

Using Math-Physical Medicine to Study the Probability of Having a Heart Attack or Stroke Based on Combination of Metabolic Conditions, Lifestyle, and Metabolism Index

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Abstract (300 word limit)

Background and Aim:

The author has extended his 8-year T2D research along with ~1.5M data to examine the relationship among metabolic conditions, lifestyle, metabolism index, and the probability of having a heart attack or stroke.

Material and Method:

In 2014, he researched and built a metabolism model to measure the multiple interactions of four metabolic disease outputs and six lifestyle inputs.

Initially, he chose age, gender, race, family history, smoking, drinking, substance abuse, personal medical history, and waistline to establish a “static” baseline. He then applied the hemodynamics concept to develop a “dynamic” macro-simulated model for blood blockage and artery rupture.

He utilized 368,513 data which include 72,893 metabolic conditions (obesity, diabetes, hypertension, hyperlipidemia) and 295,620 lifestyle conditions (food, exercise, water, sleep, stress, daily life routine) within 2,274 days (1/2012-3/2018) to compute three different sets of risk probabilities separately. Finally, he integrated them into one overall risk probability. He also conducted sensitivity analyses to cover the probability variance by using different weighting factors (WF).

Results:

The risk probabilities are:

74% in 2000 (followed by three cardiac episodes 2001-2006)

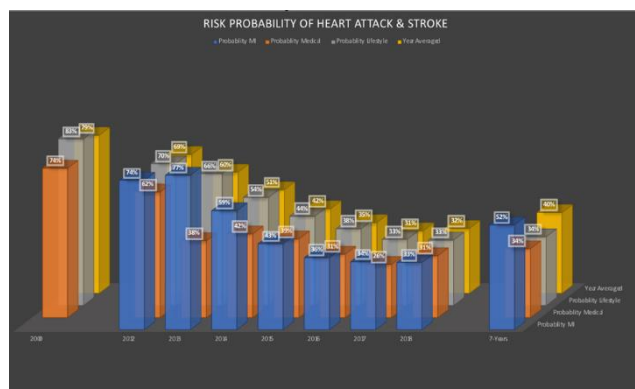
From 69% in 2012 decrease to 26.4% in 2017 (compatible with 26.7% by Framingham Study)

WF sensitivity: +/- 10% to 18%

Conclusion:

The mathematical simulation results are validated by past 17-years health examination reports. This big data dynamic simulation approach using math-physical medicine will provide an early warning to patients with chronic disease of having a heart attack or stroke in the future.

Image



Year	Probability MI	Probability Medical	Probability Lifestyle	Year Averaged
2000		74%	83%	79%
2012	74%	62%	70%	69%
2013	77%	38%	66%	60%
2014	59%	42%	54%	51%
2015	43%	39%	44%	42%
2016	36%	31%	38%	35%
2017	34%	26%	33%	31%
2018	33%	31%	33%	32%
7-Years	52%	34%	34%	40%



Biography (150 word limit)

Gerald C. Hsu received an honorable PhD in mathematics and majored in engineering at MIT. He attended different universities over 17 years and studied seven academic disciplines. He has spent 20,000 hours in T2D research. First, he studied six metabolic diseases and food nutrition during 2010-2013, then conducted research during 2014-2018. His approach is "math-physics and quantitative medicine" based on mathematics, physics, engineering modeling, signal processing, computer science, big data analytics, statistics, machine learning, and AI. His main focus is on preventive medicine using prediction tools. He believes that the better the prediction, the more control you have.

The author has not received any financial assistance from any organization.

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Notes/Comments: