To share your e-Eso experience use:
#e_ESO

Life expectancy after cancer

Expert: **Dr Laura Botta**, National Cancer Institute - IRCCS Foundation, Milan, Italy

Expert: **Dr Monica Terenziani**, National Cancer Institute - IRCCS Foundation, Milan, Italy

Life expectancy after cancer

Epidemiological point of view

Laura Botta[1,2]

[1]Inserm UMR 1231, Lipides, Nutrition, Santé (LNC), Equipe EPICAD, Hospital Center University Dijon Bourgogne, Université Bourgogne-Franche-Comté, France

[2]Unità di Epidemiologia valutativa, Fondazione IRCCS Istituto Nazionale dei Tumori, Milan, Italy

Contact detail: Laura.botta@istitutotumori.mi.it

DISEASE OCCURRENCE

The number of people living after a cancer diagnosis is increasing by 3% yearly (recent diagnosis, long-term survivors and cured).

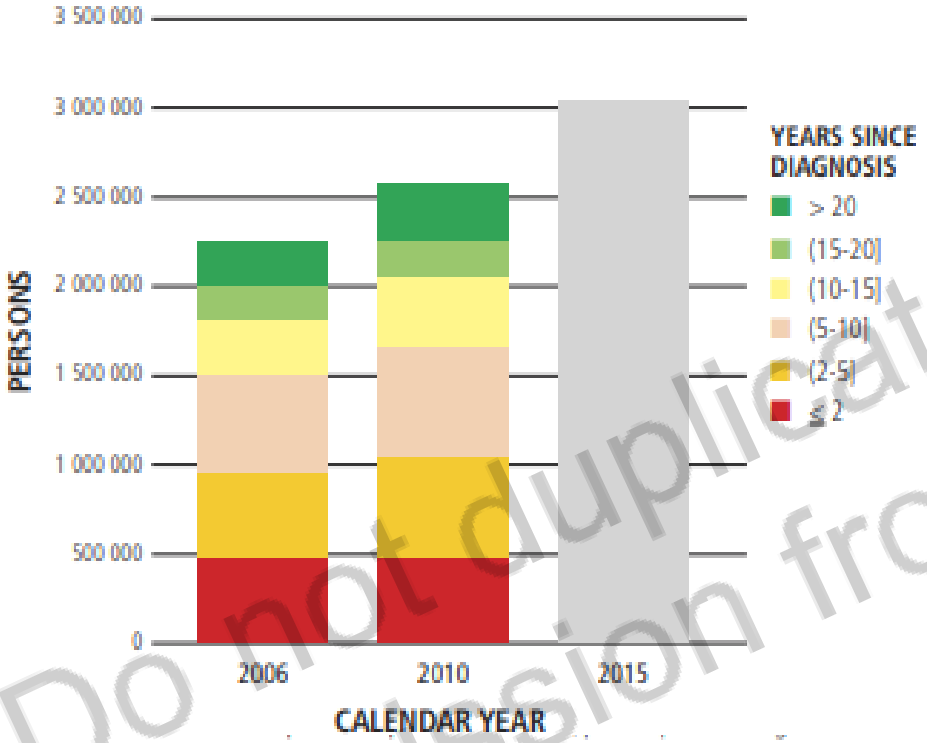


Figure 1. Estimated number of people living after a cancer diagnosis in both sexes in 2006 and 2010, and projected number for 2015 in Italy, by time since diagnosis.

Epidemiologia & Prevenzione 2014 38(6) Suppl 1: 1-144

QUESTIONS:

How many years of life I had lost having the cancer?

How many years will I have to wait to consider myself cured?

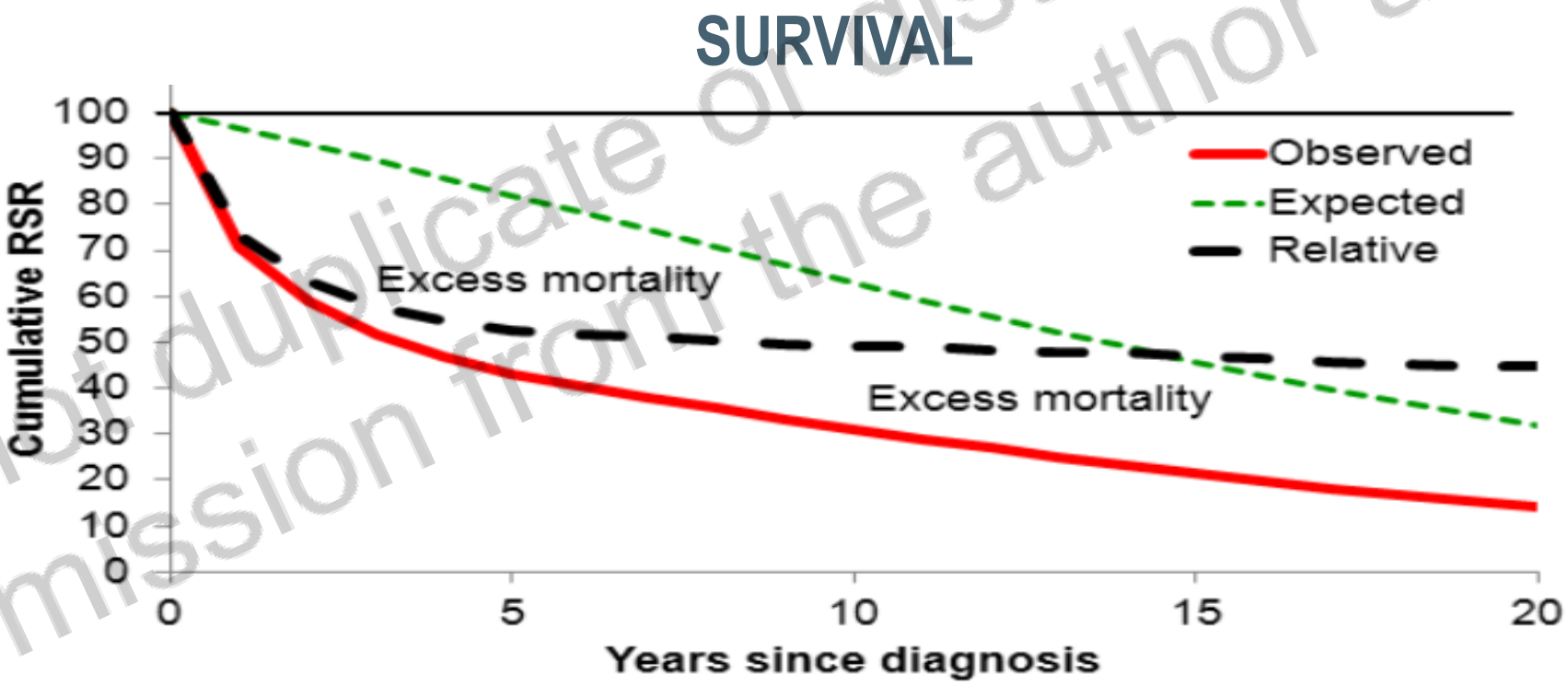
How many patients are already cured from the disease?

How many patients will be cured from the disease?

EXPRESS EFFECT OF CANCER: SURVIVAL

Survival is the main outcome in the field of oncology to evaluate the effectiveness of the health system

IINCIDENCE, new cases in a year → Follow-up → LIFE STATUS, dead or alive



LONG-TERM: LIFE EXPECTANCY (LE)

- Patients LE: mean expected number of remaining life years for a **cancer patient** at a given age, (sex, calendar year) and **time from diagnosis**

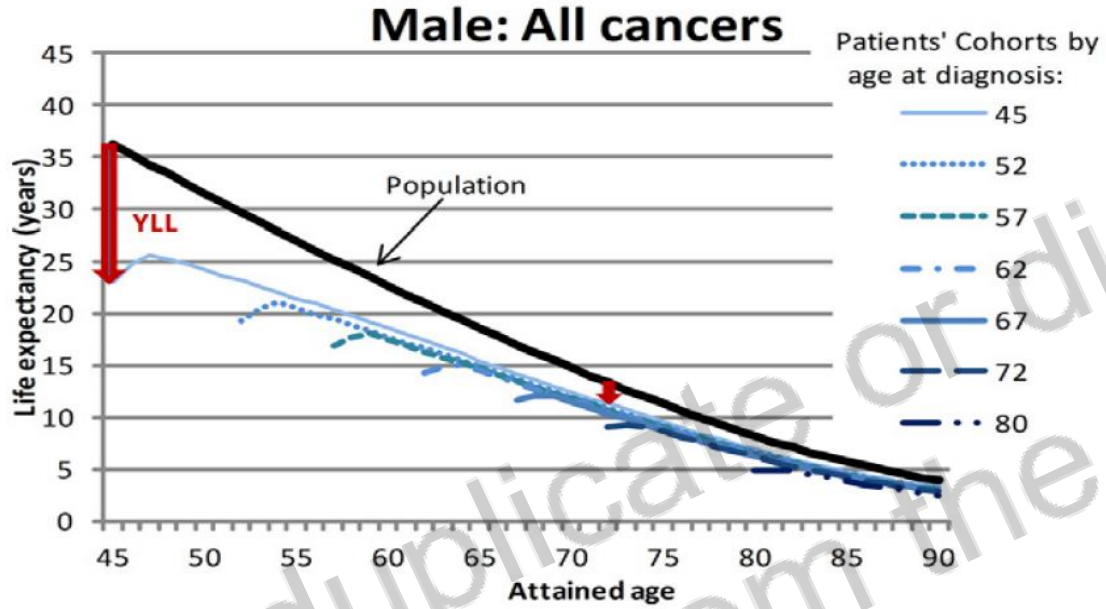
- Population LE: mean expected number of remaining life years for an individual at a given age, (sex and calendar year)

Population LE at age *i*

$$LE_i = \sum_{x=i+1}^{\omega} S_x / S_i$$

Difference population and patients LE are Year of life lost (YLL) and estimate the impact of the cancer for the whole lifespan of a person

How many years of life I had lost having the cancer?



