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From Metformin to lifestyle to Control T2D: A Summarized Report on Risks of having Six Mortality Diseases Resulted from T2D and Five Common Inputs, BMI, WHR, eAG, Diet, and Exercise using Viscoplastic Energy Model of GH-Method: Math-Physical Medicine (No. 1051, VMT #489)

Gerald C. Hsu

EclaireMD Foundation, USA

***Corresponding Author**
Gerald C. Hsu, EclaireMD Foundation, USA

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Category: Methodology

Abstract

The author recently read an article, "Is Metformin a Drug for All Diseases?" by Marilynn Larkin on Medscape Medical News, published onFebruary 27, 2024.

"As a front-line treatment for type 2 diabetes, metformin is among the most widely prescribed drugs in the United States. Metformin's recognition in 1918 for its ability to lower blood glucose, being cast aside because of toxicity fears in the 1930s, rediscovery and synthesis in Europe in the 1940s, the first reported use for diabetes in 1957, and approval in the United States in 1994. In 2021 alone, medical clinic doctors wrote more than 91 million orders for the medication. Emerging evidence suggests the drug may be effective for a much broader range of conditions beyond managing high blood glucose, including various cancers, obesity, liver disease, cardiovascular, neurodegenerative, and renal diseases.

Gregory G. Schwartz explained that "Experimental data have demonstrated attenuated development of atherosclerosis, reduced myocardial infarct size, improved endothelial function, and antiarrhythmic actions — none of those dependent on the presence of diabetes."

Sai Yendamuri, MD, said that "In our preclinical and retrospective clinical data, we found that metformin had anti-lung cancer effects but only if the patients were overweight. Research is underway in other tumor types, including oral and endometrial, and brain cancers."

"Cognitive function — or at least delaying its erosion — represents another front for metformin. The hypothesis is that improving insulin and glucose levels can lead to lowering the risk of Alzheimer's disease," José A. Luchsinger MD said."

The author of this article, diagnosed with type 2 diabetes in 1995, was initially treated with three high-dose medications, including metformin. Over the 29 years following his diagnosis, he endured five cardiac incidents, renal issues, neuropathy, foot ulcers, and retinopathy, along with other minor yet bothersome complications, but did not experience stroke, dementia, or cancer. On December 8, 2015, he ceased all medications, choosing to strictly manage his condition through lifestyle changes. He has since lived medication-free, including metformin, for approximately 8.5 years.

In November of 2023, he published six papers on risk of having six mortality-related complications, covering cardiovascular disease or stroke (CVD), chronic kidney disease (CKD), diabetic neuropathy (DN), diabetic retinopathy (DR), Alzheimer's disease (AD), and Parkinson's disease (PD). His paper No. 981, dated December 1, 2023, merged these six studies into one comprehensive article. Across these seven publications, he consistently used five identical key metrics: body mass index (BMI), waist-to-hip ratio (WHR), estimated average glucose (eAG), diet (including food portion and carbohydrate/sugar intake), and physical activity (measured in walking steps) for aforementioned six different mortality diseases study.

It is known that body weight (BMI) and abdominal fat distribution (WHR) affect insulin resistance (IR) in pancreatic

beta cells, as indicated by fasting plasma glucose (FPG) levels in the early morning. The combined effects of diet and exercise on top of insulin resistance influence are reflected in final level of postprandial plasma glucose (PPG). Ultimately, obesity and diabetes are central to the onset of various subsequent mortality-related complications, such as those 6 diseases.

In this article No. *1051, the author assesses the outcomes and efficacy of his lifestyle management compared to metformin treatment referencing from the MedScape article.*

