Cancer and Vitamin D: A Peek at the Evidence

Joan Lappe, Ph.D., R.N., F.A.A.N.

Criss/Beirne Professor of Nursing

Associate Dean of Research

Creighton University College of Nursing

Omaha NE

Background

The American Cancer Society estimates that in 2021, nearly 1.9 million new cancer cases will be diagnosed in the United States and that there will be over 608,000 cancer deaths.

American Cancer Society, news release, Jan. 12, 2021

Analysis of the National Health and Nutrition Examination Survey (NHANES), 2011-2012, showed that ~40% of U.S. persons ≥20 yrs were vitamin D deficient (25(OH)D levels less than 20 ng/mL).

Parva, N. et al. Cureus, 2018, June

Spending little time outdoors or using sunscreen when having sun exposure contribute to vitamin D deficiency. Hence, there is interest in vitamin D supplementation.

Drs. Cedric and Frank Garland conducted the first ecological study of cancer and solar ultra-violet B (UVB) radiation in 1980.

- They saw that colon cancer rates were lowest in the sunniest part of the U.S.

- They hypothesized that vitamin D was likely the agent.

Garland CF, Garland FC. Do sunlight and vitamin D reduce the likelihood of colon cancer? Int J Epidemiol. 1980 Sep;9(3):227-31.

Mechanisms by Which Vitamin D Suppresses Cancer Development and Progression

- Enhances immune response.

- Promotes cell differentiation, progression, and apoptosis (programmed cell death)

- Decreases proliferation of abnormal cells.

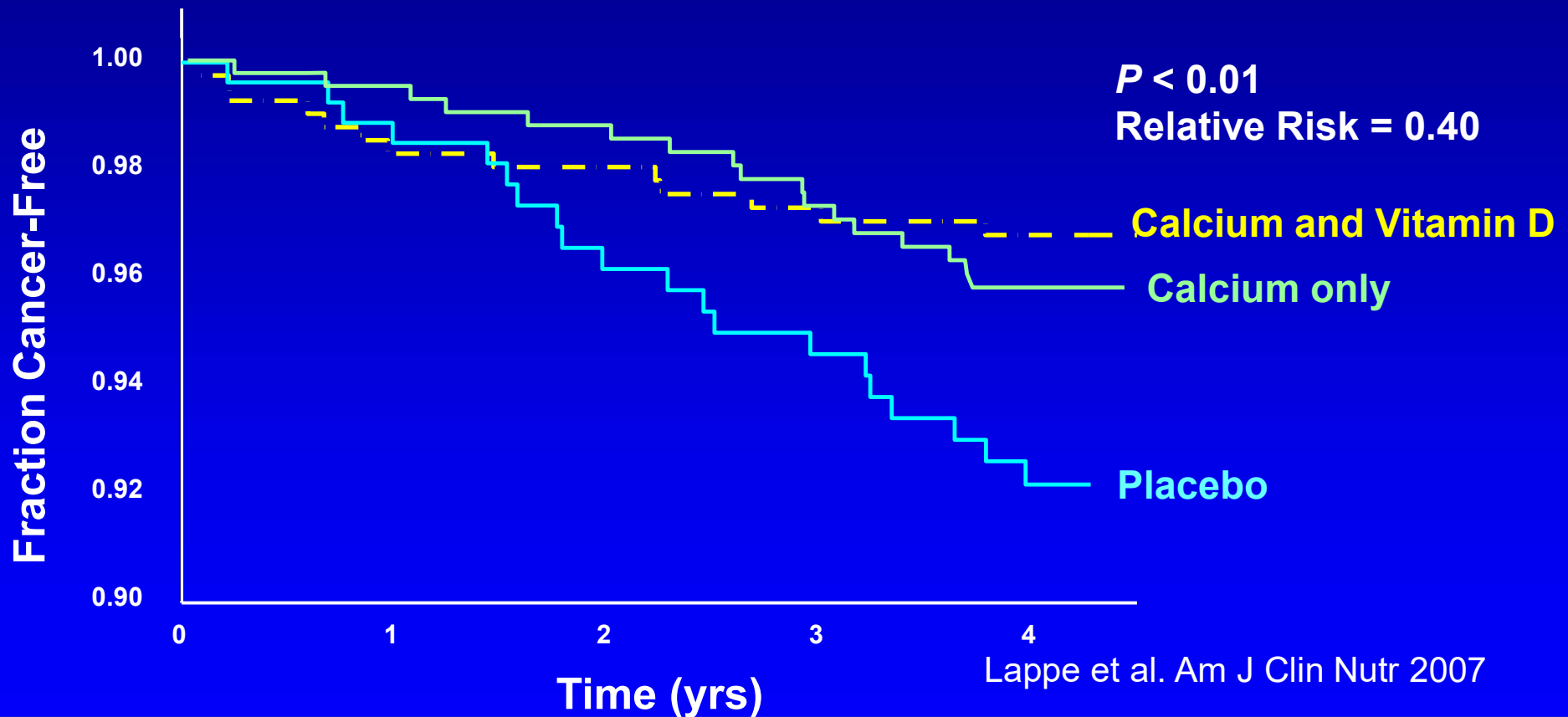- Inhibits inflammation, invasion, metastasis, and angiogenesis.