YLL= Years of life lost, difference between patients' LE and that of the age and sex matched general population

- FIRST PHASE: Largest drop at the beginning
- SECOND PHASE: increase in the first few years after diagnosis for those surviving the high death risk concentrated in these years
- THIRD PHASE: start to drop again and diffrence persisting in the long run

Remember you can ask questions and send comments at any time

Contents lists available at ScienceDirect
Journal of Advanced Research
journal homepage: www.elsevier.com/locate/jare

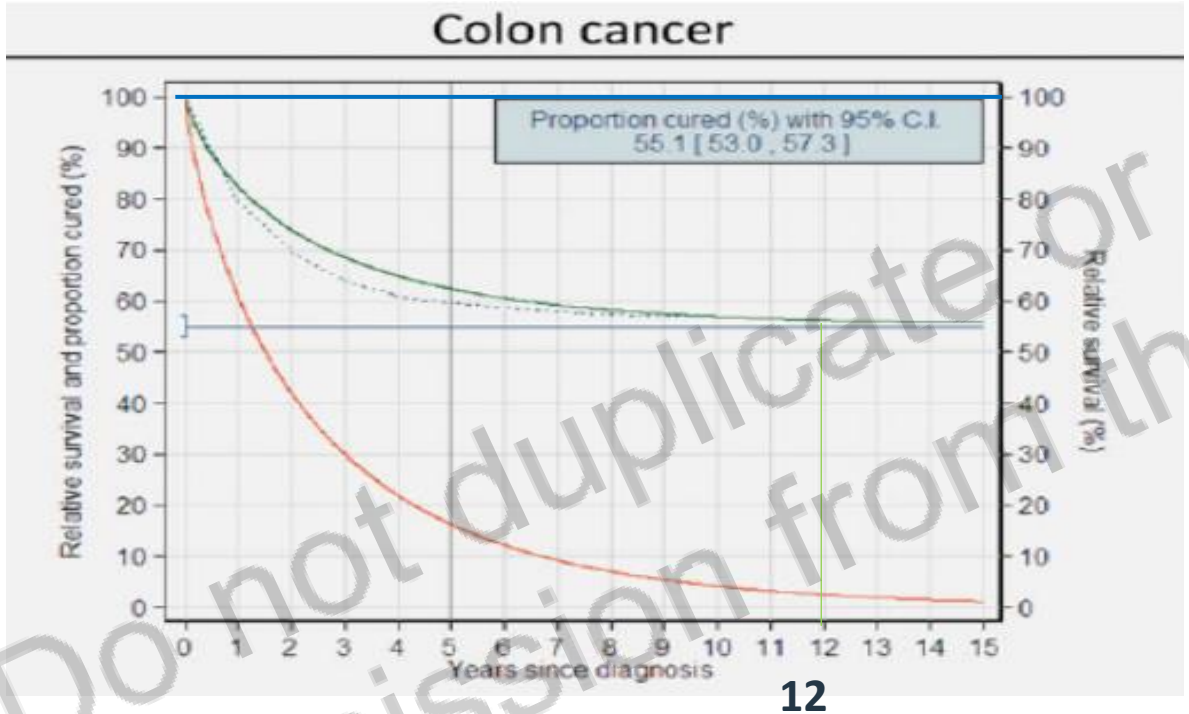
Original article

Changes in life expectancy for cancer patients over time since diagnosis

Laura Botta [a,*], Luigino Dal Maso [b,*], Stefano Guzzinati [c], Chiara Panato [b], Gemma Gatta [a], Annalisa Trama [a], Massimo Rugge [c], Giovanna Tagliabue [d], Claudia Casella [e], Bianca Caruso [f], Maria Michiara [g], Stefano Ferretti [h], Flavio Sensi [i], Rosario Tumino [j], Federica Toffolutti [b], Antonio Giampiero Russo [k], Anna Luisa Caiazzo [l], Lucia Mangone [m], Walter Mazzucco [n], Silvia Iacovacci [o], Paolo Ricci [p], Gemma Gola [q], Giuseppa Candela [r], Antonella Sutera Sardo [s], Roberta De Angelis [t], Carlotta Buzzoni [u,v], Riccardo Capocaccia [w], the AIRTUM Working Group [1]

LONG-TERM: CURE INDICATORS

"A group of disease-free survivors whose progressive death rate from all causes is similar to that of a normal population of the same age and sex constitution." 1960 (Easson)



55%

12

Mixture cure models

This model distinguished between :

-patients who will die of the disease

-patients who are cured, that is, they will experience the same survival of a comparable general population

The models estimate two indicators:

1. The cure fraction: "What is the probability to be cured?" 55%
2. The time to cure 12 years

> Biostatistics. 2007 Jul;8(3):576-94. doi: 10.1093/biostatistics/kxl030. Epub 2006 Oct 4.

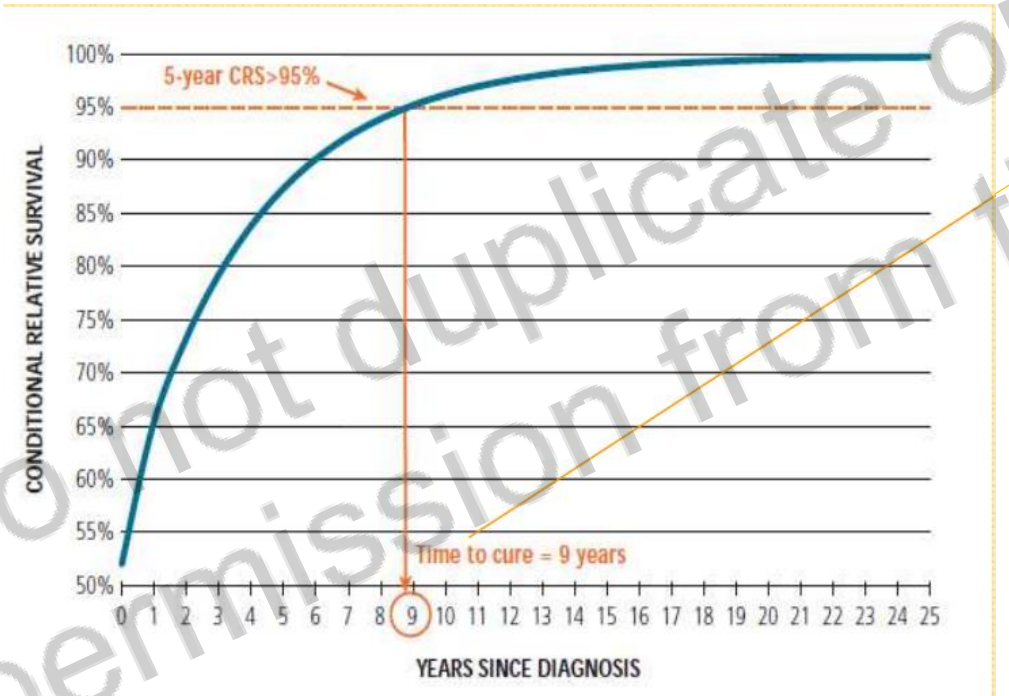
Estimating and modeling the cure fraction in population-based cancer survival analysis

Paul C Lambert [1], John R Thompson, Claire L Weston, Paul W Dickman

$$S^R(t) = \pi + (1- \pi)\ S^R_u(t)$$

How many years will I have to wait to consider myself cured?

Time span after cancer diagnosis necessary to eliminate excess mortality due to cancer.



COLON-RECTUM

AGE AT DIAGNOSIS	TIME TO CURE YEARS	
	MALE	FEMALE
0 - 44	7	6
45 - 59	8	7
60 - 74	9	8
75+	10	8

THYROID

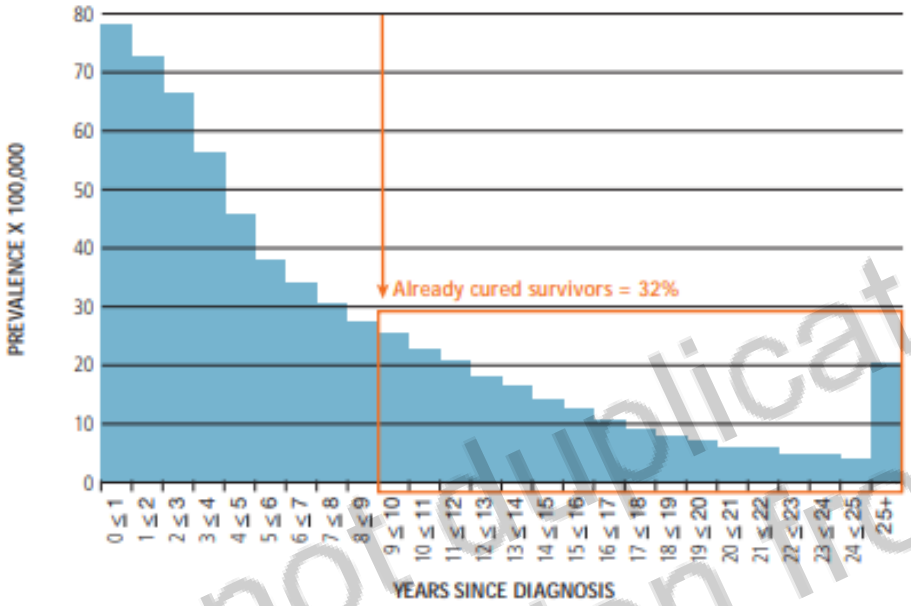
AGE AT DIAGNOSIS	TIME TO CURE YEARS	
	MALE	FEMALE
0 - 44	1	1
45 - 59	4	1
60 - 74	9	5
75+	4	5

BREAST

AGE AT DIAGNOSIS	TIME TO CURE YEARS
	FEMALE
0 - 44	>25
45 - 59	15
60 - 74	20
75+	17

How many patients are already cured from the disease?

