

Primary Prevention of Cancer Health Economics Research

Donatus (Don) Ekwueme, PhD

Donald Kenkel, PhD

Future of Cancer Health Economics Research Virtual Conference

December 2, 2020

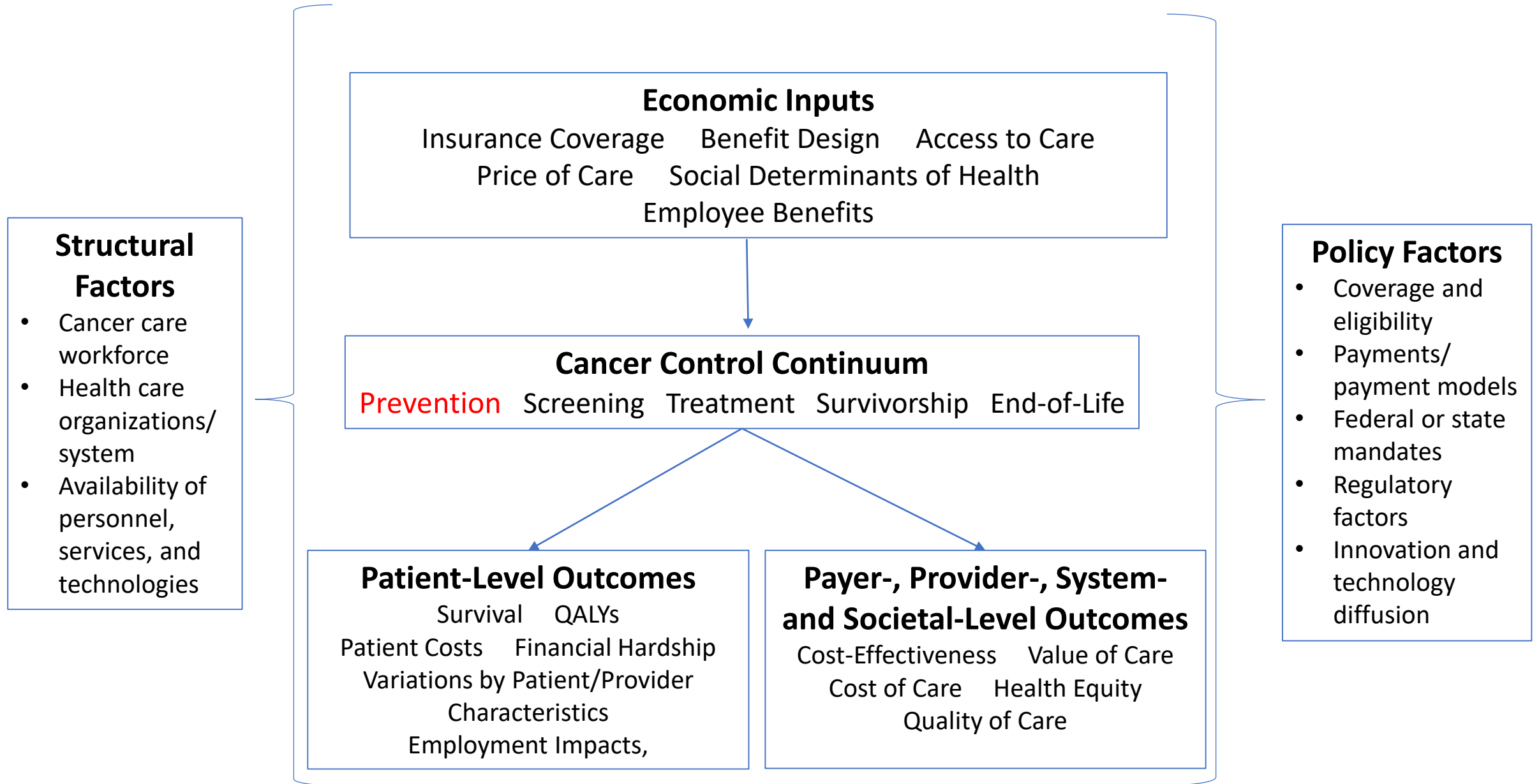
Members of the Primary Prevention Planning Group

