



Are investments in disease prevention complements? The case of statins and health behaviors^{☆, ☆☆}



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ABSTRACT

We obtain estimates of associations between statin use and health behaviors. Statin use is associated with a small increase in BMI and moderate (20–33%) increases in the probability of being obese. Statin use was also associated with a significant (e.g., 15% of mean) increase in moderate alcohol use among men. There was no consistent evidence of a decrease in smoking associated with statin use, and exercise worsened somewhat for females. Statin use was associated with increased physical activity among males. Finally, there was evidence that statin use increased the use of blood pressure medication and aspirin for both males and females, although estimates varied considerably in magnitude. These results are consistent with the hypothesis that healthy diet is a strong substitute for statins, but there is only uneven evidence for the hypothesis that investments in disease prevention are complementary.

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1. Introduction

There has been a dramatic increase in the use of cholesterol-lowering statins over the last 20 years. As reported in Health, United States 2010 (CDC, 2011), between 1988–1994 and 2005–2008, the proportion of the population aged 45–64 that reported use of a statin in the last month grew from 4.3 percent to 19.6 percent. The change in statin use during this period was even more dramatic for those ages 65 and older going from 5.9 percent in 1988–1994 to 44.5 percent in 2005–2008. Remarkably, nearly half of the elderly

population is currently using a statin. During the same period, and arguably because of greater statin use, the proportion of the population with high, total serum cholesterol has decreased significantly. For example, among those aged 45–74, the proportion of the population with high, total serum cholesterol fell by approximately 40 percent over this period (CDC, 2011).

The increased use of statins and consequent reductions in high cholesterol that has occurred over the last 20 years are significant because of the strong, positive association between high cholesterol and cardiovascular disease (Yusef et al., 2004). Several reviews of the literature have concluded that there is ample evidence, mostly from clinical trials, that statin use is associated with significant reductions in serious cardiovascular events (e.g., acute myocardial infarction) and with a significant decrease in mortality from cardiovascular disease for those with high-risk of cardiovascular disease (LaRosa et al., 1999; Grundy et al., 2004; Baigent et al., 2005; Kearney et al., 2008). There is also evidence that statin use for primary prevention—those without a high-risk of cardiovascular disease—significantly reduced serious cardiac events and mortality (Thavendiranathan et al., 2006; Mills et al., 2008; Ray et al., 2010; Taylor et al., 2011). Notably, several studies have concluded that statin use, particularly for secondary prevention among those

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with high-risk of cardiovascular disease, is cost-effective when measured against standard thresholds of the value of a life year (Goldman et al., 1999; Prosser et al., 2000; Pletcher et al., 2009; Greving et al., 2011).

The development and widespread diffusion of use of statins is arguably one of the most important advances in prevention over the last 20 years. However, given the effectiveness of statins in lowering cholesterol and reducing mortality from coronary heart disease, the introduction of statins may have caused people to significantly modify their health behavior. On the one hand, the effectiveness of statins, which have been shown to decrease the risk of dying from coronary heart disease by 40–50 percent among those with high cholesterol, provides a strong incentive to engage in health behaviors that prevent other diseases, for example by reducing tobacco use and improving diet and exercise (Dow et al., 1999; Becker, 2007). Because of the lower likelihood of mortality that is associated with statin use, the health benefits of behaviors such as not smoking are more likely to come to fruition when the person is taking statins than in the absence of statins. In this case, statin use is likely to be associated with better health behaviors.

Alternatively, the effectiveness of statins in treating high cholesterol makes dieting and exercise largely unnecessary and therefore the diet and physical activity of those who use statins may worsen, which would adversely affect health.¹ Indeed, there has long been concern among health care providers that patients will see the availability of statins as a license to engage in unhealthy behaviors, or as Bolton et al. (2006) refer to it as a “get out of jail free card.” Here are two quotes suggesting as much from Dr. David Jenkins, the lead author of a recent study in the *Journal of the American Medical Association* on the effectiveness of diet for lowering cholesterol.

