

## EDITORIAL COMMENT

# Fiscal Fitness?

## Exercise Capacity and Health Care Costs\*



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There are many benefits of exercise. Observational studies have shown that regular exercise reduces all-cause mortality, cardiovascular disease, and diabetes. Cohort studies, including extensive work from the Cooper Clinic, have reported a strong inverse relationship between greater exercise capacity, or fitness, with lower rates of death and myocardial infarction (1).

It seems quite plausible that being physically fit should also reduce health care costs. Health insurers and employers across the country have instituted wellness programs, with the expectation that improved fitness among their participants will improve health and therefore will reduce health care utilization (2). However, those who are fit may obtain more preventive medical care in the short term. To the extent that they live longer than average, they may also incur greater lifetime medical costs, as they have more years to visit doctors, get tests, take medications, and be admitted to hospitals. Therefore, the effect on health care costs of being physically fit is not necessarily straightforward and must be examined empirically.

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In this issue of the *Journal*, Bachmann et al. (3) report the results of an interesting study that tested whether exercise capacity, determined by treadmill testing, among middle-aged subjects (mean 49 years of age) predicted their subsequent Medicare costs

after they turned 65 years of age. This long-term assessment was made possible by linking data collected in the Cooper Center Longitudinal Study with Medicare files for the same subjects, on average, 22 years after their exercise tests. The authors report a strong, inverse relationship between physical fitness in middle age and later annualized Medicare costs: the least fit men (in the lowest quartile of fitness) had 37% higher costs than the moderately fit men, whereas the most fit men (in the highest quartile of fitness) had 19% lower costs than the moderately fit men. This inverse association between fitness and future health care costs remained significant after various sorts of statistical adjustments, and also when tested using different statistical models. The finding seems to be real. The question is: Why?

Health care costs are known to be higher in the last year of life (4), which is unsurprising, considering the amount of medical care provided to very sick patients during a terminal illness. Because fitness is associated with lower mortality, might the lower costs found among the fittest subjects simply be due to lower rates of death, thereby avoiding large end-of-life costs? In this study, patients who died had costs approximately 5 times higher than those who survived. But when the authors omitted patients who died from the analysis, they still found a significant inverse relationship between fitness and costs among subjects who were alive throughout follow-up. This suggests that the favorable effect of fitness on mortality does not explain the lower health care costs among the most fit.

Another potential explanation for the findings of Bachmann et al. (3) is that the least fit subjects had additional adverse health conditions that increased their medical costs. Indeed, the least fit subjects had much higher rates of diabetes, obesity, and smoking, as well as higher levels of blood pressure and cholesterol. Statistical adjustments for these factors attenuated the inverse relationship between fitness

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and costs, but a significant association remained, even after controlling for these confounding factors. Therefore, although a higher level of fitness may be part of a constellation of favorable health indicators, it appears to have an independent effect on health care costs, perhaps by reducing the incidence of cardiovascular disease.

It makes a neat story to say that being fit leads to lower rates of cardiovascular disease and hence lower health care costs. Higher levels of fitness were indeed associated with sharply lower costs for cardiovascular disease, as well as lower total medical costs. However, higher levels of fitness were also associated with lower costs of noncardiovascular disease: the least fit men had a mean noncardiovascular disease cost of \$9,478 compared with a mean cost of \$6,111 in the most fit men, with similar results in women. It is a bit harder to understand how higher levels of physical fitness could lead to lower noncardiovascular disease costs, which suggests that fitness may be a marker for other lifestyle factors and comorbidities that reduce health care costs. The study of Bachmann et al. (3) is inherently limited by its observational design and by the possibility of residual confounding, despite careful statistical adjustments. Those who were physically fit may have engaged in other healthy behaviors that were not considered in the analysis, including obtaining cancer screening, eating a healthy diet, wearing seat belts, and adhering to prescribed medications. Consequently, the observed associations of fitness with lower health care costs may have been confounded by other, unmeasured reductions in overall risk.

An alternative explanation for the study findings is referral bias for exercise testing: perhaps the least fit

subjects were referred to get a wake-up call about their poor physical condition, whereas the most fit went for testing because they were highly health conscious and wanted to do all they could to stay healthy. The possibility of this kind of self-sorting is difficult to prove and difficult to discount entirely. Analyses of other, less selected and more diverse populations could address this concern and confirm the findings.

There is little question that being physically active is a good thing for one's health and well-being. We have yet to demonstrate, with high-quality randomized controlled trials (5) or outcomes analyses of contemporary workplace wellness programs (6), that interventions that increase physical activity or fitness prevent illness and therefore reduce long-term health care costs, either at the individual or at the population level. It is an intriguing hypothesis that promoting physical fitness might save a lot of money for the health care system over a person's lifetime, a hypothesis worthy of further investigation. The best way to minimize health care costs may just be to stay healthy for as long as possible, prevent chronic diseases, and fade away at a ripe old age (7). Dr. Oliver Wendell Holmes' "wonderful one-hoss shay" is an apt metaphor for such successful aging: every part worked perfectly and in harmony for exactly 100 years, when it fell to pieces all at once (7,8).

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## REFERENCES

1. Wei M, Kampert JB, Barlow CE, et al. Relationship between low cardiorespiratory fitness and mortality in normal-weight, overweight, and obese men. *JAMA* 1999;282:1547-53.
2. Baicker K, Cutler D, Song Z. Workplace wellness programs can generate savings. *Health Aff (Millwood)* 2010;29:304-11.
3. Bachmann JM, DeFina LF, Franzini L, et al. Cardiorespiratory fitness in middle age and health care costs in later life. *J Am Coll Cardiol* 2015;66:1876-85.
4. Hogan C, Lunney J, Gabel J, et al. Medicare beneficiaries' costs of care in the last year of life. *Health Aff (Millwood)* 2001;20:188-95.
5. Look Ahead Research Group. Cardiovascular effects of intensive lifestyle intervention in type 2 diabetes. *N Engl J Med* 2013;369:145-54.
6. Caloyeras JP, Liu H, Exum E, et al. Managing manifest diseases, but not health risks, saved PepsiCo money over seven years. *Health Aff (Millwood)* 2014;33:124-31.
7. Fries JF. Aging, natural death, and the compression of morbidity. *N Engl J Med* 1980;303:130-5.
8. Holmes, Oliver W. The one-hoss shay. In: *The Complete Poetical Works of Oliver Wendell Holmes*. Boston, MA: Houghton Mifflin; 1895:158-60.

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