These mechanisms have been found both in basic science cell experiments and in numerous animal studies.

Bouillon, R., et al. Endocrine Reviews, 40: 1109 – 1151, 2019

Vitamin D and Calcium Supplementation to Reduce Cancer Risk: A Randomized Clinical Trial

- Population-based, randomized clinical trial in rural Nebraska

- 1179 post-menopausal women age ≥ 55

- Vitamin D^3 2000 IU/d and calcium 1500 mg/d, calcium 1500 mg/d, or placebo

- Followed for 4 years

Lappe et al. Am J Clin Nutr 2007

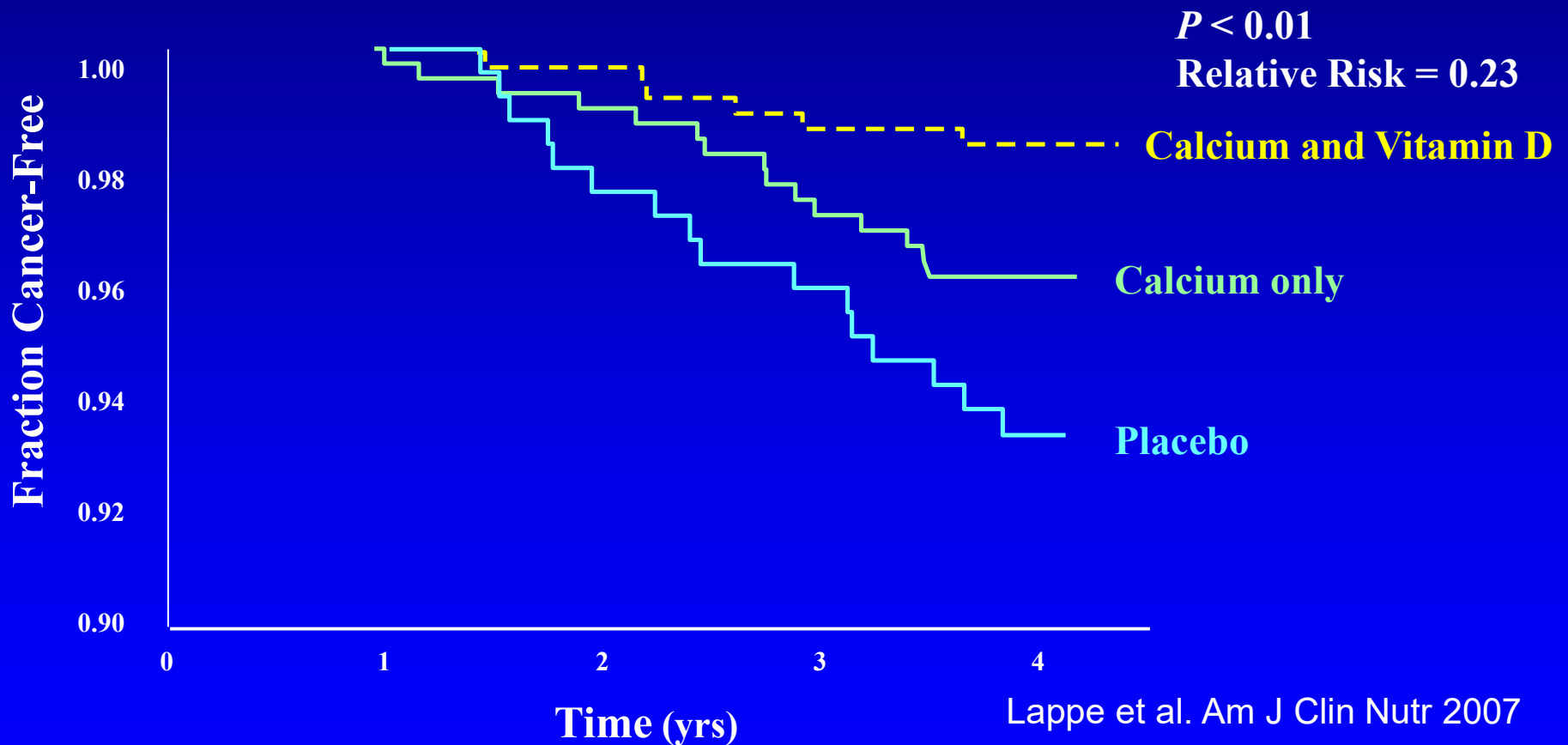Kaplan-Meier survival curves (i.e., free of cancer) for the 3 treatment groups in the entire cohort of 1,179 women.