- **Donatus (Don) Ekwueme, PhD:** CDC, Chair

Alphabetical order

- **Mahima Ashok, PhD:** Blue Shield of California
- **Harrell W. Chesson, PhD:** CDC
- **Jeffrey (Jeff) Drope, PhD:** University of Illinois at Chicago
- **Michael T. Halpern, MD, PhD:** NCI
- **Young-Rock Hong, PhD:** University of Florida
- **Donald (Don) Kenkel, PhD:** Cornell University
- **Michael Maciosek, PhD:** HealthPartners Institute
- **Michael (Mike) Pesko, PhD:** Georgia State University

Framework for cancer health economics research



Background

- **Purpose of primary cancer prevention**

- Primary prevention is an effective means to lower the **incidence of cancer**
- The aim is to lower the incidence of cancer by avoiding the known causes and risk factors

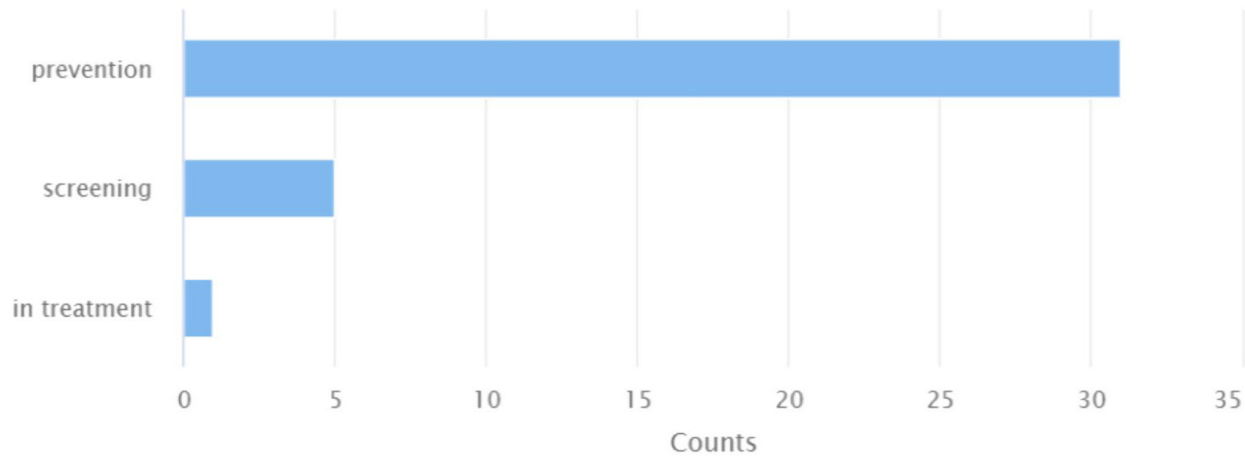
- **Exposures to Risk factors**

- "The food we eat, how active we are and how much we weigh are all things that influence our risk of cancer, and all of these factors are modifiable – there are things people can do to reduce their risk."