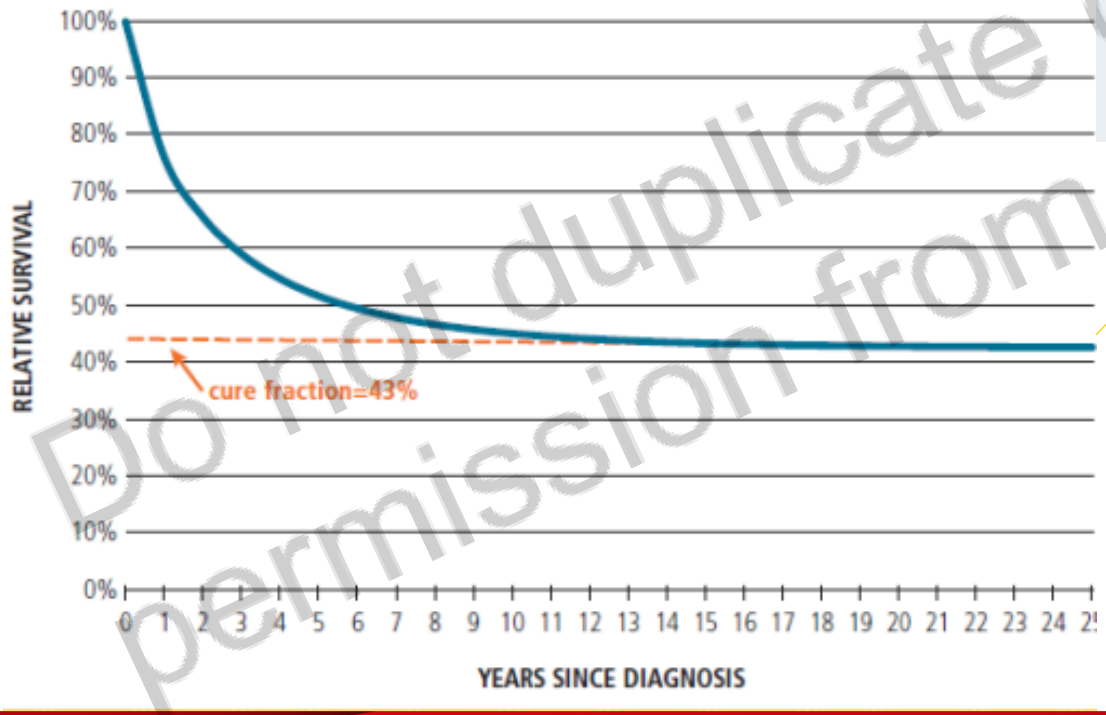
Already cured Patients who have survived longer than time to cure.



Cancer type	Men	Women
Stomach	40%	45%
Colorectum	30%	44%
Lung	22%	18%
Breast		16%
Thyroid	62%	81%
All cancers*	20%	33%

How many patients will be cured from the disease?

Cure fraction: proportion of cancer patients who are expected to reach the same death rates of the general population and will not die as a result of their cancer.



COLON-RECTUM

AGE AT DIAGNOSIS	CURE FRACTION %	
	MALE	FEMALE
0 - 44	60%	65%
45 - 59	52%	56%
60 - 74	43%	47%
75+	38%	41%

THYROID

AGE AT DIAGNOSIS	CURE FRACTION %	
	MALE	FEMALE
0 - 44	96%	99%
45 - 59	84%	95%
60 - 74	50%	74%
75+	35%	38%

BREAST

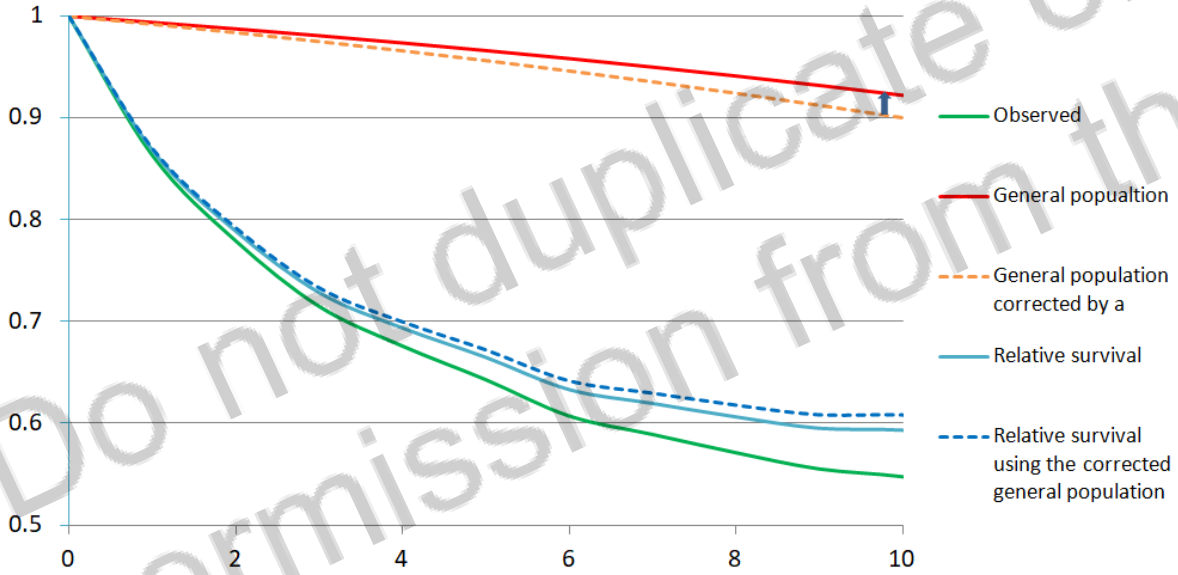
CURE FRACTION %
FEMALE
46%
64%
52%
47%

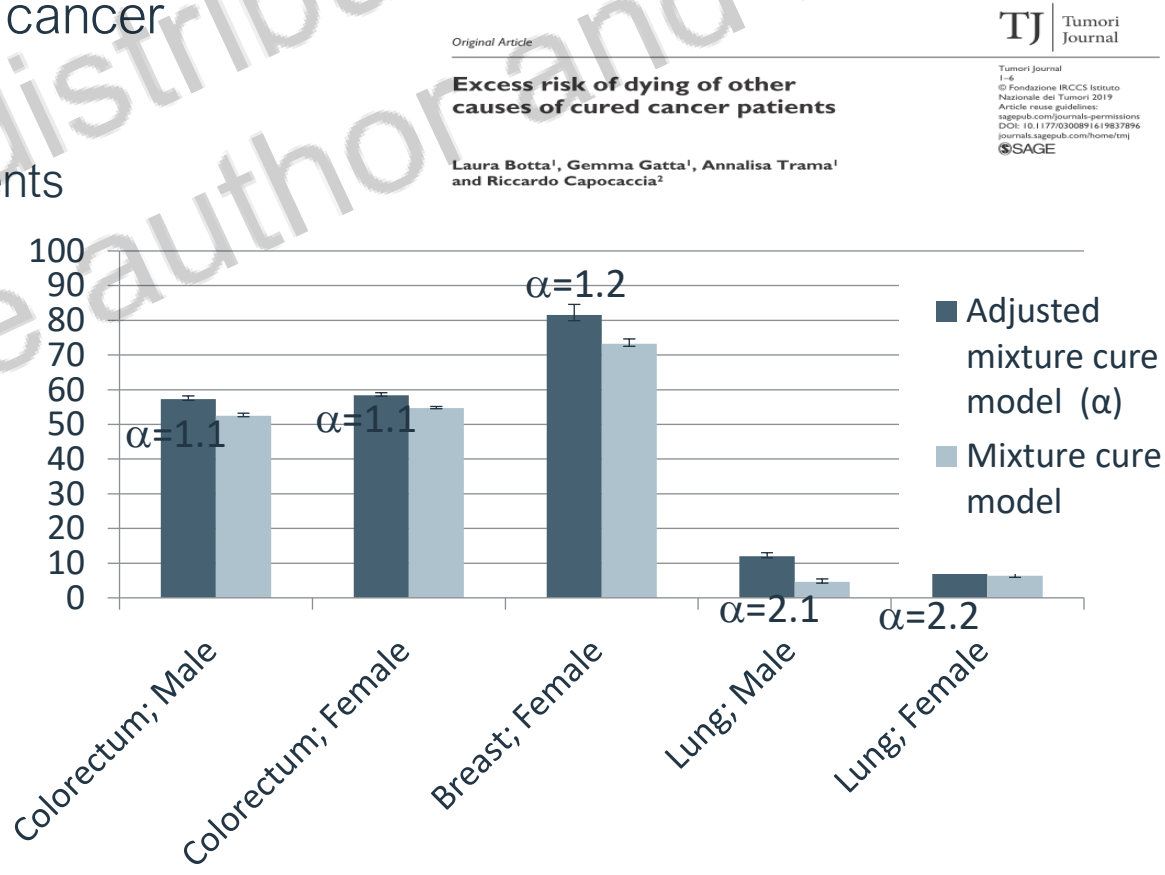
EXTENDED MIXTURE CURE MODEL

Cured patients are no longer at risk of dying from cancer but are more fragile, and at risk of:

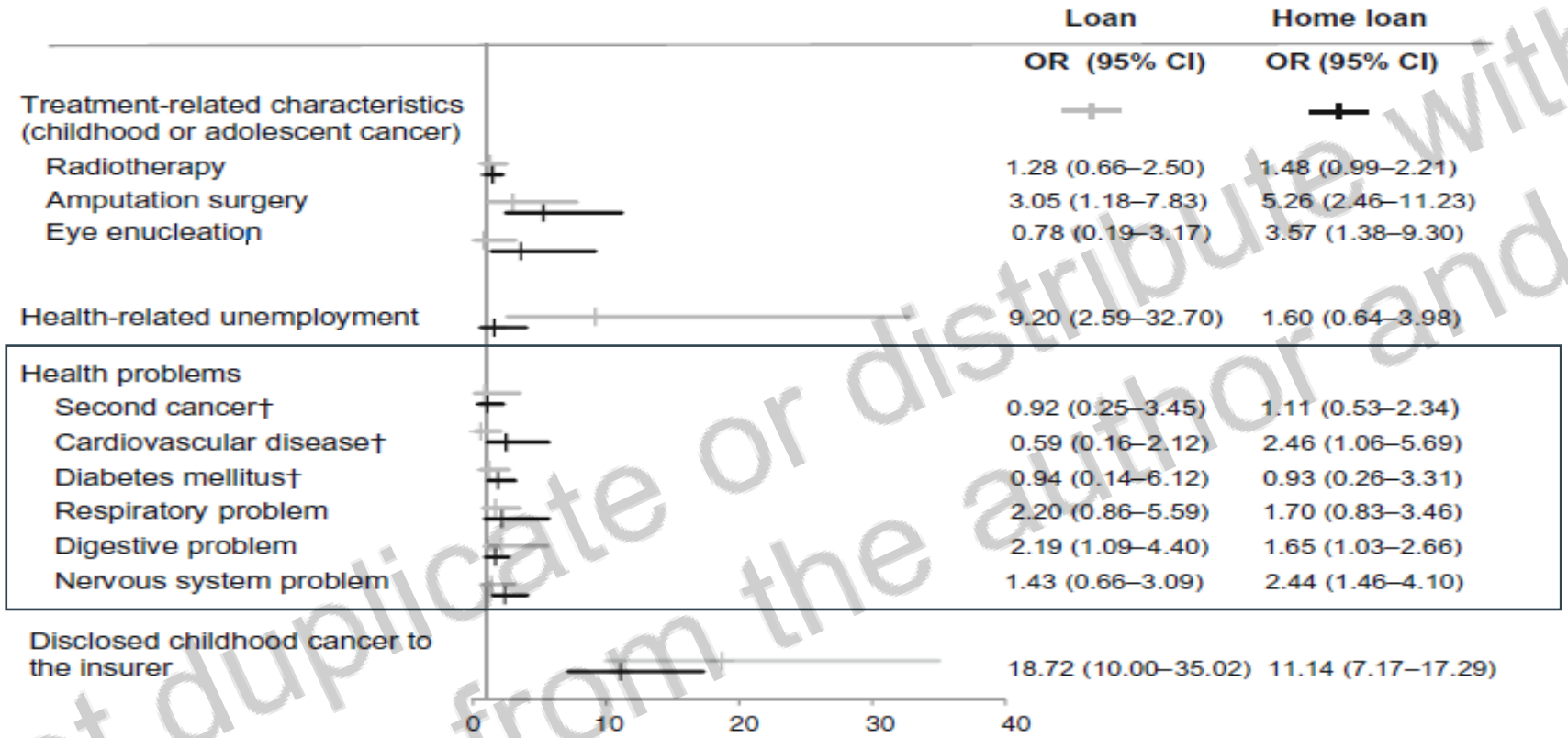
- develop diseases related to the treatment received
- develop pathologies related to risk factors common to cancer
- develop a second tumor

α = relative risk of death of other causes of cured cancer patients





DISCUSSION



"Cure refers only to the original disease regardless of any potential for, or presence of, disabilities or side effects of treatment." Haupt 2007

> Lancet Oncol. 2016 Oct;17(10):1354-1356. doi: 10.1016/S1470-2045(16)30452-1.

Access to loan-related insurance for French cancer survivors

Agnès Dumas [1], Florent De Vathaire [2], Gilles Vassal [3]

> J Cancer Surviv. 2017 Aug;11(4):431-437. doi: 10.1007/s11764-017-0600-9. Epub 2017 Jan 27.

The right to be forgotten: a change in access to insurance and loans after childhood cancer?

Agnès Dumas [1 2], Rodrigue Allodji [3 4], Brice Fresneau [3 4 5], Dominique Valteau-Couanet [5],

> Eur J Cancer. 2007 Aug;43(12):1778-80. doi: 10.1016/j.ejca.2007.04.015. Epub 2007 May 31.

Long term survivors of childhood cancer: cure and care. The Erice statement

Riccardo Haupt [1], John J Spinetta, Irina Ban, Ronald D Barr, Joern D Beck, Julianne Byrne,

CONCLUSION

- The presented estimates, in particular, those for cure fraction and time to cure, were average figures referred to groups of patients.
- The availability of these indicators has a high potential impact on health planning, clinical practice, and patients' perspective.
- Research is keep on movin' to find the best statistical approach to reply to question
- The results presented provide quantitative information on the number of patients, though not on their general health status. In particular, cancer registries do not systematically collect the information on the treatments of the patients, on relapses, or new hospitalisations after their first diagnosis.
- Upcoming methodologies are studied now to estimate Prevalence by phase of care and of the disease (initial care, long-term survivors, post- diagnostic monitoring, treatment for recurrent or metastatic disease, and terminal care).

Monica Terenziani

Struttura Complessa di Pediatria
Fondazione IRCCS Istituto Nazionale dei Tumori
Milano

Life expectancy of cancer patients

Monica Terenziani

Struttura Complessa di Pediatria
Fondazione IRCCS Istituto Nazionale dei Tumori
Milano

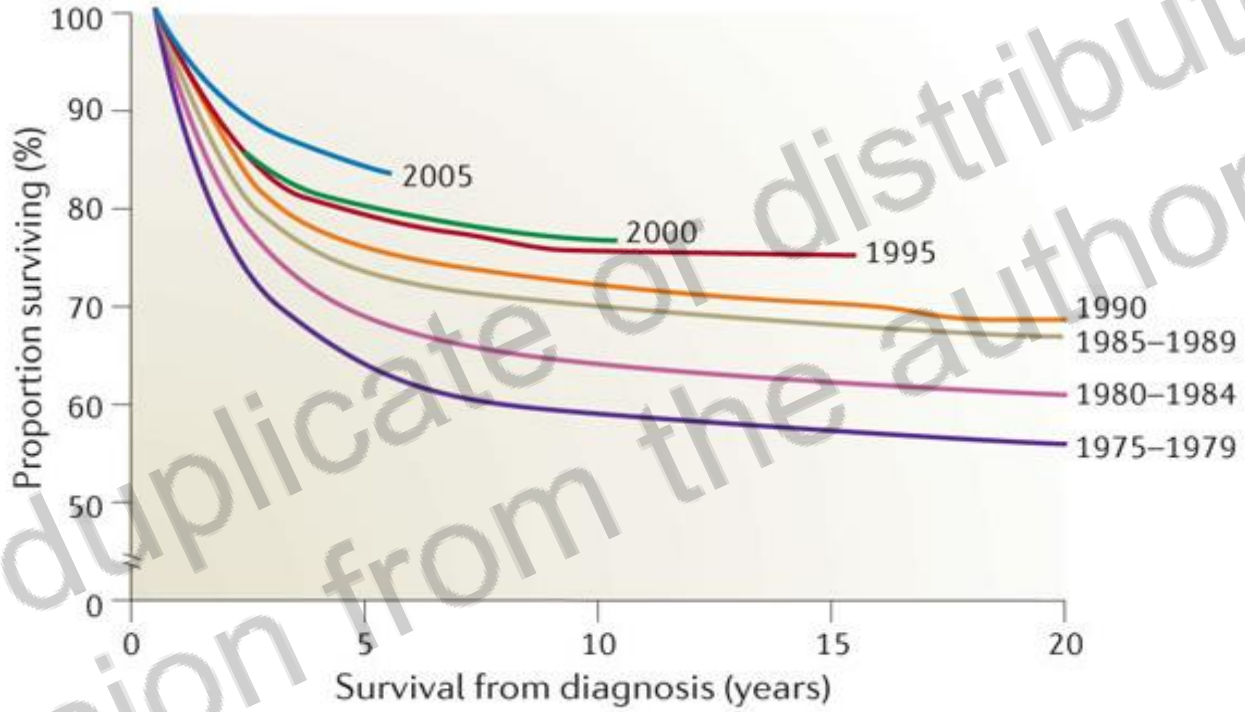
Conflicts of Interest Statement: nothing to disclose

Life expectancy of cancer patients

- For children and adolescents and young adults, focusing on the cure of cancer cannot be the only end-point today
- Because of their young age and life-expectancy, the late sequelae of therapies will probably have effects on their lives and families
- Health care providers must educate and follow these survivors to ensure a better quality of life

Life expectancy of cancer patients

Pediatric Cancer Survival



Life expectancy of cancer patients

Over the past 30 years the survival rate has improved

Cancer still remains the most common cause of disease-related mortality

5-yrs SURVIVAL
FROM 65 % in 1983-85

TO 75% in 1992-1994
(Gatta G, JCO 23; 3742-3751)

currently about 80% of children and adolescents *will survive >5 year* beyond their diagnosis and this group will become "long-term survivors"

Life expectancy of cancer patients

At present there are approximately 300,000 to 500,000 survivors of childhood cancer in Europe

-1 out of 350 people under the age of 20 years has cancer

- 80% are cured

-1 out of 700 people is a childhood cancer survivor

For some survivors follow up and medical care are life-long.
For others there is little long-term risk

Life expectancy of cancer patients

- 60 -75% of survivors have at least one late effect;
- 20-30% have a severe / life threatening late effect
  - ✓ 45 years from diagnosis
    - → The risk of death is 3 time greater compared to general population
    - → The risk increases with ageing without reaching a plateau

St Jude Lifetime cohort: 1713 adult (18-60 years) survivors of childhood cancer (median time from diagnosis 25 years) who completed a 2-3 days evaluations

98% of the cohort had 1 or more chronic health conditon

67% had a serious or disabling health condition (grade 3-4 CTCAE)

-Mertens AC et al . JNCI 2008

-MH Hudson et al Jama 2013

Life expectancy of cancer patients

CHILDHOOD CANCERS ARE 1-2% OF ALL CANCERS

- In adults, the percentage of patients defined as cured reaches about 27% of the entire population of cancer patients
- An increase in life expectancy creates new challanges for the oncologists and today investigation oncology may not be just pre-clinical and clinical but also assistance modeling research
- European Union developed a 12 points recommentation for psychosocial, rehabilitation and survivorship research

Life expectancy of cancer patients

- In current p is important to recognize that about *2/3 of patients with cancer* *are over the age* comorbidity conditions can be exacerbated by cancer treatments
- Cancer –related lifestayle chang sychosocial impact can be devastating in the daily life
- According to the age of the patients , cancer c just one several disabling diseases and the better or worse qualiy of life and l ectancty could depends on the “wise” management focused on the person and not on the disease/s

