

# How a new approach to funding Alzheimer's research could pay off

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Diagram of the brain of a person with Alzheimer's Disease. Credit: Wikipedia/public domain.

More than 5 million Americans suffer from Alzheimer's disease, the affliction that erodes memory and other mental capacities, but no drugs targeting the disease have been approved by the U.S. Food and Drug Administration since 2003. Now a paper by an MIT professor suggests that a revamped way of financing Alzheimer's research could spur the development of useful new drugs for the illness.

"We are spending tremendous amounts of resources dealing with this disease, but we don't have any effective therapies for it," says Andrew Lo, the Charles E. and Susan T. Harris Professor of Finance and director

of the Laboratory for Financial Engineering at the MIT Sloan School of Management. "It really imposes a tremendous burden on society, not just for the afflicted, but also for those who care for them."

Lo and three co-authors propose creating a public-private partnership that would fund research for a diverse array of drug-discovery projects simultaneously. Such an approach would increase the chances of a therapeutic breakthrough, they say, and the inclusion of public funding would help mitigate the risks and costs of Alzheimer's research for the private sector.

There would be a long-term public-sector payoff, according to the researchers: Government funding for Alzheimer's research would pale in comparison to the cost of caring for Alzheimer's sufferers in public health-care programs. The paper's model of the new funding approach calls for an outlay of \$38.4 billion over 13 years for research; the costs of Medicare and Medicaid support for Alzheimer's patients in 2014 alone is estimated to be \$150 billion.

"Having parallel development would obviously decrease the waiting time, but it increases the short-run need for funding," Lo says. "Given how much of an urgent need there is for Alzheimer's therapies, it has to be the case that if you develop a cure, you're going to be able to recoup your costs and then some." In fact, the paper's model estimates a double-digit return on public investment over the long run.

Lo adds: "Can we afford it? I think a more pressing question is, 'Can we afford not to do something about this now?'"

## **Modeling the odds of success**

The paper, "Parallel Discovery of Alzheimer's Therapeutics," was published today in *Science Translational Medicine*. Along with Lo, the co-

authors of the piece are Carole Ho of the biotechnology firm Genentech, Jayna Cummings of MIT Sloan, and Kenneth Kosik of the University of California at Santa Barbara.

The main hypothesis on the cause of Alzheimer's involves amyloid deposition, the buildup of plaques in the brain that impair neurological function; most biomedical efforts to tackle the disease have focused on this issue. For the study, Ho and Kosik, leading experts in Alzheimer's research, compiled a list of 64 conceivable approaches to drug discovery, addressing a range of biological mechanisms that may be involved in the disease.

A fund backing that group of research projects might expand the chances of developing a drug that could, at a minimum, slow the progression of the disease. On the other hand, it might not increase the odds of success so much that pharmaceutical firms and biomedical investment funds would plow money into the problem.

"Sixty-four projects are a lot more than what's being investigated today, but it's still way shy of the 150 or 200 that are needed to mitigate the financial risks of an Alzheimer's-focused fund," Lo says.

The model assumes 13 years for the development of an individual drug, including clinical trials, and estimates the success rates for drug development. Given 150 trials, the odds of at least two successful trials are 99.59 percent. Two successful trials, Lo says, is what it would take to make the investment—a series of bonds issued by the fund—profitable and attractive to a broad range of investors.

"With a sufficiently high likelihood of success, you can issue debt to attract a large group of bondholders who would be willing to put their money to work," Lo says. "The enormous size of bond markets translates into enormous potential funding opportunities for developing these

therapeutics."

## Stakeholders everywhere

To be clear, Lo says, Alzheimer's drug development is a very difficult task, since researchers often have to identify a pool of potential patients well before symptoms occur, in order to see how well therapies might work on delaying the onset of the disease.

Compared with the development of new drugs to treat other diseases, "Alzheimer's [drug development](#) is more expensive, takes longer, and needs a larger sample of potential patients," Lo acknowledges.

However, since the number of Americans suffering from Alzheimer's is projected to double by 2050, according to the Alzheimer's Association, an advocacy group, Lo stresses the urgency of the task at hand.

"I see myself as a future patient, or a family member of a future patient," Lo observes. "We all have a stake in this."

**More information:** "Parallel Discovery of Alzheimer's Therapeutics," [stm.sciencemag.org/lookup/doi/ ... scitranslmed.3008228](http://stm.sciencemag.org/lookup/doi/.../scitranslmed.3008228)

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