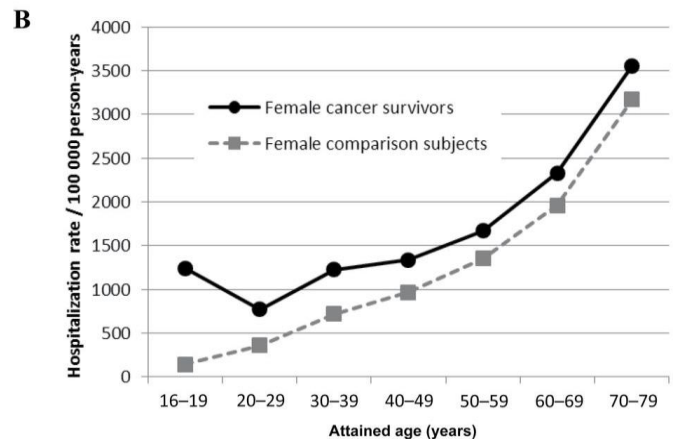
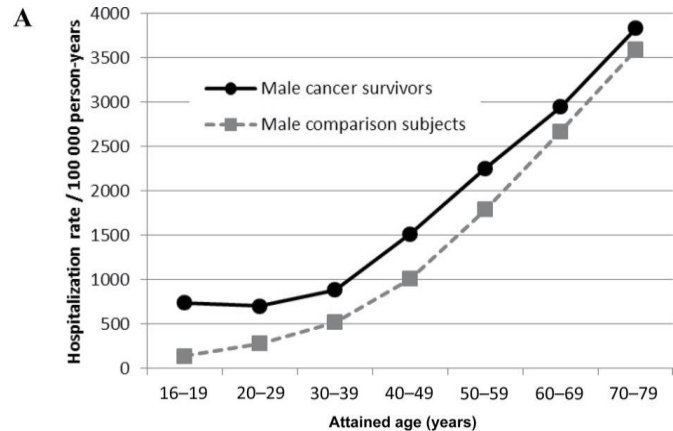


Chronic Health Conditions

Most research has focused on hospitalizations:

- 1.4 x risk of general population
- Infections and cancers drive admissions
- Also, elevated risk for cardiac disease

But, risk not as high as in childhood cancer survivors



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Late Mortality and Chronic Health Conditions in Long-term Survivors of Adolescent and Early Young Adult Cancers

- 5804 early AYA cancer survivors (15-20.9): median age 42
- 5804 childhood cancer survivors (0-14.9): median age 34

	AYA	Childhood
Standardized mortality ratio (SMR)*	5.9	6.2
Non-recurrent SMR*	4.8	6.8
Grade 3-5 health conditions (HR)**	4.2	5.6
Grade 3-5 cardiac (HR)**	4.3	5.6
Grade 3-5 endocrine(HR)**	3.9	6.4
Grade 3-5 MSK (HR)**	6.5	8.0

*compared to general population

** compared to siblings



Psychosocial outcomes

- Mental health, HRQL, social functioning, fatigue
 - Cancer-related distress (fear of recurrence, late effects, death)
 - Altered relationships
 - Body/sexual image
 - Interrupted future plans
 - Forced dependence
- Elevated risk for depression, suicidal ideation, anxiety, PTSD
- Screening critical (e.g. ESAS)

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Fertility and interpersonal issues

- AYA report lack of awareness of gonadotoxic treatments and reproductive impact
- Fertility information is one of the most cited needs by AYA
- Sexuality, intimacy, relationship formation
- Body image