LJM1 important to note that vitamin D supplementation may not be needed by all and it is not the only risk factor for cancer
Lappe, Joan M, 3/6/2021

Kaplan-Meier survival curves for the 3 treatment groups in the cohort of women free of cancer at 1 year of intervention (n = 1,085).
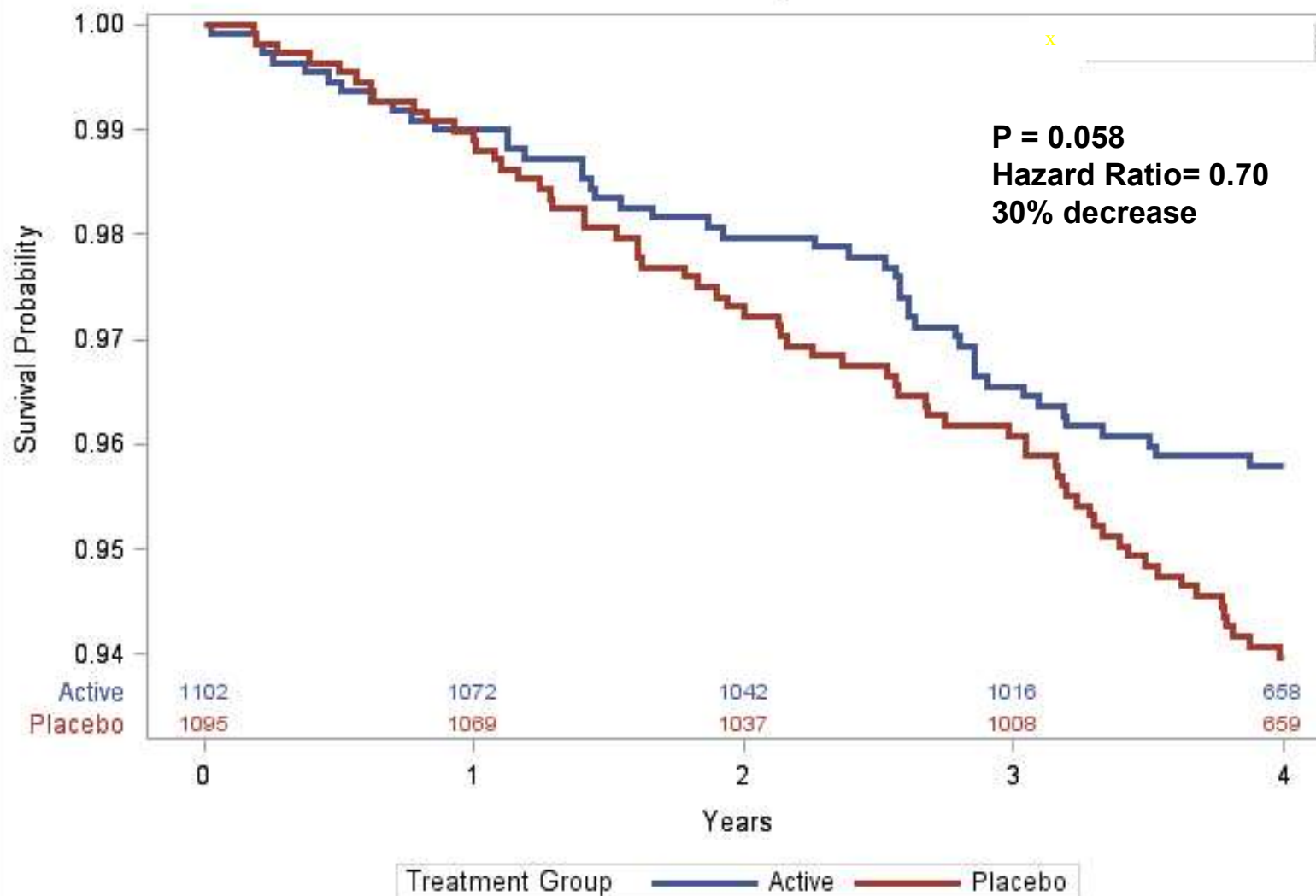