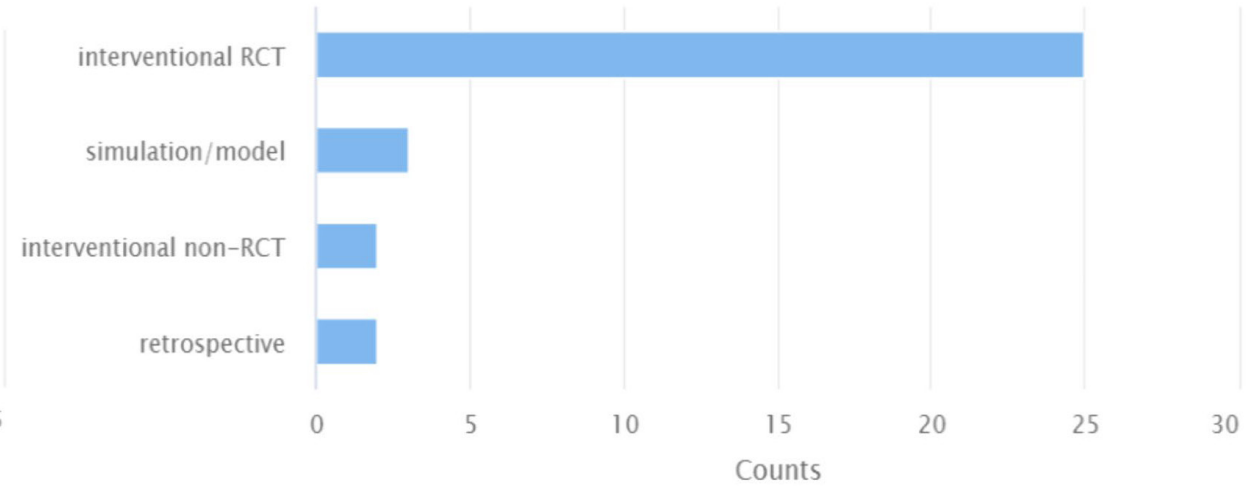
Dr Kate Allen, Executive Director,
World Cancer Research Fund International

NCI's portfolio analysis on competitive awards in cancer prevention, fiscal year 2015-2020