Life expectancy of cancer patients

The cost of cure

- The treatment has been defined like a battle and survivors were those who were winning a war and they were “ lucky to survive”
- There is a cost of survival, often considerable
- For some survivors life is defined as “ disturbing “ or “ surviving survival”
- Cured dose not always mean being “ well”

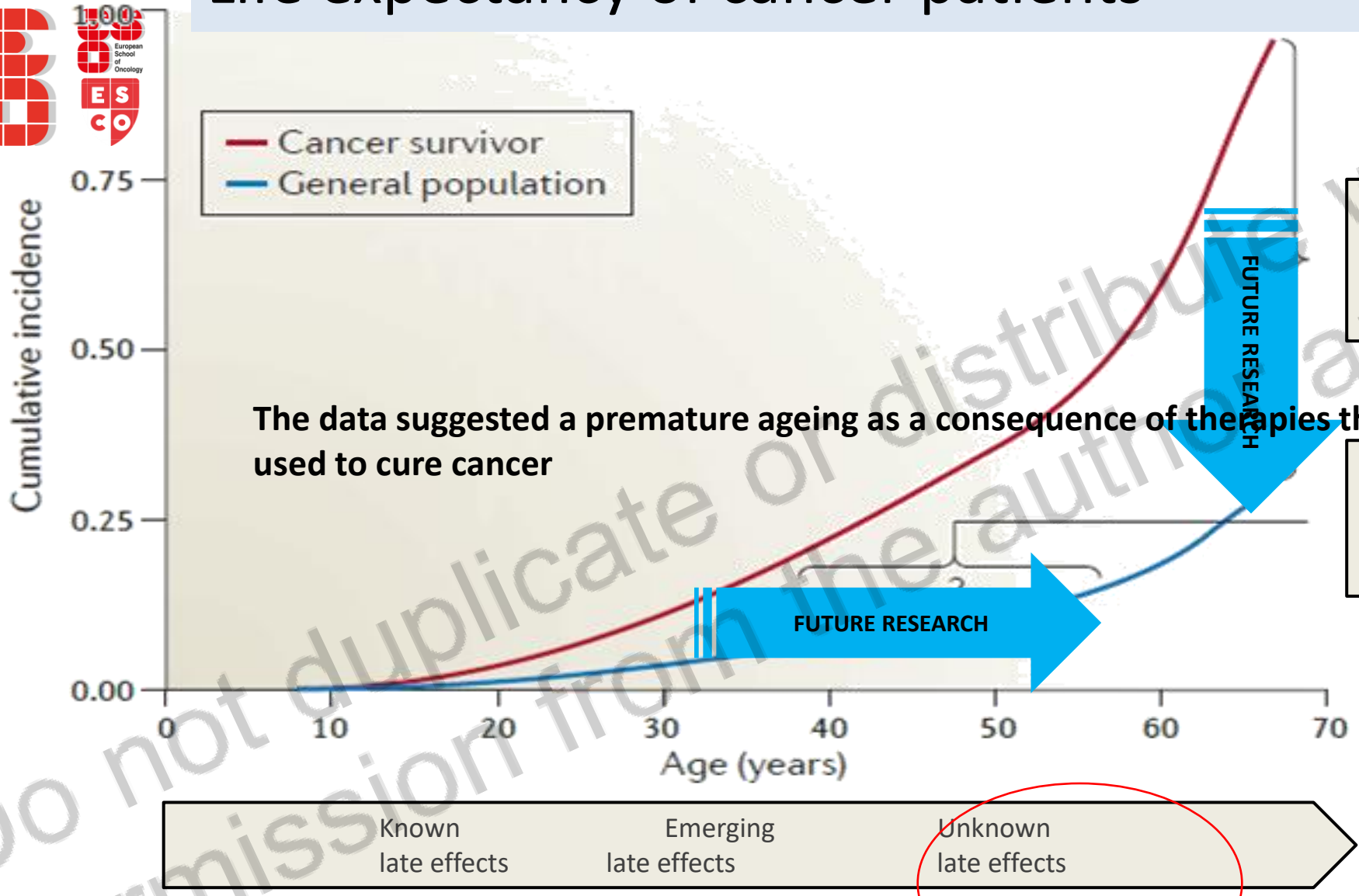
How survivorship care is delivered is essential and how is managed the transiton between treatment and long-term follow-up is fundamental in term of quality of life, use of resources .

Life expectancy of cancer patients

- A debate within the oncological community about the best model for survivorship care is underway
- A coordination between professionals is essential to guide patients and families on their journey through the different phases of cancer, follow up and survivorship.

Any model have to consider the patients' categories, the type of disease, the comorbidites, the distance form the cancer center or a hospital, the services available to the territory , the National Health system (private or public) and the role of insurances, the professionals involved and their expertise.

Life expectancy of cancer patients

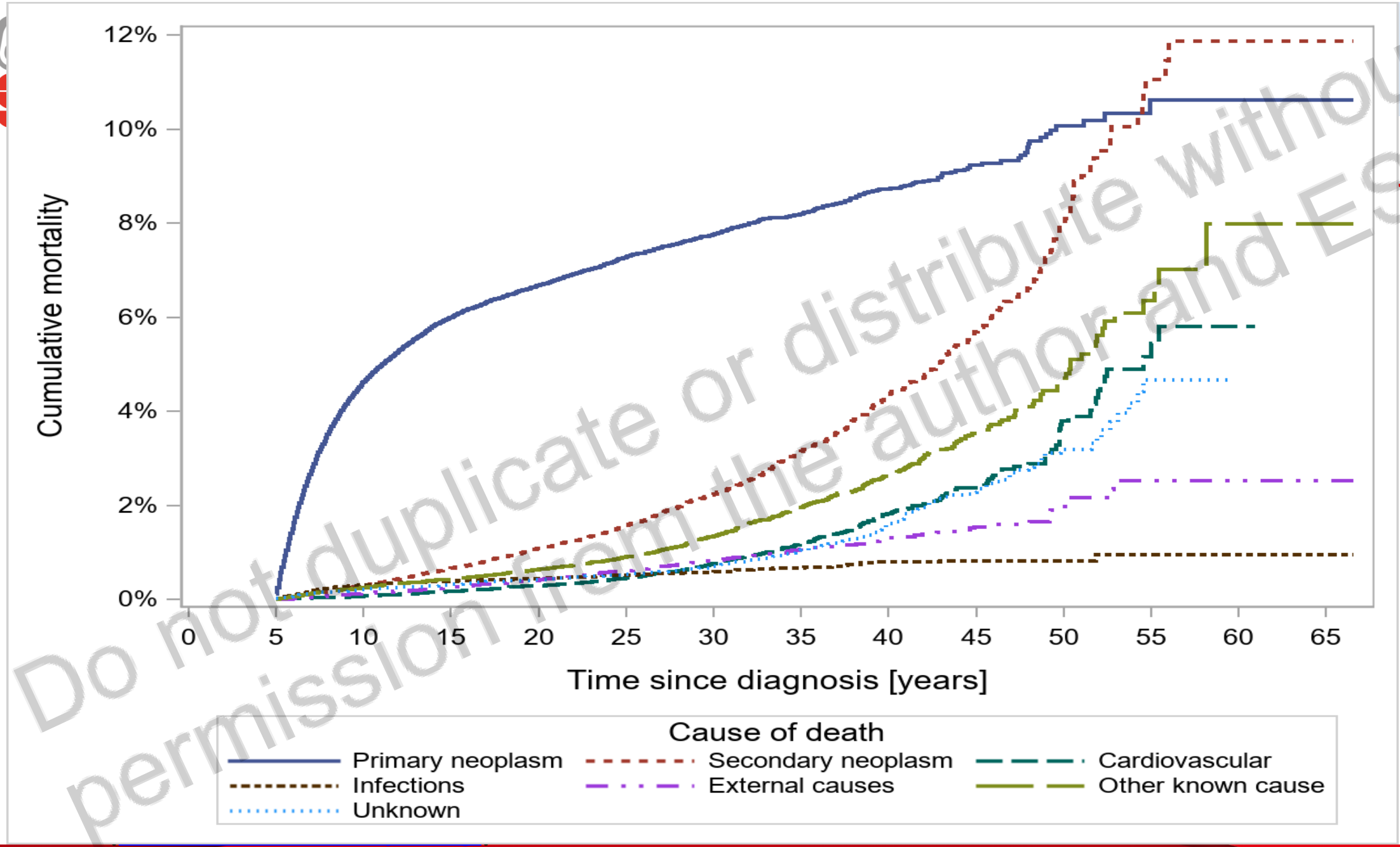


The data suggested a premature ageing as a consequence of therapies that are used to cure cancer

Excess lifetime morbidity associated with cancer, therapy and contribution of genetic predisposition

Advanced onset of morbidity associated with cancer, therapy and contribution of genetic predisposition

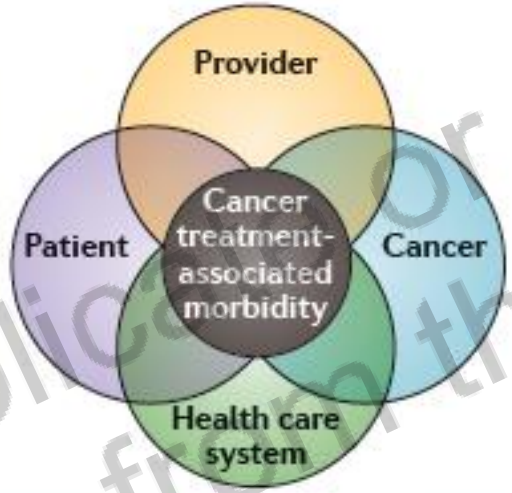
Modified from: Robison LL, Hudson MM. Survivors of childhood and adolescent cancer: life-long risks and responsibilities. Nat Rev Cancer. 2014 Jan;14(1):61-70



Life expectancy of cancer patients

- Survivorship education or training
- Survivorship experience
- Practice style
- Perceptions regarding preventive care
- Access to survivorship resources
- Knowledge or access to individual survivor health history

- Age at treatment and attained age
- Sex, race or ethnicity
- Familial or genetic factors
- Pre- or co-morbid conditions
- Health behaviours
- Cognitive or developmental