P < 0.01
Relative Risk = 0.23

Calcium and Vitamin D

Calcium only

Placebo

Fraction Cancer-Free

Time (yrs)

Lappe et al. Am J Clin Nutr 2007

Clinical Trial of Vitamin D^3 to Reduce Cancer Risk in Postmenopausal Women

- Population-based, randomized clinical trial in rural Nebraska

- 2300 post-menopausal women age ≥ 55
- Vitamin D^3 2000 IU/d and calcium 1500 mg/d or placebo (no calcium-only group)
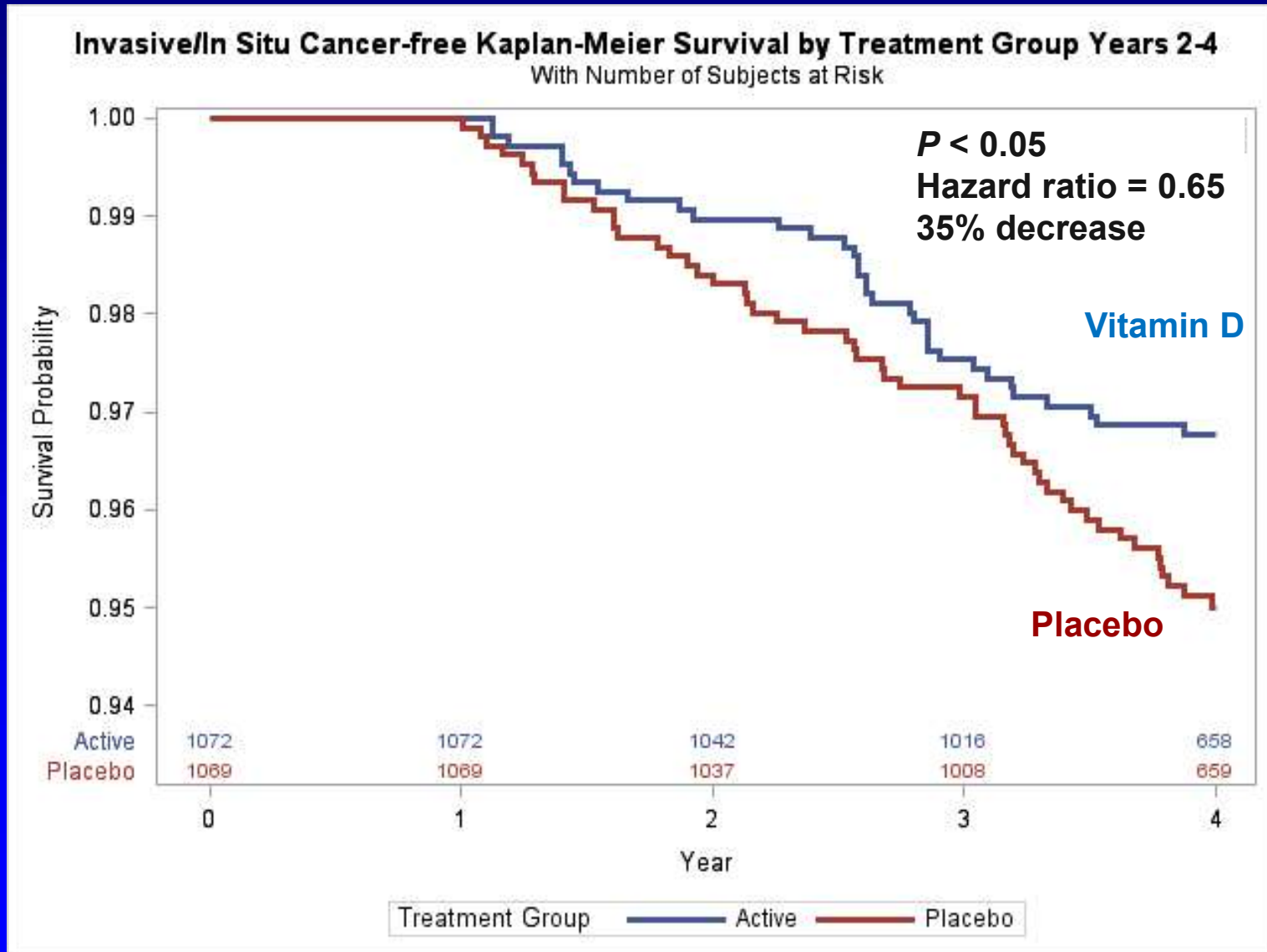- Followed for 4 years

