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Viscoelastic Medicine Theory (VMT #328): Estimated and Predicted Risks of Developing Cancers versus Obesity, Type 2 Diabetes, Meal Portion, Food Nutrition and Physical Activities During a Period between 2014 and 2023 Based on Viscoplastic Energy Model of GH-Method: Math-Physical Medicine (No. 928)

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Abstract

The author embarked on cancer research since 2020, following his extensive work on metabolic disorders, diabetes, and associated complications, including CVD, CKD, neuropathy, dementia, among others. Through this journey, he has gained insights into the connections between these diseases and more ominous conditions, such as cancers. Recently, the author came across an article from the University of Edinburgh in the UK, which highlighted the global increase in cancer cases among individuals under the age of 50 (in the "Other Biomedical Information" below). Motivated by this article, he decided to undertake another cancer research project. This study focuses on five influential factors for estimating his cancer risks over the past ten years, from January 1, 2014, to September 17, 2023. These five factors include obesity, diabetes, meal portions, food nutrition, and physical exercise. To conduct a quantitative analysis, he employed the viscoplastic energy model (VMT) borrowed from advanced engineering. Subsequently, he also applied his developed VMT-based prediction model to calculate another set of cancer risks for comparative analysis. In this context, "energy" denotes the impact, influence, or contribution that specific factors exert on health outcomes or medical symptoms. The term "energy rate" signifies the degree of influence on these outcomes or symptoms. "Overall energy" represents 100% of the total energy, with higher levels indicating a more significant strain on bodily organs. Furthermore, this article also offers some pathophysiological explanations of cancer and its five key influential factors. In summary, three key observations emerge: 1. Based on the SD-VMT analysis tesults, the following energy contributions were identified: 25% from obesity (m1), 25% from diabetes (m2), 16% from exercise (m5), 21% from meal portions (M9a), and 13% from food nutrition. Additionally, 87% of the total energy is associated with Y14-Y16, with the remaining 13% associated with Y17-Y23. 2. The energy contribution ratios derived from the SD-VMT analysis reveal the following relationships: 1.7 for meal portions versus food nutrition, 2.1 for diet versus exercise, and an equal split of 1.0 (indicating a 50% contribution each) for the two metabolic conditions of obesity and diabetes versus the three lifestyle factors of diet and exercise. These ratios lead to three significant conclusions: First, his continuous reduction of meal portions holds greater significance than his well-balanced food nutrition profile. Second, his dietary choices carry more weight than his physical exercise levels. Third, his two metabolic conditions are equally influential as his three lifestyle factors. 3. The VMT-based prediction model and the metabolism index (MI)-based prediction model yield two distinct sets of cancer risks for the period between Y2024 and Y2023. These two datasets achieve a 100% prediction accuracy and demonstrate an 87% correlation, reflecting a high degree of similarity in these two cancer risk waveforms.

Keywords: Viscoelastic; Viscoplastic; Cancer; Obesity; Type 2 diabetes; Exercise

Abbreviations: MI: metabolism index; CVD: cardiovascular diseases; CKD: chronic kidney diseases; T2D: type 2 diabetes; PPG: postprandial plasma glucose; FPG: fasting plasma glucose

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1. INTRODUCTION

The author embarked on cancer research since 2020, following his extensive work on metabolic disorders, diabetes, and associated complications, including CVD, CKD, neuropathy, dementia, among others. Through this journey, he has gained insights into the connections between these diseases and more ominous conditions, such as cancers.

Recently, the author came across an article from the University of Edinburgh in the UK, which highlighted the global increase in cancer cases among individuals under the age of 50 (in the "Other Biomedical Information" below). Motivated by this article, he decided to undertake another cancer research project. This study focuses on five influential factors for estimating his cancer risks over the past ten years, from January 1, 2014, to September 17, 2023. These five factors include obesity, diabetes, meal portions, food nutrition, and physical exercise. To conduct a quantitative analysis, he employed the viscoplastic energy model (VMT) borrowed from advanced engineering. Subsequently, he also applied his developed VMT-based prediction model to calculate another set of cancer risks for comparative analysis.

In this context, "energy" denotes the impact, influence, or contribution that specific factors exert on health outcomes or medical symptoms. The term "energy rate" signifies the degree of influence on these outcomes or symptoms. "Overall energy" represents 100% of the total energy, with higher levels indicating a more significant strain on bodily organs.

Furthermore, this article also offers some pathophysiological explanations of cancer and its five key influential factors.

1.1 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.