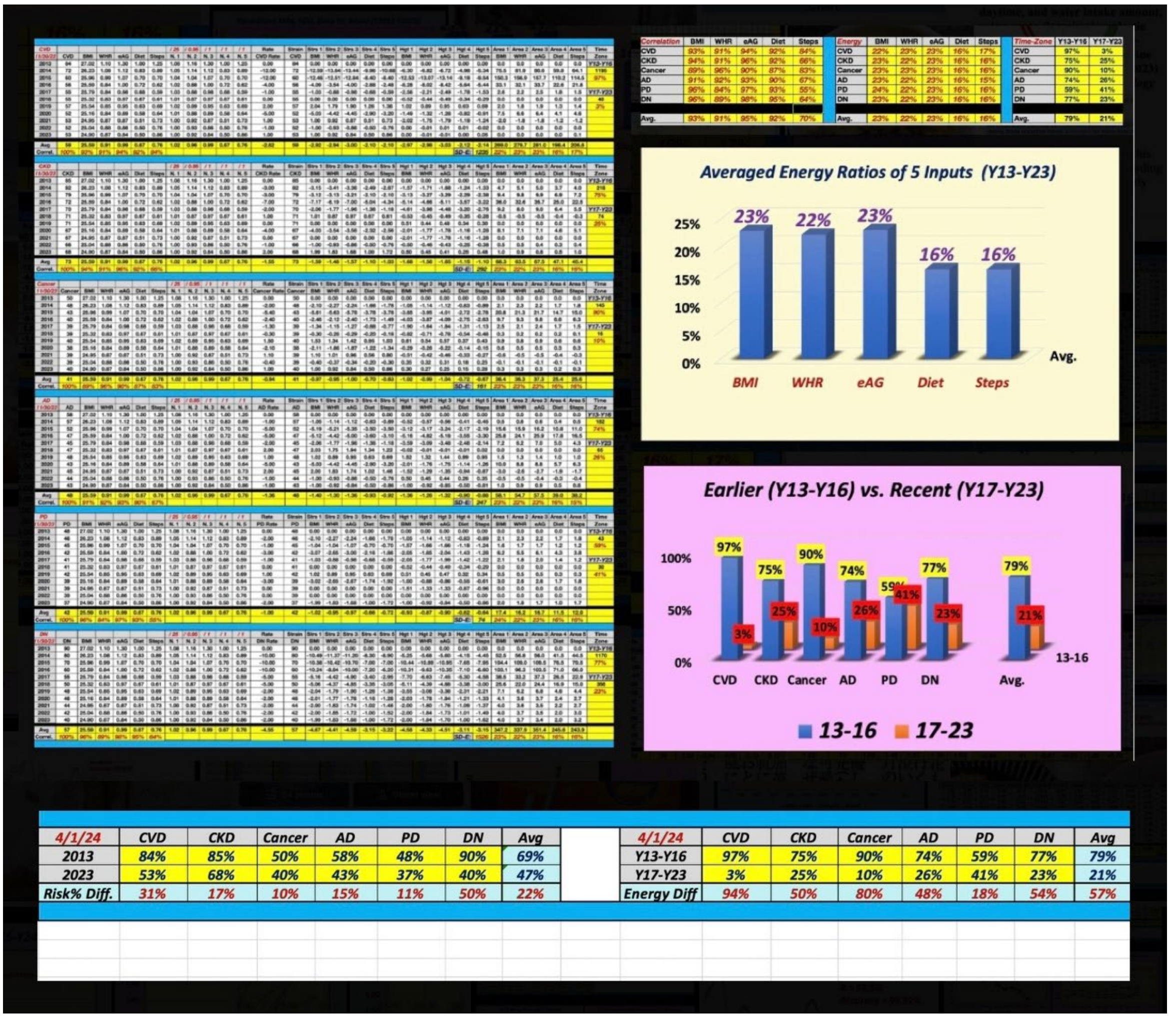
To summarize, *there are two principal findings:*

First, regarding the six risk percentages for mortality diseases, there is an average decrease of 22%, from 69% in 2013 (with metformin) to 47% in 2023 (without metformin).

Second, in terms of the six SD-VMT energy ratios, the average reduction is 57%, from 78% of the period 2013-2016 to 21% of the period 2017-2023.

Key Message

The author's six mortality disease risk and their associated energy levels have significantly decreased over time, 22% reduction on risk % and 57% reduction on energy, without the use of any medication, particularly metformin. ***His case study has demonstrated that lifestyle management can rival the effectiveness of medication, such as metformin.*** However, many patients either lack the necessary knowledge or the will power and persistence to practice lifestyle management consistently over the long term.