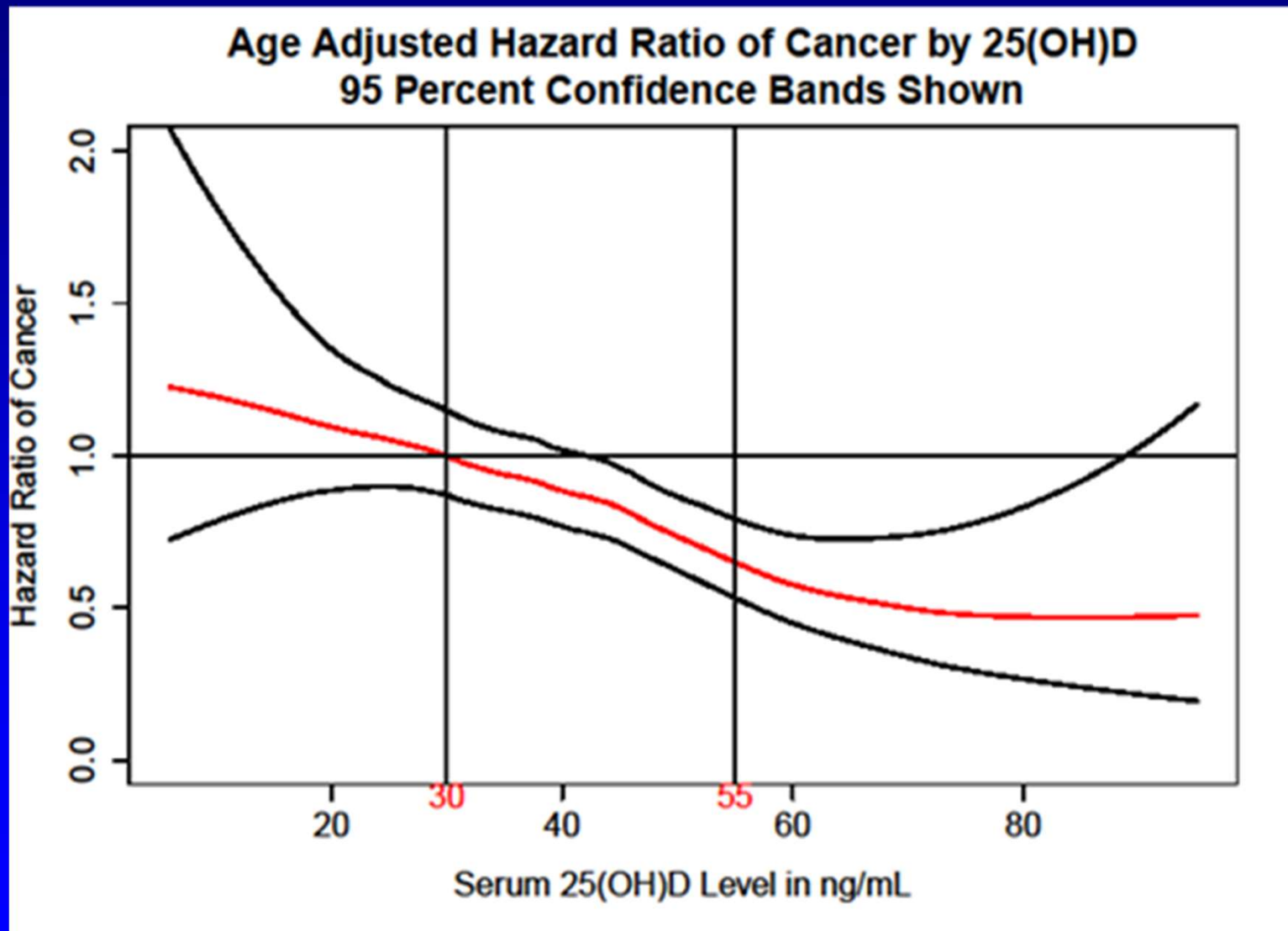Lappe, J. et al. JAMA, 2018