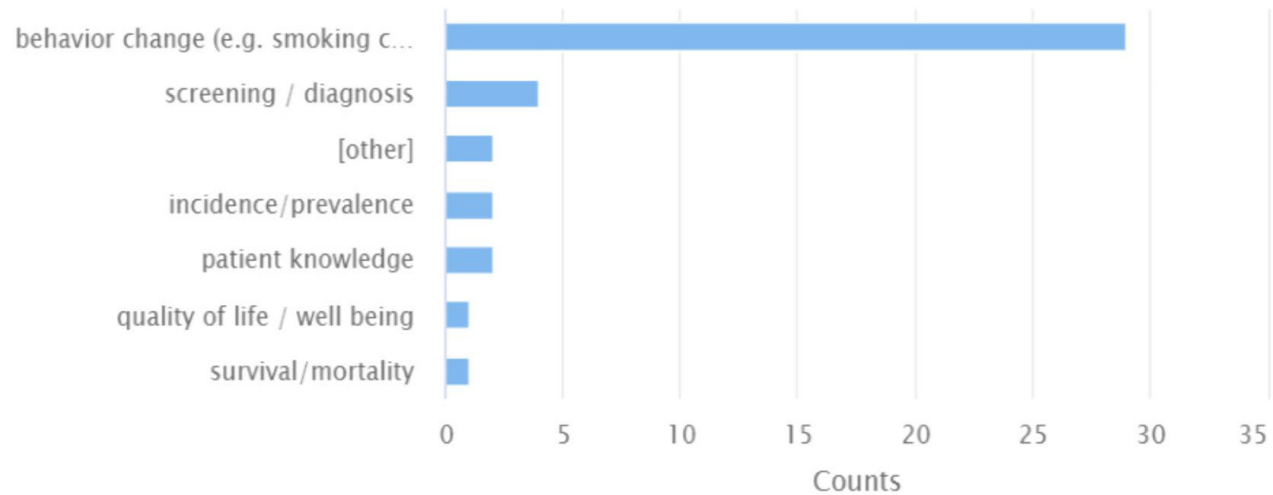
Cancer Continuum



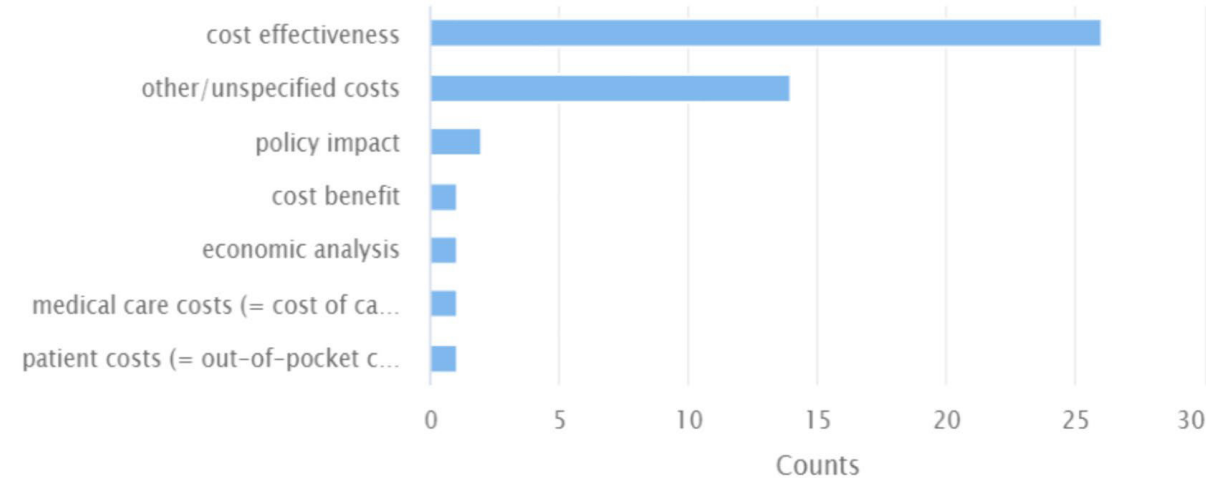
Study Type



Clinical Outcome

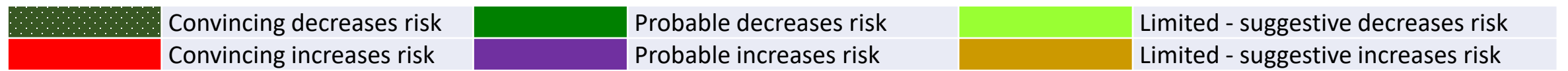


Economic Outcome



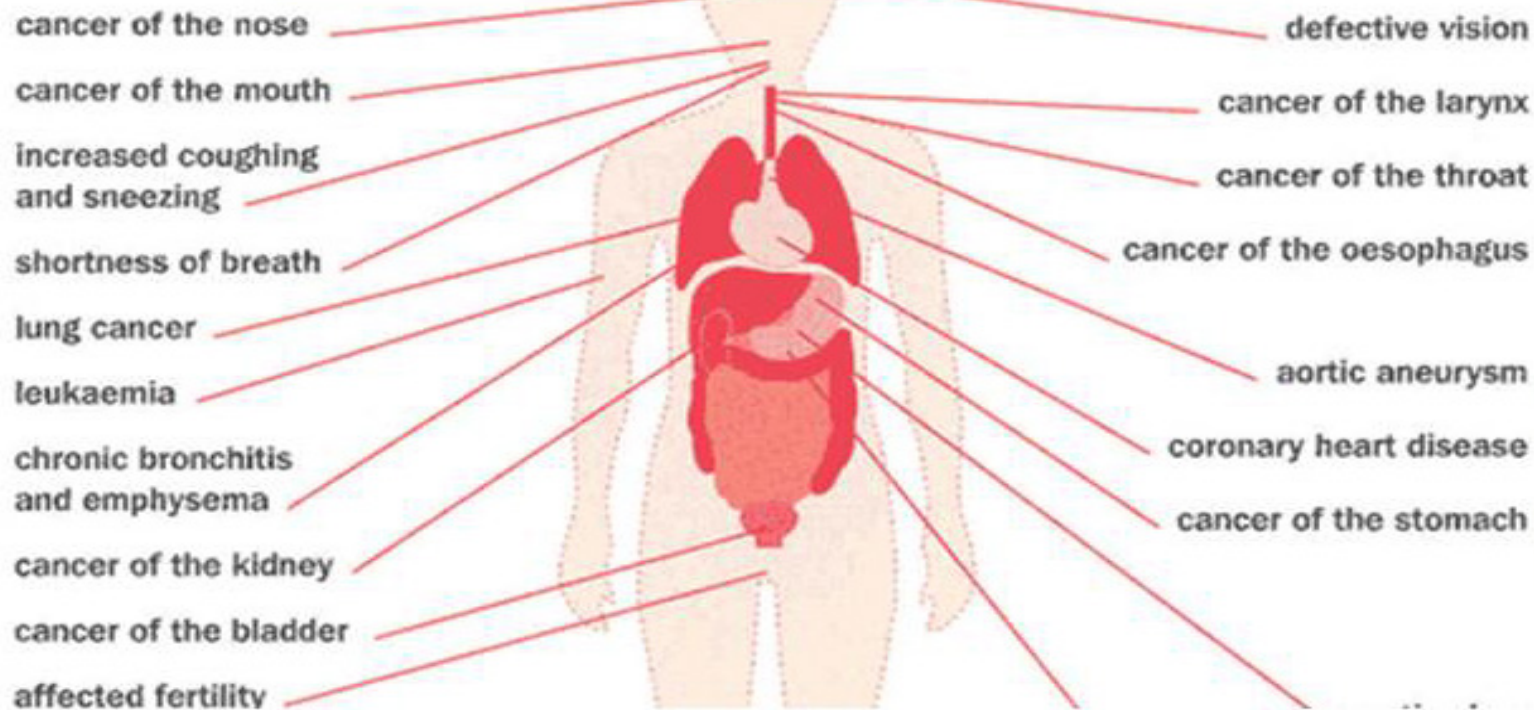
Example of strength of the evidence on causal relationship between exposure to cancer risk factors and cancer as the outcome (Source: World Cancer Research Fund/American Ins for Cancer Research, 2018)