A lot of people rely on the medication, but diet is really powerful actually,” . . . “People ignore that. They think if they’re on statins, they can do anything they want, they can eat the high-fat foods because the statins are going to take care of that.”²

“If you want to sit on the couch with the six pack and the wings and watch other people exercise and you’re quite determined not to do anything other than that, then we’ve got a medication for you,”³

And the following excerpt from an ABC World News report illustrates perfectly how the effectiveness of statins leaves the choice to diet and exercise to control cholesterol sometimes a distant second:

“I tried to do the diet,” said Lipsett, a marketing coordinator from New Haven, Conn. “I ate all organic. It did help me a little bit. My LDL [the bad cholesterol] went down to the 220 range, but then I found out I was allergic to wheat and gluten, and I couldn’t just eat vegetables and fish all day.” When her numbers climbed up again, she started on a statin. And it worked. “My most recent tests show my lowest numbers ever, at 205,” she said. But as her cholesterol dropped, so too did her healthy lifestyle. “Since then,

I haven’t exercised or been watching my diet. I tend to go for foods such as meat or shellfish that are very high in cholesterol,” said Lipsett. “I love to eat, so it makes it difficult.”⁴

While diet and exercise have been shown to reduce cholesterol, statin use has a demonstrated effect that is much larger than that obtained from a typical dietary regime (Julia et al., 2002; Jenkins et al., 2002, 2003, 2005, 2011; Barnard et al., 2006; Hooper et al., 2012). Most research suggests that dietary changes in real world settings can reduce “bad” (LDL) cholesterol by 10% whereas statin use is associated with a 50–60% decrease in “bad” (LDL) cholesterol. In addition, statin use is easier to adhere to than a healthy diet, as the quote above indicates, which makes statin use a particularly appealing option for lowering cholesterol.

As the alternatives described above indicate, it is unclear whether statins are a substitute for, or a complement with, a healthy lifestyle. While statins are a substitute for diet and exercise for treating high cholesterol, statins are a complement for diet, exercise and other health behaviors (e.g., smoking) because of the complementarity of investments in disease prevention. Whether statin use is associated with changes in health behaviors, particularly diet and exercise is a question of substantial interest for both theory and policy. Although results of clinical trials have demonstrated that statin use reduced mortality from cardiovascular disease, presumably by lowering cholesterol, similar reductions in heart disease have been found from dietary changes that lower cholesterol (Burr et al., 1989; De Lorgeril et al., 1994; Julia et al., 2002). Therefore, if statin use is associated with undesirable changes in diet and exercise, then the real-world effectiveness of statin use in treating heart disease may be significantly decreased (although remain quite effective). Part of the health benefits of statin use may be offset by the harm of a less healthy lifestyle. In effect, patients may choose to consume some of the benefits of statin use in the form of utility from unhealthy behavior. Moreover, the relative benefit and harm (from possible lifestyle changes) of statin use may change over time. It may be the case that the health consequences of worse health behaviors accumulate over time, for example because of a rise in diet-related obesity, whereas the benefits of statin use (i.e., controlled cholesterol) remain constant. Thus, the efficacy of long-term statin use, which is increasingly becoming the norm for many persons, may be particularly diminished by the change in health behaviors that are potentially caused by statin use. Notably, there have been no clinical trials of the efficacy of statin use over a 20–30 year period.

The relationship between statin use, which is a powerful form of prevention that greatly reduces the risk of dying, and health behavior is also an opportunity to test theories about whether investments in disease prevention are complementary (Dow et al., 1999; Becker, 2007). Specifically, do people increase investments in health when their probability of dying decreases significantly? Surprisingly, there is relatively little evidence on this question (Kahn, 1999; Oster, 2012).

To summarize, statin use may theoretically be associated with a worsening of health behaviors, particularly diet, an improvement in health behaviors, particularly behaviors unrelated to cholesterol such as smoking, or even no change in health behaviors. To date, there is virtually no evidence on the association between statin use and health behaviors and only a limited number of papers that address the issue of whether there are complementarities of

¹ See the following for evidence of the efficacy of diet and exercise for controlling cholesterol: Ornish et al. (1998), Hooper et al. (2000), Singh et al. (2002), Yancy et al. (2004), Brunner et al. (2007), Jenkins et al. (2011), and Franklin and Cushman (2011).

² This quote is from Dr. David Jenkins who is the lead author of a recent study on diet and cholesterol (Jenkins et al., 2011). The quote was reported in Reuters: Diet alone helps lower bad cholesterol: study, by Geneva Pittman 3:19 p.m. CDT, August 23, 2011, <http://www.reuters.com/article/2011/08/23/us-diet-bad-cholesterol-idUSTRE77M7PM20110823>, website accessed August 7, 2012.

³ See footnote 2.

⁴ <http://abcnews.go.com/Health/cholesterol-lowers-due-statins/story?id=12934422>, website last accessed June 22, 2011.

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