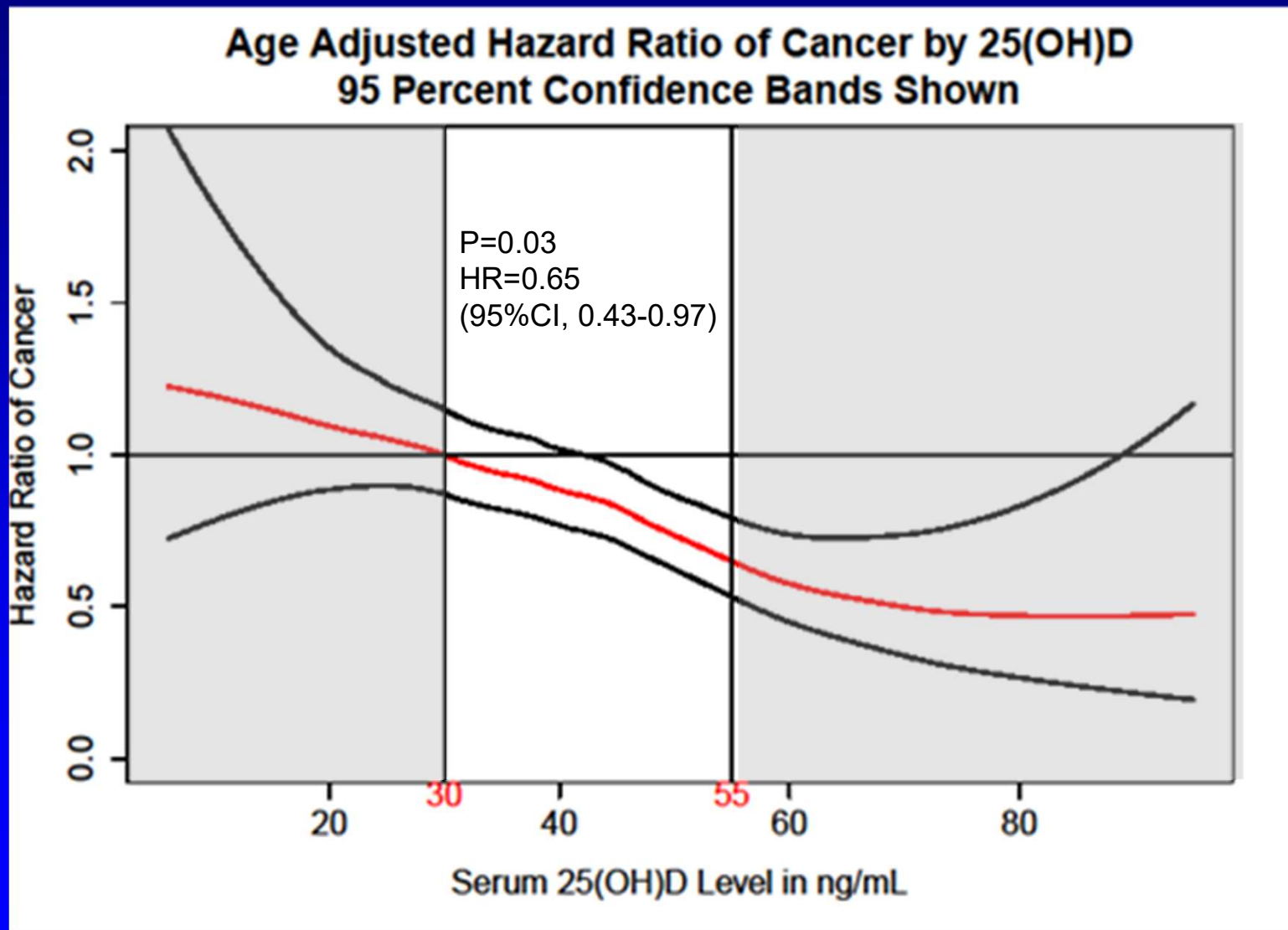
Lappe, J. et al. JAMA, Supplementary information, 2017