	Exposure to cancer risk factors				
	Alcoholic drinks	Body fatness and weight gain			Physical activity
Cancer as outcome	Alcoholic drinks	Adult body fatness	AYA body fatness	Adult weight gain	Physical activity
Lung	Limited - suggestive increases risk				Limited - suggestive decreases risk
Stomach	Probable increases risk	Probable increases risk			
Pancreas	Limited - suggestive increases risk	Convincing increases risk			
Gallbladder		Probable increases risk			
Liver	Convincing increases risk	Convincing increases risk			Limited - suggestive decreases risk
Colorectal	Convincing increases risk	Convincing increases risk			Convincing decreases risk
Breast (pre-menopause)	Probable increases risk	Limited - suggestive decreases risk	Limited - suggestive decreases risk		Limited - suggestive decreases risk
Breast (post-menopause)	Convincing increases risk	Convincing increases risk	Limited - suggestive decreases risk	Convincing increases risk	Probable decreases risk
Ovarian		Probable increases risk			
Cervical		Convincing increases risk			Probable decreases risk
Endometrial		Limited - suggestive increases risk			
Prostate		Probable increases risk			
Kidney	Probable decreases risk	Convincing increases risk			
Bladder					
Skin	Limited - suggestive increases risk				
Month, pharynx, and larynx	Convincing increases risk	Probable increases risk			
Nasopharynx					
Esophageal (Adeno carcinoma)		Convincing increases risk			
Esophageal (Squamous cell carcinoma)	Convincing increases risk				

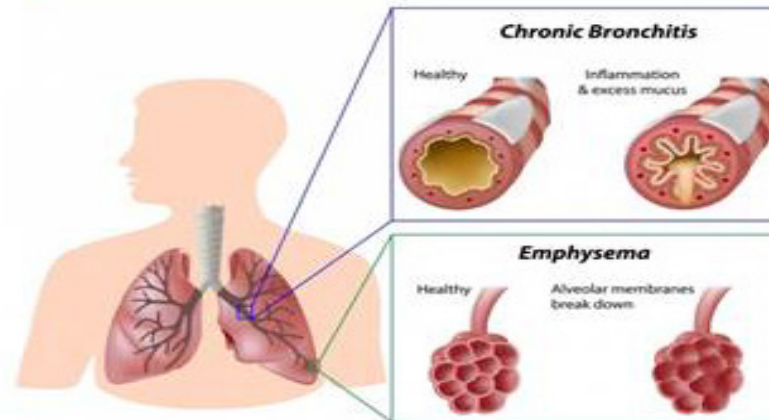


The Impact of Tobacco

Effects on the Human Body



Effects on the Lungs

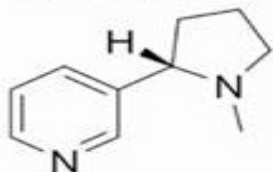


Second Hand Smoke



Nicotine Addiction

NICOTINE



DEADLY ADDICTION

Money Spent



Chewing Tobacco



Gaps in primary cancer prevention research in health economics literature

- A recent systematic review of 30 years of cancer health economic studies that used QALY as an outcome measure

