

# We're all living longer, but longevity increases not benefitting everybody

December 14 2012

---

Global lifespans have risen dramatically in the past 40 years, but the increased life expectancy is not benefitting everybody equally, say University of Toronto researchers. In particular, adult males from low- and middle-income countries are losing ground.

People are living longer on average than they were in 1970, and those extra years of life are being achieved at lower cost, the researchers, led by U of T Chemical Engineering PhD candidate Ryan Hum, say in a paper published in the open access science journal *eLife* this month.

However, the costs for an extra year of life among adult males in lower-income countries are rising, Hum and his colleagues say, while the costs for an extra year of life among children worldwide and for adults in high-income countries continues to drop.

Hum, who is also a member of U of T's Centre for Global Engineering, co-wrote the paper with Professors Yu-Ling Cheng, director of the Centre, Prabhat Jha of the Dalla Lana School of Public Health and Anita McGahan of the Rotman School of Management.

The researchers made the discovery when they took the Michaelis-Menten (MM) equation – a well-known mathematical model first used to analyze enzyme kinetics in 1913 – and applied it to adult and child mortality at different incomes. They reasoned that just as chemical catalysts affect enzyme velocity; the public health catalysts react with income to affect [life expectancy](#).

"We noticed the similarity in the curvature and became fascinated with the beauty of the analogy," said Hum. The MM equation is standard curriculum for biochemistry, biology and most chemical engineering undergraduate students and we knew there could be added knowledge that we could decipher purely from the math."

"Over the past few decades, research and development of new technologies (drugs, vaccines, policies) have focused mostly on childhood and infectious disease, with fewer worldwide investments for adult [chronic diseases](#)," the U of T researchers suggest. "Increasing coverage of inexpensive health interventions such as immunization, insecticide-treated nets, and case management of childhood infections could be contributing to decline in critical income for child survival."

Hum and his colleagues conclude by recommending that society invest in research and treatment of adult chronic disease, most notably the control of smoking and other risk factors for chronic diseases, and low-cost, widely useful treatments for these diseases.

In the paper, "Global divergence in critical income for adult and childhood survival: analyses of mortality using Michaelis-Menten", the authors expand on the analogy between enzymes and incomes: "Income directly enables certain technologies, immunization programs, epidemiological knowledge, education, and sanitation systems and other areas, which may themselves be interpreted as 'catalysts' – agents that accelerate the rate of a reaction without being fully consumed in the process," they write.

They came up with a new parameter, critical income, which they define as the level of income needed to achieve half of the maximal overall life expectancy found in high-income countries. For example, in 1970, the critical income for overall life expectancy (in inflation adjusted 2005 dollars) was \$1.48 per day. By the year 2007, the critical income had

fallen to \$1.21 per day. In other words, a lower national income is needed to achieve a higher life expectancy now, compared to 40 years ago.

However, that good news is due mostly to improvements in children's health and to increased life expectancy in high-income countries, the researchers say. For adults (aged 15 to 59) in lower-income countries, critical income has actually risen since 1970. In other words, adults in low- and middle-income countries need to have higher incomes on average in order to add an extra year of life. Adult males in these countries are especially affected, though adult females also suffer.

"Under the current conditions, an approximate national income per capita of \$2.20 per day would be required in 2007 to attain the same achievable adult male survival rate with \$1.25 per day in 1970. Moreover, should the critical income costs for adults continue to rise (in line with current trends)," they warn.

Hum and his colleagues noted that increases in smoking, especially among [adult males](#), and HIV prevalence are responsible for part of the life expectancy gap. By contrast, worldwide attention to childhood health including much research on new technologies, vaccines and political attention mean a rosier future for children – it's becoming less expensive to give children the chance for longer lives.

Provided by University of Toronto

Citation: We're all living longer, but longevity increases not benefitting everybody (2012, December 14) retrieved 27 April 2024 from <https://medicalxpress.com/news/2012-12-longer-longevity-benefitting.html>

This document is subject to copyright. Apart from any fair dealing for the purpose of private

study or research, no part may be reproduced without the written permission. The content is provided for information purposes only.