Kaplan-Meier survival curves (i.e., free of cancer) for the 2 treatment groups, excluding 23 cases diagnosed in the first year of study

Invasive/In Situ Cancer-free Kaplan-Meier Survival by Treatment Group Years 2-4
With Number of Subjects at Risk

Age-Adjusted Hazard Ratio of Cancer by 25(OH)D

Age Adjusted Hazard Ratio of Cancer by 25(OH)D
95 Percent Confidence Bands Shown

Age-Adjusted Hazard Ratio of Cancer by 25(OH)D

Age Adjusted Hazard Ratio of Cancer by 25(OH)D
95 Percent Confidence Bands Shown

P=0.03
HR=0.65
(95%CI, 0.43-0.97)

The Association Between Breast Cancer and 25(OH)D Levels

- Analyses used pooled data from two Lappe randomized clinical trials and the prospective GrassrootsHealth cohort (N = 1713) to examine a broad range of 25(OH)D levels.

- Women in the GrassrootsHealth cohort were from a prospective population-based study. Voluntary participants submitted home blood spot 25(OH)D test kits and completed online health questionnaires.

- Analysis included only female participants aged 55 years or older who matched the inclusion criteria of the Lappe cohorts.

Frequency distribution and breast cancer incidence rates by 25(OH)D (Pooled cohort, N=5038)

McDonnell SL, et al. (2018). PLOS ONE 13(6)

Evidence From a Multitude of Human Studies Supports the Anti-cancer Effects of Vitamin D

- Numerous observational studies show that higher serum 25(OH)D is associated with lower incidence of cancer.

- VITAL, a study of 25,871 persons randomly assigned to 2000 IU/d vitamin D or placebo, found that vitamin D decreased cancer <u>mortality</u> by 21% when excluding the 1st year of follow-up.

Summary

The scientific evidence strongly supports that UVB and vitamin D reduce the risk of cancer.

Most scientists and policy makers agree that a minimum level of serum 25(OH)D is needed for optimal health, although controversy exists about what that minimum level might be.

Vitamin D is not a "cure-all," but maintaining adequate vitamin D levels is important in an overall approach to decreasing our cancer risk.