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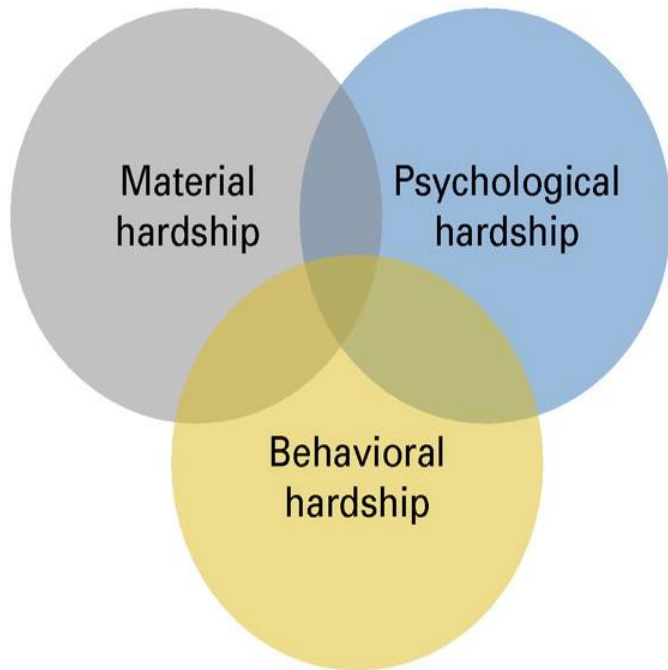
Financial hardship (FH)

- Also called financial *toxicity* or *burden*
- FH → physical/psychological harm
- Physical, psychological or neurocognitive late effects → FH
- Multidimensional construct

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Dimensions of financial toxicity



Material Hardship

High out-of-pocket medical costs that impact household income and assets
Inability to pay for medical care or deferral of needed care or testing
Asset depletion, general/medical debt, or declaration of bankruptcy
Housing and food insecurity
Inability to actively engage in productive work for pay as a result of the lasting effects of cancer that lead to unemployment or underemployment
Job lock, or the inability of individuals to freely engage in extra work activities to earn a promotion, reduce work hours to attend to household needs, or leave a job to pursue other activities because doing so will result in the loss of employee benefits, most notably health insurance

Psychological Hardship

Elevated stress, distress, or worry about current/future financial situation

Behavioral Hardship

A delaying or forgoing of medical care because of costs
Nonadherence to medications, as prescribed, including skipping medication doses, taking less medication, or not filling a prescription because of cost





National Health Interview Survey

- Nationally representative, annual cross-sectional USA survey
- Age at survey: ≥ 18 years
- 2010-2018
- AYA: age at cancer diagnosis 15-29 years (n=996)
- Comparison group: no history of cancer (n=256,000)





Material Hardship

	Survivors	No cancer history	P
Problems paying off medical bills	21%	16%	.001
Paying off medical bills now	32%	23%	<.001

Survivors: $n = 897$
Comparison: $n = 231,221$

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Psychological Hardship

	Survivors	No cancer history	P
Worried about medical costs of illness/accident	42%	42%	NS
Worried about medical costs of healthcare	32%	29%	NS

Survivors: $n = 649$
Comparison: $n = 169,880$

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Behavioral Hardship

	Survivors	No cancer history	P
Delayed medical care due to worry about cost	15%	10%	<.001
Forgone medical care due to worry about cost	10%	7%	.005
Couldn't afford prescription medicine	11%	7%	.001
Couldn't afford mental health care/counselling	4%	2%	.04
Couldn't afford dental care	16%	12%	.004
Couldn't afford eyeglasses	9%	7%	.01
Couldn't afford to see a specialist	9%	5%	<.001
Couldn't afford follow-up care	9%	4%	<.001

Survivors: $n = 994$; 824 (S, F/U)
Comparison: $n = 255,967$; 208,822 (S, F/U)

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Summary Measures of Hardship



	Survivors	No cancer history	P
Any material hardship	38%	28%	<.001
Any psychological hardship	44%	45%	NS
Any behavioral hardship	31%	22%	<.001



Models of AYA survivor care

- No single location or provider
 - Acute oncology clinics
 - Specialized survivor clinics
 - Shared care
 - PCP
- Guidelines generally written for children but extend into young AYA
- Survivor care plans

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Questions



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