- Histology
- Biology
- Treatment
- Surgery
- Chemotherapy
- Radiotherapy
- Transplantation
- Transfusion
- Treatment events

New treatments and late toxicites

Familal and genetic predisponing factors'

- Financing and payment policies
- Organization and affiliation of providers
- Data systems and information sharing
- Models of survivorship care
- Insurance coverage and benefits supporting survivors (especially preventive and psychosocial services)
- Community resources
- Survivorship advocacy activity

Different Health System Policies

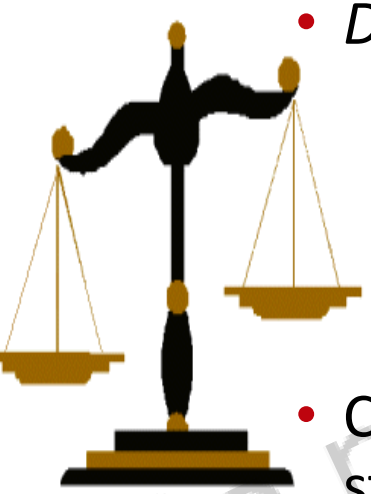
Life expectancy of cancer patients

- A comparison of late mortality among CCS in the US and UK
  - *A restrospective US cohort of patients compared to retrospective Britain cohort*
  - *Age at diagnosis younger than 15 years*
  - *Diagnosis period of 1970-1999*
  - *Leukemia, CNS tumor, lymphoma, WT, Neuroblastoma, Rhabdomyosarcoma, bone tumors*
- All-cause of cumulative 10-years mortality from diagnosis were statistically lower in US cohort compared with Britain cohort (lower probability of death from recurrence or progression)
- At 40 years form diagnosis the US cohort had a cumulative mortality % attributable to a 2 fold higher risk of mortality from late toxicities

MM Fidler-Benaoudia et al JNCI 2021

Life expectancy of cancer patients

- A better risk stratification is a crucial point in oncology practice : it is a way to selec[illegible]ccording to different risk categories , different treatment strategy and [illegible] a tailored survivorship care plan.
- *Dis[illegible]*



BMJ Open

Can intensity of long-term follow-up for survivors of childhood and teenage cancer be determined by therapy-based risk stratification?

A B Edgar,[1] K Duffin,[1] S Borthwick,[1] P Marciniak-Stepak,[2] W H Wallace[1]

- [illegible]
- Characterizing highest-risk [illegible] strategies is essential
- Despite the fact that causes may be multifactorial, it is [illegible]ific factors that detemine the risk of late effects

Life expectancy of cancer patients

intensify therapy for all
(additional drugs; more radiotherapy)
↑EFS; ↑morbidity

reduce therapy in all
↓EFS (OS);
↓morbidity

Better stratify patient groups according to prognostic factors

Life expectancy of cancer patients

- The current knowledge is based on “old” treatment modalities that are modified during the years with reduction /omission of cumulative doses of Chemo and Radiotherapy
  - i.e. ↓ CNS RT in ALL , ↓dose and fields of RT in HL, ↓ use of doxorubicin in Wilms Tumor…
- These modifications have reduced the treatment burden and the occurence of life-threatening complications

The current knowledge is based on “old” treatment modalities that are modified during the years with treatments’ intensification in selected “High risk group”
These modifications have increased the treatment burden, with a better cure rate but a higher risk of late toxicities

Life expectancy of cancer patients

- To note, the recent advent of immunotherapy and targeted therapy for the treatment of some form of cancer would not markedly changing the scenario

- Their mode of action differs from conventional oncological chemotherapy, but a detrimental effect on future health status cannot be excluded

Life expectancy of cancer patients

→ and further research is needed!!

- patients diagnosed during 1940s-1990s received as a standard of care 2 dimensionally-planned radiotherapy treatment without CT scan imaging
- Since 2000, CT scan based 3 dimensionally-planned radiotherapy and multibeam techniques have been implemented.

compared to 2D-RT the dose delivered to the healthy tissue surrounding the tumor is lower

But a larger area of healthy tissue receives low-dose RT and data of these low-doses including long term follow up beyond the 5-year are rare or unknown

Life expectancy of cancer patients

The NEW ENGLAND JOURNAL of MEDICINE

ORIGINAL ARTICLE

Reduction in Late Mortality among 5-Year Survivors of Childhood Cancer

Gregory T. Armstrong, M.D., M.S.C.E., Yan Chen, M.M., Yutaka Yasui, Ph.D., Wendy Leisenring, Sc.D., Todd M. Gibson, Ph.D., Ann C. Mertens, Ph.D., Marilyn Stovall, Ph.D., Kevin C. Oeffinger, M.D., Smita Bhatia, M.D., M.P.H., Kevin R. Krull, Ph.D., Paul C. Nathan, M.D., Joseph P. Neglia, M.D., M.P.H., Daniel M. Green, M.D., Melissa M. Hudson, M.D., and Leslie L. Robison, Ph.D.

ABSTRACT

BACKGROUND

Among patients in whom childhood cancer was diagnosed in the 1970s and 1980s, 18% of those who survived for 5 years died within the subsequent 25 years. In recent

(78%, 55%, and 43%, respectively), of chest radiotherapy for Hodgkin's lymphoma (87%, 79%, and 61%, respectively), and of anthracycline exposure. Reduction in treatment exposure was associated with reduced late mortality among survivors of acute lymphoblastic leukemia and Wilms' tumor.

CONCLUSIONS

The strategy of lowering therapeutic exposure has contributed to an observed decline in late mortality among 5-year survivors of childhood cancer. (Funded by the National Cancer Institute and the American Lebanese–Syrian Associated Charities.)

From the Departments of Epidemiology and Cancer Control (G.T.A., Y.Y., T.M.G., K.R.K., D.M.G., M.M.H., L.L.R.) and On-ogy (G.T.A., M.M.H.), St. Jude Chil-n's Research Hospital, Memphis, TN; School of Public Health, University of erta, Edmonton (Y.C., Y.Y.), and the spital for Sick Children, Toronto C.N.) — both in Canada; the Cancer vention and Clinical Statistics Pro-ms, Fred Hutchinson Cancer Research nter, Seattle (W.L.); the Department of diatrics, Emory University, Atlanta C.M.); the Department of Radiation ysics, the University of Texas M.D. An-rson Cancer Center, Houston (M.S.); Departments of Pediatrics and Medi-e, Memorial Sloan Kettering Cancer nter, New York (K.C.O.); the Depart-nt of Pediatrics, University of Alabama ool of Medicine, Birmingham (S.B.); the Department of Pediatrics, Univer-of Minnesota Medical School, Minne-olis (J.P.N.). Address reprint requests Dr. Armstrong at the Department of idemiology and Cancer Control, St. Jude ildren's Research Hospital, 262 Danny omas Pl., Mail Stop 735, Memphis, TN 105, or at greg.armstrong@stjude.org.

is article was published on January 13, 16, at NEJM.org.

Engl J Med 2016;374:833-42.
I: 10.1056/NEJMoa1510795

However, with respect to Hodgkin's lymphoma, findings suggest that factors other than reduced treatment exposures may have caused the observed reductions in late health-related mortality. Potential contributors to decreased late mortality include increased use and accuracy of screening methods. Although guideline-based screening and care have not been universally adopted, it should be expected that these efforts would have a positive effect on health-related mortality.

Life expectancy of cancer patients

→ The screening and surveillance of at-risk treatment groups can facilitate early detection and timely intervention

Many studies show that screening identifies a substantial proportion of survivors with previously unrecognized treatment-related complications

Some of these undiscovered late sequelae may benefit from treatment or preventive interventions

Life expectancy of cancer patients

- Variable latency of Late Effects and timely preventive and remedial interventions

→ cisplatin hearing loss toxicity develops soon after treatment, depending on age, cumulative dose and combination RT, sex

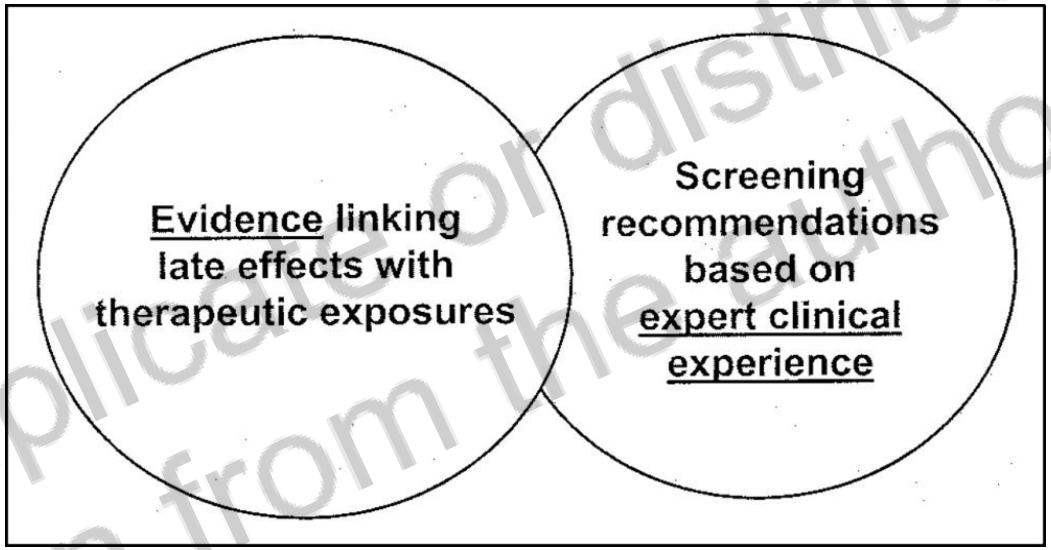
→ monitor of hearing during treatment, modify treatment-strategy, act with remedial interventions to optimize language development and academic achievement

→ risk of Breast cancer after chest RT with a median time to diagnosis of 10-20 yrs, depending on dose and age and volume.