St. John's Church and Creighton Hall
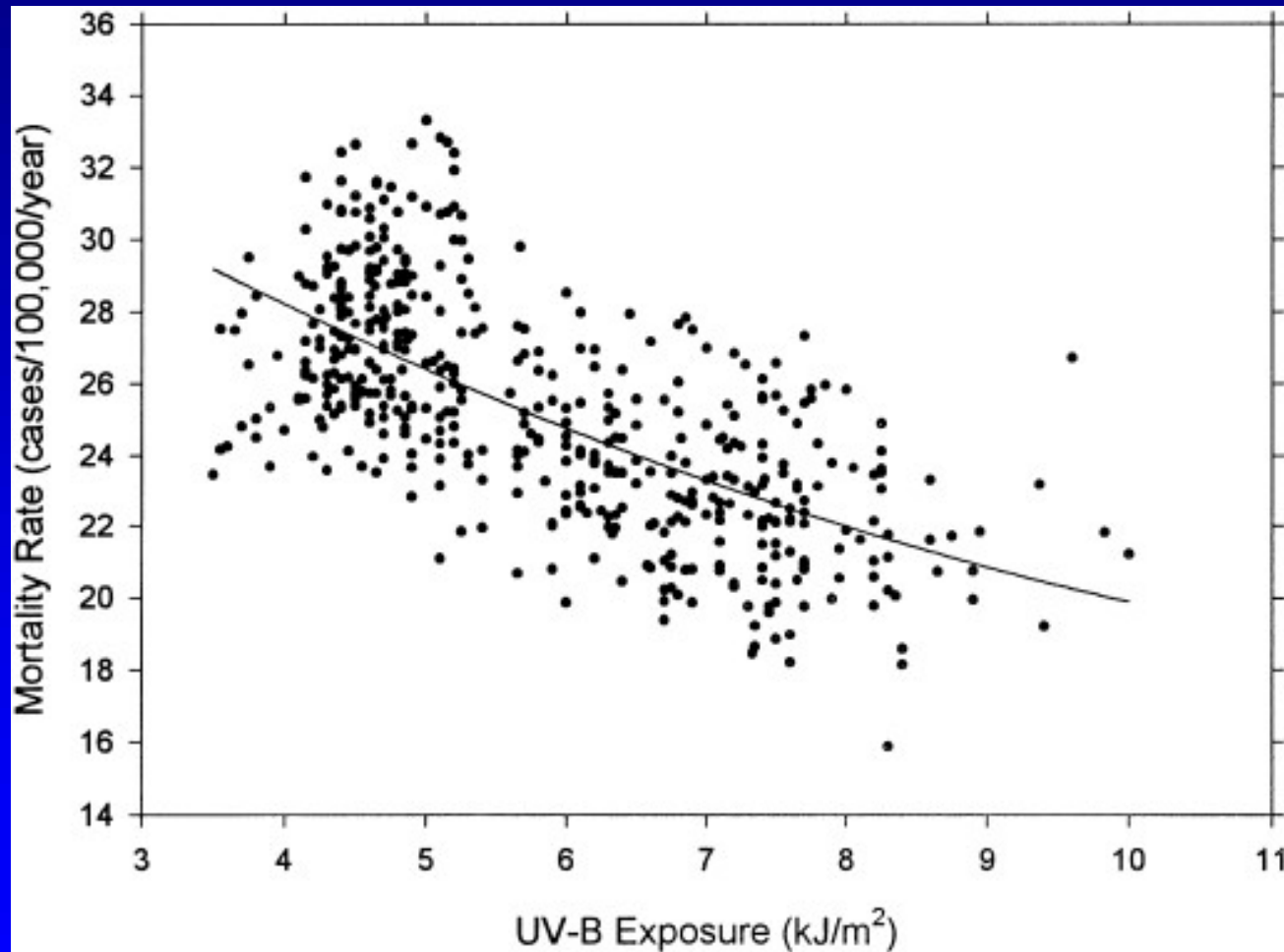Creighton University

Presenter Disclosures

Joan Lappe, Ph.D, R.N., F.A.A.N.

No relationships to disclose

The near universal distribution of the vitamin D receptor and vitamin D metabolizing enzymes, along with the large number of genes under direct control of vitamin D, all argue for a wide diversity of actions of the vitamin D endocrine system.

Annual mortality rates for breast carcinoma in white females (1970-1994) vs UV-B radiation for July 1992

Grant. (2002) Cancer,94:1867