Prevention stage	Percent
Primary	7.1
Secondary	14.8
Tertiary	68.4
Multiple	9.7

- Strong epidemiologic evidence exist in the literature on causal relationship between exposure (risk factors) and cancer as (outcome)
- Limited health economic studies exist in the literature to quantify the causal relationship between risk factors and cancer outcomes
- Limits knowledge on how to effectively allocate scarce health care resources

Challenges and barriers in conducting health economics research in primary cancer prevention

	Challenges and barriers [†]		
	Improved training of health economists	Data quality and access	Improvements in methods
Cancer risk factors			
Diet and nutrition	✓✓	✓✓✓	✓
Alcoholic drinks	✓	✓✓✓	✓✓
Physical activity and obesity	✓✓	✓✓✓	✓✓
Tobacco use	✓	✓✓✓	✓
Occupational and environmental risk	✓✓✓	✓✓✓	✓✓
Sun protection/ultraviolet radiation	✓	✓✓✓	✓✓
HPV vaccine/vaccination	✓✓	✓	✓✓✓
Chemoprevention	✓✓	✓✓✓	✓
Hepatitis B vaccination	✓	✓	✓✓✓
Hepatitis C screening/treatment	✓	✓	✓✓✓
Socioeconomic factors (Social determinants of health)	✓✓✓	✓✓✓	✓✓✓

[†]Lack of adequate funding; Planning Group's suggested ranking: ✓ = Important; ✓✓ = Very important; ✓✓✓ = Extremely important

Recommendations and next steps

Training

- Award grants to institutions of higher learning to recruit and train undergraduate students in health economics and/or health services research field
- Create a task force consisting of federal agencies and universities to develop rigorous training programs for cancer health economists or health services researchers
 - Trained in grant writing
 - Technical/manuscript writing
 - Other career development areas
- Encourage interdisciplinary trainings with other disciplines such as epidemiology, medicine, and other health-related professions
- Encourage trainings in health economics in economic departments, schools of public health and other allied health sciences
- Develop communication platforms for training seminars and networks to provide career development opportunities for health economists and health services researchers

Recommendations and next steps (Cont'd)

Data

- **Meta-Data for Cancer prevention Research**
 - ***BIG Data and Advances in Methods***
 - Use of unconventional dataset (e.g., Satellite data, Google searches, social media discussions)
 - Data Mining / Machine Learning (MI)
 - Natural Language Processing (NLP)
 - ***Cancer Data Repository***
 - e.g., BioLINCC – NHLBI
 - ***Private and Public Data Collaboration***
 - e.g., SEER-MarketScan for young cancer population
 - Mobile-based mobility data from Apple and Google (e.g., COVID community mobility report)
 - Consumer spending data (e.g., credit cards; Amazon)
- **Data to improve quality of cancer care**
 - “Cancer surveillance data systems can also become powerful tools for assessing quality of care when linked to other data sources or when used to select individual cases for special studies” (IOM: National Cancer Policy Board, 2000)

Recommendations and next steps (Cont'd)

Methods

- Continue to engage with state-of-the-art methodologists in economic evaluation, biostatistics, and econometrics
- Big data methods
 - Machine-learning methods can deal with unconventional data that are too high dimensional for conventional methods
 - Variable selection methods: LASSO, regression trees, random forests
 - Many big data methods focus on prediction, but are being adapted to the causal inference questions of interest to cancer prevention health economics
- Small area estimation techniques to disentangle population sub-groups from a larger observational study
 - For decision analysis, how small of a population is reasonable?
 - How to convey uncertainty in decision analysis estimates to a small population versus a large population?
- Statistical power calculations for quasi-experimental research design