

Income and Cancer Overdiagnosis — When Too Much Care Is Harmful

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Income has long been known to be an important determinant of health. Four decades ago, the Whitehall study of British civil servants revealed that higher employment grades were associated with better physical and mental health and lower mortality.¹ In 2016, an analysis in which data from U.S. tax returns were linked with Social Security death records confirmed that higher income is associated with greater longevity throughout the U.S. income distribution.² It found little evidence, however, that people with higher incomes live longer because they receive more medical care.

In fact, there are reasons to wonder whether wealthier people receive too much care. There has been a growing recognition among U.S. physicians that the conventional concern about too little medical care needs to be balanced with a concern about too much.³ People with higher incomes would seem to be at higher risk for overutilization — whether because of their greater ability to pay for services, their expectations or demands, or more aggressive marketing by the health systems that serve them.

Cancer screening is one area in which overutilization can cause harm, resulting in overdiagnosis and potentially unnecessary treatment — particularly for cancers for which the reported incidence is sensitive to observational intensity. Observational intensity refers to the combined effect of multiple factors: the frequency of screen-

ing and diagnostic exams (including physical exams, imaging, and laboratory testing), the ability of exams to detect small irregularities, and the threshold used to label results as abnormal. Observational intensity can have a dramatic effect on the apparent amount of disease — particularly for cancers that have a substantial reservoir of indolent, subclinical forms.⁴

We used data from the Surveillance, Epidemiology, and End Results program to examine incidence and mortality trends for four types of cancer whose reported incidence is known to be sensitive to observational intensity: breast cancer, prostate cancer, thyroid cancer, and melanoma.⁴ The combined incidence of these cancers has been rising in all U.S. counties, but there hasn't been a parallel increase in cancer-specific mortality — which suggests that considerable overdiagnosis may be occurring. Using 2000 U.S. Census data, we compared incidence and mortality among white people (to avoid confounding by race) in high- versus low-income counties (those with median family incomes greater than \$75,000 and less than \$40,000, respectively). This type of analysis probably underestimates the effect of a person's family income on reported cancer incidence, since county-level median income is an imprecise measure.

We found that high-income counties have experienced mark-

edly greater increases in incidence than low-income counties since 1975 (see graph). This trend was also evident for each of the four cancers individually (see the Supplementary Appendix, available at NEJM.org). What explains this pattern? We hypothesize that the proximal cause is that wealthier people are exposed to increased observational intensity: they are likely to be screened more often and by means of tests (such as magnetic resonance imaging) that can detect smaller abnormalities, undergo more follow-up testing, and undergo more biopsies, and they may be served by health systems that have a lower threshold for labeling results as abnormal. More cancers are therefore found.

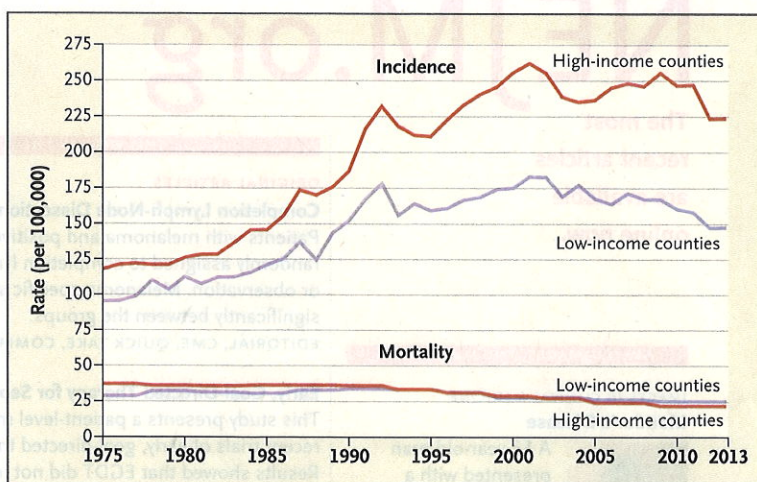
By contrast, the graph also shows that combined mortality from the four cancers is similar in high- and low-income counties, suggesting that the underlying disease burden is actually similar. What's more, mortality hasn't been increasing — as one might expect given the increasing incidence in some areas — but rather decreasing, reflecting decreasing mortality from breast and prostate cancer in particular. We believe most of the decrease in mortality from breast and prostate cancer can be attributed to improved treatments, many of which were informed by the discovery that these are largely hormonal tumors. The finding that since 1990, mortality has decreased by slightly more in high-income counties (40%) than in low-income

observational intensity

counties (25%) probably reflects better access to these improved treatments in wealthier areas. Although it's possible that the mortality trends can be explained by higher rates of screening resulting in fewer cancer deaths in high-income counties, such a benefit would have come at a cost — using these data, 5 to 10 overdiagnosed patients for every death averted.

The underlying cause of the difference in cancer incidence between high- and low-income counties is less clear. Affluent people may expect, and demand, more testing — enabled by their greater ability to pay. Alternatively, the fee-for-service health systems in those markets may be the driving factor: systems serving relatively wealthy and healthy populations may see offering more testing as a good way to attract consumers, produce more patients, and increase business. It's also possible that both explanations are at work, creating a mutually reinforcing cycle that promotes testing as the path to health.

Some of the resistance to moving toward a more sustainable (and affordable) health care system comes from people who fear they will be forced to give something up. Our findings offer the possibility that what may be given up is unnecessary care. Excessive testing of low-risk people produces real harm, leading to treatments that have no benefit (because there is nothing to fix) but can nonetheless result in medication side effects, surgical complications, and occasionally even death. The psychological effects of overutilization and overdiagnosis are also worrisome: turning people into patients may un-



Incidence and Mortality Trends for Breast Cancer, Prostate Cancer, Thyroid Cancer, and Melanoma in High- and Low-Income Counties in the United States, 1975–2013.

Because income and cancer-incidence trends (particularly for melanoma) may be confounded by race, the data here are for white people only. High-income counties have a median family income of more than \$75,000, and low-income counties have a median family income of less than \$40,000, according to 2000 U.S. Census data.

dermine their sense of resilience, which is fundamental to health. We believe that giving up excessive testing — not to mention unwarranted medications, unnecessary referrals, and avoidable hospital stays — could lead to better health.

Getting there will require more balanced incentives. For example, physicians working under accountable care organization payment models are less likely to deliver low-value care than those working under traditional fee-for-service models.⁵ Financial conflicts of interest (such as those of physicians who receive proceeds from breast and prostate care centers) could be minimized or, at the very least, exposed. And physicians can promote a more nuanced view of medical care, particularly for people who are well. Although we have much to offer people who are sick or injured, physicians have overstated medicine's role in promoting health.

In so doing, we may have unintentionally devalued the role of more important determinants of health for people at every income level — healthy food, regular movement, and finding purpose in life.

Disclosure forms provided by the authors are available at NEJM.org.

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