→ recommendations for early BC surveillance

Life expectancy of cancer patients

INTERNATIONAL GUIDELINE HARMONIZATION GROUP" (IGHG)



CANCER and TREATMETNS → LATE EFFECS → CONSENSUS-BASED CLINICAL PRACTICE GUIDELINES

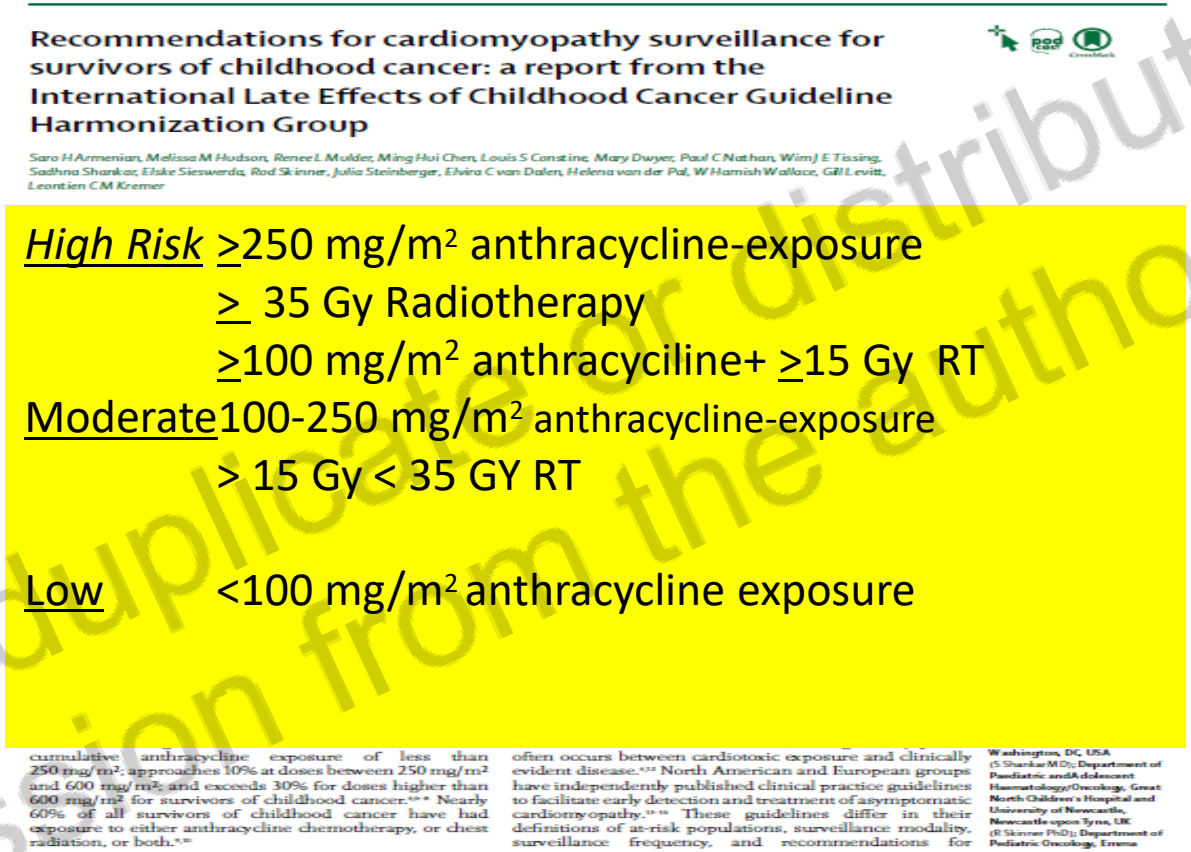
Life expectancy of cancer patients

1. Who needs surveillance?
2. (When) At what age or time from exposure should surveillance be initiated? At what frequency should surveillance be performed?
3. What surveillance modality should be used?
4. What should be done if abnormalities are identified? What can be done to modify risk factors

According to IGHG criteria four levels of Strength of recommendations to enter a Specific screening program are reported and highlighted with a colour code:

Strong	→green
Moderate	→yellow
Weak	→orange
Not to do	→ red

Life expectancy of cancer patients



Recommendations for cardiomyopathy surveillance for survivors of childhood cancer: a report from the International Late Effects of Childhood Cancer Guideline Harmonization Group

Saro H Armenian, Melissa M Hudson, Renee L Mulder, Ming Hui Chen, Louis S Constine, Mary Dwyer, Paul C Nathan, Wim J E Tissing, Sadhna Shankar, Elske Sieswerda, Rod Skinner, Julia Steinberger, Elvira C van Dalen, Helena van der Pal, W Hamish Wallace, Gill Levitt, Leontien CM Kremer

High Risk ≥250 mg/m² anthracycline-exposure
≥ 35 Gy Radiotherapy
≥100 mg/m² anthracyciline+ ≥15 Gy RT

Moderate 100-250 mg/m² anthracycline-exposure
> 15 Gy < 35 GY RT

Low <100 mg/m² anthracycline exposure

cumulative anthracycline exposure of less than 250 mg/m²; approaches 10% at doses between 250 mg/m² and 600 mg/m²; and exceeds 30% for doses higher than 600 mg/m² for survivors of childhood cancer.[5–8] Nearly 60% of all survivors of childhood cancer have had exposure to either anthracycline chemotherapy, or chest radiation, or both.[5,9]

often occurs between cardiotoxic exposure and clinically evident disease.[5,12] North American and European groups have independently published clinical practice guidelines to facilitate early detection and treatment of asymptomatic cardiomyopathy.[5–9] These guidelines differ in their definitions of at-risk populations, surveillance modality, surveillance frequency, and recommendations for

Washington, DC, USA (S Shankar MD); Department of Paediatric and Adolescent Haematology/Oncology, Great North Children's Hospital and University of Newcastle, Newcastle upon Tyne, UK (R Skinner PhD); Department of Paediatric Oncology, Emma

Life expectancy of cancer patients

Cumulative burden of cardiovascular morbidity in paediatric, adolescent, and young adult survivors of Hodgkin's lymphoma: an analysis from the St Jude Lifetime Cohort Study

Nickhill Bhakta, Qi Liu, Frederick Yeo, Malek Baassiri, Matthew J Ehrhardt, Deo K Srivastava, Monika L Metzger, Matthew J Krasin, Kirsten K Ness, Melissa M Hudson, Yutaka Yasui, Leslie L Robison

Summary

Background The magnitude of cardiovascular morbidity in paediatric, adolescent, and young adult survivors of Hodgkin's lymphoma is not known. Using medically ascertained data, we applied the cumulative burden metric to compare chronic cardiovascular health conditions in survivors of Hodgkin's lymphoma and general population controls.

Methods For this study, participant data were obtained from two ongoing cohort studies at St Jude Children's Research Hospital: the St Jude Lifetime Cohort Study (SJLIFE) and the St Jude Long-term Follow-up Study (SJLTFU). SJLIFE is a cohort study initiated on April 27, 2007, to enable longitudinal clinical evaluation of health outcomes of survivors of childhood cancer treated or followed at St Jude Children's Research Hospital, and SJLTFU is an administrative system-based study initiated in 2000 to collect outcome and late toxicity data for all patients treated at the hospital for childhood cancer. The patient cohort for our study was defined as patients treated at St Jude Children's Research Hospital who reached 18 years of age and were at least 10 years post-diagnosis of pathologically confirmed primary Hodgkin's lymphoma. Outcomes in the Hodgkin's lymphoma survivors were compared with a sample of SJLIFE community control participants, aged 18 years or older at the time of assessment, frequency-matched based on strata defined by 5-year age blocks within each sex, who were selected irrespective of previous medical history. All SJLIFE participants underwent assessment for 22 chronic cardiovascular health conditions. Direct assessments, combined with retrospective clinical reviews, were used to assign severity to conditions using a modified Common Terminology Criteria of Adverse Events (CTCAE) version 4.03 grading schema. Occurrences and CTCAE grades of the conditions for eligible non-SJLIFE participants were accounted for by multiple imputation. The mean cumulative count (treating death as a competing risk) was used to estimate cumulative burden.

Findings Of 670 survivors treated at St Jude Children's Research Hospital, who survived 10 years or longer and reached age 18 years, 348 were clinically assessed in the St Jude Lifetime Cohort Study (SJLIFE); 322 eligible participants did not participate in SJLIFE. Age and sex frequency-matched SJLIFE community controls (n=272) were used for comparison. At age 50 years, the cumulative incidence of survivors experiencing at least one grade 3–5 cardiovascular condition was 45·5% (95% CI 36·6–54·3), compared with 15·7% (7·0–24·4) in community controls. The survivor cohort at age 50 experienced a cumulative burden of 430·6 (95% CI 380·7–480·6) grade 1–5 and 100·8 (77·3–124·3) grade 3–5 cardiovascular conditions per 100 survivors; these numbers were appreciably higher than those in the control cohort (227·4 [192·7–267·5] grade 1–5 conditions and 17·0 [8·4–27·5] grade 3–5 conditions per 100 individuals). Myocardial infarction and structural heart defects were the major contributors to the excess grade 3–5 cumulative burden in survivors. High cardiac radiation dose (≥35 Gy) was associated with an increased proportion of grade 3–5 cardiovascular burden, whereas increased anthracyline dose was not.

Interpretation The true effect of cardiovascular morbidity in paediatric, adolescent, and young adult survivors of Hodgkin's lymphoma is reflected in the cumulative burden. Survivors aged 50 years will experience more than two times the number of chronic cardiovascular health conditions and nearly five times the number of more severe (grade 3–5) cardiovascular conditions compared with community controls and, on average, have one severe, life-threatening, or fatal cardiovascular condition. The cumulative burden metric provides a more comprehensive approach for assessing overall morbidity compared with currently used cumulative incidence based analytic methodologies, and will assist clinical researchers when designing future trials and refining general practice screening guidelines.

Funding US National Cancer Institute, St Baldrick's Foundation, and American Lebanese Syrian Associated Charities.