Viscoelastic Medicine theory (VMT #489):

From metformin to lifestyle to control T2D: A summarized report on risks of having six mortality diseases resulted from T2D and five common inputs, BMI, WHR, eAG, Diet, and Exercise using viscoplastic energy model of GH-Method: math-physical medicine (No. 1051)

1. Introduction

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The Author's Note

Detailed discussions on the pathophysiological explanations related to specific diseases and the five inputs are presented in the Introduction Section of the following six papers:

No. 975: Cardiovascular Diseases (CVD)
No. 976: Chronic Kidney Diseases (CKD)
No. 977: Cancers
No. 978: Alzheimer's Disease (AD)
No. 979: Parkinson's Disease (PD)
No. 980: Diabetic Neuropathy (DN)

2. Biomedical Information

The following sections contain excerpts and concise information drawn from multiple medical articles, which have been meticulously reviewed by the author of this paper. The author has adopted this approach as an alternative to including a conventional reference list at the end of this document, with the intention of optimizing his valuable research time. It is essential to clarify that these sections do not constitute part of the author's original contribution but have been included to aid the author in his future reviews and offer valuable insights to other readers with an interest in these subjects.

Metformin and CVD, CKD, Cancers, Dementia

Metformin, a medication commonly used to treat type 2 diabetes, has been researched for its potential impacts on cardiovascular disease (CVD), chronic kidney disease (CKD), various types of cancer, and dementia. Here's a brief overview of the associations and research findings related to metformin and these conditions:

1. Cardiovascular Disease (CVD)

Metformin is often considered beneficial for heart health, especially in people with type 2 diabetes. It has been associated with a reduction in the risk of cardiovascular events and is thought to improve lipid profiles and reduce inflammation, which are critical factors in the development of CVD.

2. Chronic Kidney Disease (CKD)

While metformin was once contraindicated in patients with CKD due to concerns about lactic acidosis, updated guidelines have expanded its use, even in patients with mild to moderate kidney impairment. The medication is believed to have protective effects on the kidneys, and its use is carefully considered based on the patient's glomerular filtration rate (GFR).

3. Cancer

Research has suggested that metformin may lower the risk of developing certain types of cancer, such as breast, colon, and pancreatic cancer, in people with type 2 diabetes. The exact mechanisms are still under investigation, but metformin is thought to exert anti-tumor effects through the activation of AMP-activated protein kinase (AMPK) and the inhibition of the mTOR signaling pathway, which are involved in cell growth and proliferation.

4. Dementia

Studies on the relationship between metformin and dementia have yielded mixed results. Some research suggests that metformin may reduce the risk of developing Alzheimer's disease and other forms of dementia, potentially through its effects on glucose metabolism and anti-inflammatory properties. However, other studies have indicated a possible increased risk of dementia with long-term metformin use, necessitating further research to clarify this relationship.

In summary, while metformin is primarily used for glucose control in type 2 diabetes, its effects may extend to influencing the risk and progression of CVD, CKD, certain cancers, and possibly dementia, with ongoing research continuing to explore these relationships.

3. MPM Background

To learn more about his developed GH-Method: math-physical medicine (MPM) methodology, readers can read the following three papers selected from his published 760+ papers.

The first paper, No. 386 (Reference 1) describes his MPM methodology in a general conceptual format. The second paper, No. 387 (Reference 2) outlines the history of his personalized diabetes research, various application tools, and the differences between biochemical medicine (BCM) approach versus the MPM approach. The third paper, No. 397 (Reference 3) depicts a general flow diagram containing ~10 key MPM research methods and different tools.

4. The Author's Diabetes History

The author was a severe T2D patient since 1995. He weighed 220 lb. (100 kg) at that time. By 2010, he still weighed 198 lb. with an average daily glucose of 250 mg/dL (HbA1C at 10%). During that year, his triglycerides reached 1161 (high risk for CVD and stroke) and his albumin-creatinine ratio (ACR) at 116 (high risk for chronic kidney disease). He also suffered from five cardiac episodes within a decade. In 2010, three independent physicians warned him regarding the need for kidney dialysis treatment and the future high risk of dying from his severe diabetic complications.

In 2010, he decided to self-study endocrinology with an emphasis on diabetes and food nutrition. He spent the entire year of 2014 to develop a metabolism index (MI) mathematical model. During 2015 and 2016, he developed four mathematical prediction models related to diabetes conditions: weight, PPG, fasting plasma glucose (FPG), and HbA1C (A1C). Through using his developed mathematical metabolism index (MI) model and the other four glucose prediction tools, by the end of 2016, his weight was reduced from 220 lbs. (100 kg) to 176 lbs. (89 kg), waistline from 44 inches (112 cm) to 33 inches (84 cm), average finger-piercing glucose from 250 mg/dL to 120 mg/dL, and A1C from 10% to ~6.5%. One of his major accomplishments is that he no longer takes any diabetes-related medications since 12/8/2015.

In 2017, he achieved excellent results on all fronts, especially his glucose control. However, during the pre-COVID period, including both 2018 and 2019, he traveled to ~50 international cities to attend 65+ medical conferences and made ~120 oral presentations. This hectic schedule inflicted damage to his diabetes control caused by stress, dining out frequently, post-meal exercise disruption, and jet lag, along with the overall negative metabolic impact from the irregular life patterns; therefore, his glucose control was somewhat affected during the two-year traveling period of 2018-2019.

He started his COVID-19 self-quarantined life on 1/19/2020. By 10/16/2022, his weight was further reduced to ~164 lbs. (BMI 24.22) and his A1C was at 6.0% without any medication intervention or insulin injection. In fact, with the special COVID-19 quarantine lifestyle since early 2020, not only has he written and published ~500 new research articles in various medical and engineering journals, but he has also achieved his best health conditions for the past 27 years. These achievements have resulted from his non-traveling, low-stress, and regular daily life routines. Of course, his in-depth knowledge of chronic diseases, sufficient practical lifestyle management experiences, and his own developed high-tech tools have also contributed to his excellent health improvements.

On 5/5/2018, he applied a continuous glucose monitoring (CGM) sensor device on his upper arm and checks his glucose measurements every 5 minutes for a total of 288 times each day. Furthermore, he extracted the 5-minute intervals from every 15-minute interval for a total of 96 glucose data each day stored in his computer software.

Through the author's medical research work over 40,000 hours and read over 4,000 published medical papers online in the past 13 years, he discovered and became convinced that good life habits of not smoking, moderate or no alcohol intake, avoiding illicit drugs; along with eating the right food with well-balanced nutrition, persistent exercise, having a sufficient and good quality of sleep, reducing all kinds of unnecessary stress, maintaining a regular daily life routine contribute to the risk reduction of having many diseases, including CVD, stroke, kidney problems, micro blood vessels issues, peripheral nervous system problems, and even cancers and dementia. In addition, a long-term healthy lifestyle can even "repair" some damaged internal organs, with different required time-length depending on the particular organ's cell lifespan. For example, he has "self-repaired" about 35% of his damaged pancreatic beta cells during the past 10 years.

5. Energy Theory

The human body and organs have around 37 trillion live cells which are composed of different organic cells that require energy infusion from glucose carried by red blood cells; and energy consumption from labor-work or exercise. When the residual energy (resulting from the plastic glucose scenario) is stored inside our bodies, it will cause different degrees of damage or influence to many of our internal organs.

According to physics, energies associated with the glucose waves are proportional to the square of the glucose amplitude. The residual energies from elevated glucoses are circulating inside the body via blood vessels which then impact all of the internal organs to cause different degrees of damage or influence, e.g. diabetic complications. Elevated glucose (hyperglycemia) causes damage to the structural integrity of blood vessels. When it combines with both hypertension (rupture of arteries) and hyperlipidemia (blockage of arteries), CVD or Stroke happens. Similarly, many other deadly diseases could result from these excessive energies which would finally shorten our lifespan. For an example, the combination of hyperglycemia and hypertension would cause micro-blood vessel's leakage in kidney systems which is one of the major cause of CKD.