Lancet Oncol 2016; 17: 1325–34

Published Online
July 25, 2016
http://dx.doi.org/10.1016/S1470-2045(16)30215-7

See Comment page 1189

Department of Oncology (N Bhakta MD, F Yeo, M Baassiri MD, M J Ehrhardt MD, Prof M L Metzger MD, Prof M M Hudson MD), **Department of Epidemiology and Cancer Control** (M J Ehrhardt, Prof K K Ness PhD, Prof M M Hudson, Prof Y Yasui PhD, Prof L L Robison PhD), **Department of Biostatistics** (Prof D K Srivastava PhD), **and Department of Radiation Oncology** (Prof M J Krasin MD), **St Jude Children's Research Hospital, Memphis, TN, USA; and School of Public Health, University of Alberta, Edmonton, AB, Canada** (Q Liu MS, Prof Y Yasui)

Correspondence to:
Dr Nickhill Bhakta, Department of Oncology, St Jude Children's Research Hospital, 262 Danny Thomas Pl, MS-721, Memphis, TN 38105, USA
nickhill.bhakta@stjude.org

Life expectancy of cancer patients

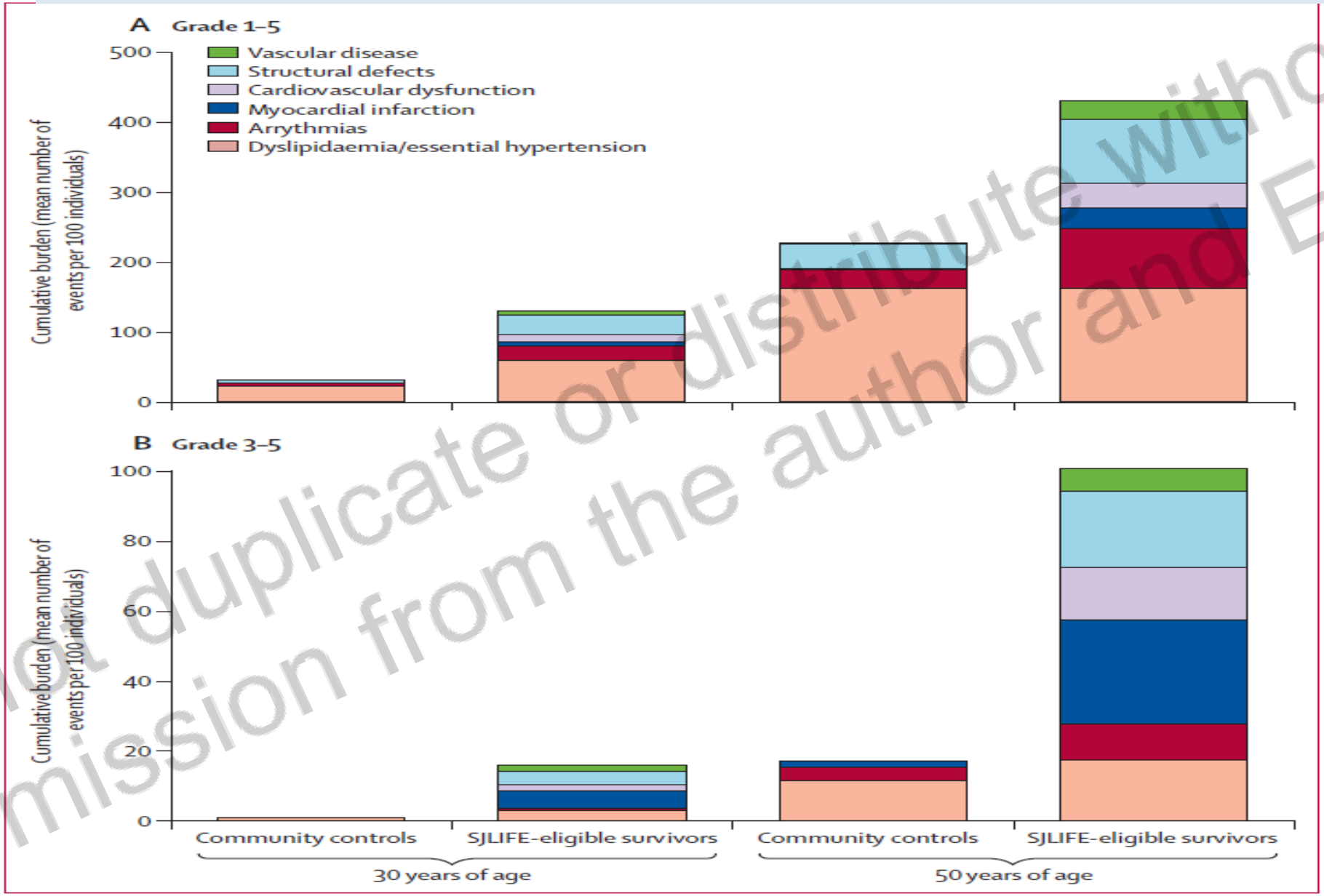


Figure 4: **Contributions to cumulative burden by cardiovascular disease group**
SJLIFE=St Jude Lifetime Cohort Study.

Life expectancy of cancer patients

Female born in 1978;

1980 Wilms tumor with bilateral lung metastases

- Nephrectomy + and 3 drugs chemotherapy

(Doxorubicin cumulative dose 300 mg/smq) +whole lung radiotherapy (12 Gy), and left flank radiotherapy (25,6 Gy)

Follow up at late effetcs clinic

- 2000 (22 years old) pregnancy: at term with a live born
- HCV infection treated with Ribavirin
- 2017 (39 yrs old) orthopedic surgery for a severe lumbar scoliosis

Life expectancy of cancer patients

In 2018 (42 years old) after 40 years from her pediatric cancer

1. A breast biopsy for the presence of micocalcificati… …port was negative for cancer;
2. A reduction of 8% on LVEF com… …e previous year, with a LVEF at lower limit
3. A FNA on thyr… …my for a papillary thyroid carcino…

A WHAT SHOULD HAVE WORRIED US MOST FOR THIS WOMAN?

A … …d pathological features of Thyroid Carcinoma the M… …gist suggested a POSTOPERATIVE 131 I THERAPY … …ver a Balance between the Risk of Relapse of Thyroid Carcinoma and the Risk of adding another toxic treatment had to be done

Life expectancy of cancer patients

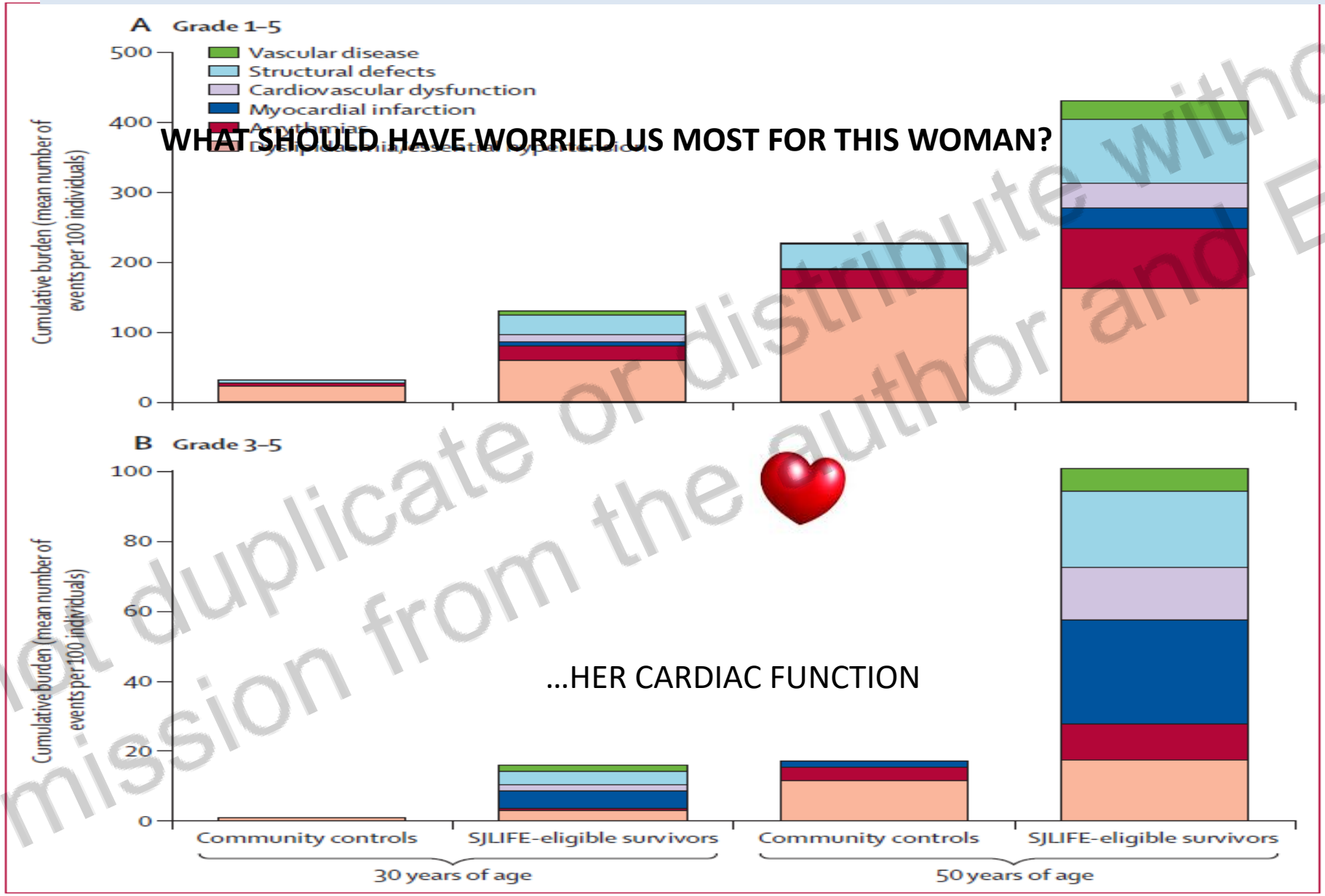


Figure 4: **Contributions to cumulative burden by cardiovascular disease group**
SJLIFE= St Jude Lifetime Cohort Study.

Life expectancy of cancer patients

The Best cancer care starts with the best cancer information

-***Mainteining success***
-***Reducing treatment burden***
-***Focusing on survivorship***

Life expectancy of cancer patients

Thank you