The author then applied Fast Fourier Transform (FFT) operations to convert the input wave from a time domain into a frequency domain. The y-axis amplitude values in the frequency domain indicate the proportional energy levels associated with each different frequency component of input occurrence. ***Both output symptom value (i.e. strain amplitude in the time domain) and output symptom fluctuation rate (i.e. the strain rate and strain frequency) are influencing the energy level (i.e. the Y-amplitude in the frequency domain).***

Currently, many people live a sedentary lifestyle and lack sufficient exercise to burn off the energy influx which causes them to become overweight or obese. Being overweight and having obesity leads to a variety of chronic diseases, particularly diabetes. In addition, many types of processed food add unnecessary ingredients and harmful chemicals that are toxic to the bodies, which lead to the development of many other deadly diseases, such as cancers. For example, ~85% of worldwide diabetes patients are overweight, and ~75% of patients with cardiac illnesses or surgeries have diabetes conditions.

In engineering analysis, when the load is applied to the structure, it bends or twists, i.e. deform; however, when the load is removed, it will either be restored to its original shape (i.e, elastic case) or remain in a deformed shape (i.e. plastic case). In a biomedical system, the glucose level will increase after eating carbohydrates or sugar from food; therefore, the carbohydrates and sugar function as the energy supply. After having labor work or exercise, the glucose level will decrease. As a result, the exercise burns off the energy, which is similar to load removal in the engineering case. In the biomedical case, both processes of energy influx and energy dissipation take some time which is not as simple and quick as the structural load removal in the engineering case. Therefore, the age difference and 3 input behaviors are "dynamic" in nature, i.e. time-dependent. T*his time-dependent nature leads to a "viscoelastic or viscoplastic" situation.* ***For the author's case, it is "viscoplastic" since most of his biomarkers are continuously improved during the past 13-year time window.***

<u>Time-Dependent Output Strain and Stress of (Viscous Input*Output Rate)</u>

Hooke's law of linear elasticity is expressed as:

Strain (ε: epsilon)
= Stress (σ: sigma) / Young's modulus (E)

For biomedical glucose application, his developed linear elastic glucose theory (LEGT) is expressed as:

PPG (strain) = carbs/sugar (stress) * GH.p-Modulus (a positive number) + post-meal walking k-steps * GH.w-Modulus (a negative number)

Where GH.p-Modulus is reciprocal of Young's modulus E.

However, in viscoelasticity or viscoplasticity theory, the stress is expressed as:

Stress
= viscosity factor (η: eta) * strain rate (dε/dt)

Where strain is expressed as Greek epsilon or ε.

In this article, in order to construct an "ellipse-like" diagram in a stress-strain space domain (e.g. "hysteresis loop") covering both the positive side and negative side of space, he has modified the definition of strain as follows:

Strain
= (body weight at certain specific time instant)

He also calculates his strain rate using the following formula:

Strain rate
= (body weight at next time instant) - (body weight at present time instant)

The risk probability % of developing into CVD, CKD, Cancer is calculated based on his developed metabolism index model (MI) in 2014. His MI value is calculated using inputs of 4 chronic conditions, i.e. weight, glucose, blood pressure, and lipids; and 6 lifestyle details, i.e. diet, drinking water, exercise, sleep, stress, and daily routines. These 10 metabolism categories further contain ~500 elements with millions of input data collected and processed since 2010. For individual deadly disease risk probability %, his mathematical model contains certain specific weighting factors for simulating certain risk percentages associated with different deadly diseases, such as metabolic disorder-induced CVD, stroke, kidney failure, cancers, dementia; artery damage in heart and brain, micro-vessel damage in kidney, and immunity-related infectious diseases, such as COVID death.

Some of explored deadly diseases and longevity characteristics using the ***viscoplastic medicine theory (VMT)*** include stress relaxation, creep, hysteresis loop, and material stiffness, damping effect ***based on time-dependent stress and strain*** which are different from his previous research findings using ***linear elastic glucose theory (LEGT) and nonlinear plastic glucose theory (NPGT).***

6. Results

Figure 1 shows data tables and comparison table.

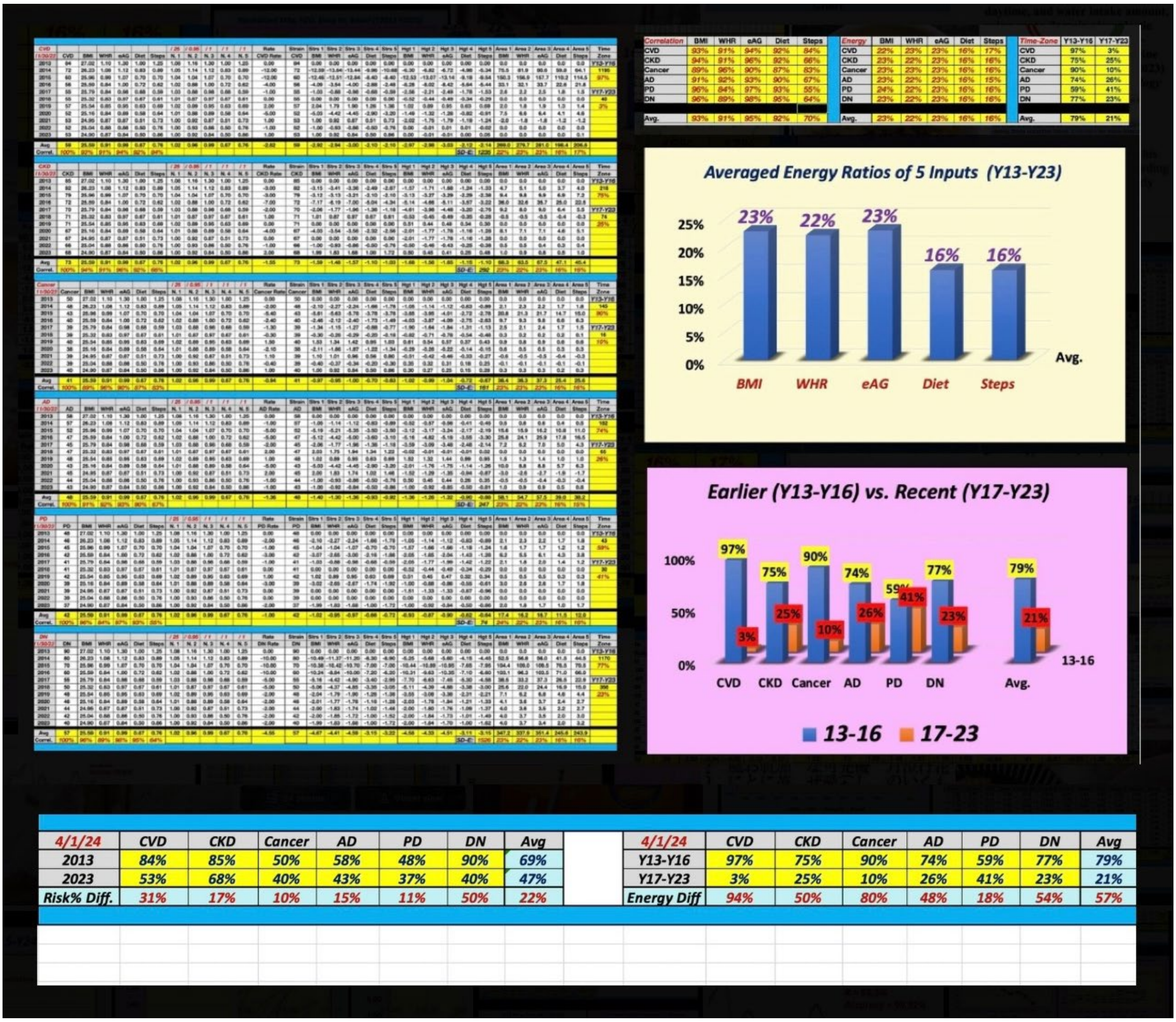

Figure 1: Data tables and Comparison table

7. Conclusions

To summarize, there are two principal findings:

First, regarding the six risk percentages for mortality diseases, there is an average decrease of 22%, from 69% in 2013 (with metformin) to 47% in 2023 (without metformin).

Second, in terms of the six SD-VMT energy ratios, the average reduction is 57%, from 78% of the period 2013-2016 to 21% of the period 2017-2023.

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References

For editing purposes, majority of the references in this paper, which are self-references, have been removed for this article. Only references from other authors' published sources remain. The bibliography of the author's original self-references can be viewed at www.eclairemd.com.

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For reading more of the author's published VGT or FD analysis results on medical applications, please locate them through platforms for scientific research publications, such as ResearchGate, Google Scholar, etc.