Notes from the author of this paper:

Upon reviewing the upcoming excerpts from other published articles, it becomes evident that these findings are predominantly conveyed using qualitative statements. On occasion, these statements include a limited number of numerical values, typically sourced from statistical data within epidemiological studies. However, a recurring deficiency among them is the lack of robust quantitative findings to underpin their qualitative conclusions. Consequently, the author of this paper has deliberately opted to leverage his familiar methodologies from mathematics, physics, and engineering fields in his medical research pursuits. This strategic choice is intended to yield substantial conclusions supported by sound proofs via quantitative data, effectively bridging the current gap in the realm of biomedical research.

Article of "Global surge in cancer cases among under-50s" on 9/18/2023
By University of Edinburgh, UK

Global cancer cases in people under the age of 50 have risen by 79 per cent between 1990 and 2019, according to new research.

Cancer deaths in the same age group also grew by more than 27 per cent, with more than 1 million under-50s a year now dying of cancer.

Cancers of the breast, windpipe, lung, bowel and stomach are responsible for the biggest death toll.

Risk factors
Cancer is more commonly associated with older age. However, growing global evidence from the past three decades has pointed to an increasing number of cases among young adults.

While genetics are likely to play a part in the rise of cancer cases in young people, experts say that smoking, alcohol consumption and

diets high in meat and salt but low in fruit and milk are the main risk factors.

Concerning rise
The University of Edinburgh-led team looked at the impact of 29 cancers on people aged between 14 and 49 years-old in more than 200 countries and regions.

Their analysis found that cancer cases worldwide rose from 1.82 million in 1990 to 3.26 million in 2019.

Breast cancer accounted for the largest number of cases – 13.7 per every 100,000 people.

The fastest rise was seen in windpipe and prostate cancers, growing 2.38 per cent and 2.23 per cent per year respectively.

The highest rates of early onset cancers in 2019 were seen in North America, Australasia, and Western Europe.

Upward trend
Based on the trends for the past three decades, researchers estimate that the global number of new early onset cancer cases and associated deaths will rise by a further 31 per cent and 21 per cent, respectively, in 2030, with those in their 40s the most at risk.

Further research is needed to fully understand the reasons driving the concerning growth in cases.

It is unclear how screening and early life exposure to environmental factors may be influencing the observed increase, researchers say.

To conduct their analysis, the study team examined data from the Global Burden of Disease 2019 Study.

They looked at figures related to new cases, deaths, health consequences – known as disability-adjusted life years or DALYs – and risk factors for all those aged 14 to 49 to estimate the annual percentage change between 1990 and 2019.

The research team highlight that variable quality of cancer registry data in different countries may have led to under-reporting and under-diagnosis.

The study was led by scientists from the University of Edinburgh and the Zhejiang University School of Medicine in China.

Research on the drivers of early-onset cancer is currently quite limited. The hypotheses we have presented are based on existing data and literature. The impact of air pollution, climate change, or birth cohort effect on the increasing trend of young cancer is not fully investigated. We strongly encourage more researchers and funding support to be dedicated to the field of early-onset cancer. This will help elucidate the factors behind this phenomenon and ultimately reduce the social, economic, and familial burden posed by early-onset cancer.

Pathophysiological explanations and statistical data regarding relationships between cancers versus obesity and diabetes:

Pathophysiological explanations

1. Obesity and cancer

Adipose tissue: Excess adipose tissue in obese individuals can secrete adipokines, such as leptin, adiponectin, and resistin. These adipokines can promote cell proliferation, angiogenesis (formation of new blood vessels to supply the tumor), and inflammation, creating favorable conditions for tumor growth.

Insulin resistance and hyperinsulinemia: Insulin resistance, common in obesity, causes elevated insulin levels. Insulin has been shown to enhance cell division and inhibit cell death (apoptosis), potentially promoting the growth of cancer cells.

2. Diabetes and cancer:

Hyperglycemia: High blood glucose levels can trigger production of insulin and insulin-like growth factor (IGF-1). Both can stimulate cell proliferation and inhibit apoptosis, contributing to tumor growth.

Insulin resistance and hyperinsulinemia: In type 2 diabetes, insulin resistance can lead to increased insulin production. This excess insulin can promote tumor growth by acting as a growth factor.

Chronic inflammation: In diabetes, ongoing inflammation triggered by hyperglycemia

can cause DNA damage and lead to the development of cancer cells. Inflammatory cytokines can also promote tumor growth and metastasis.

Statistical data

1. Obesity and cancer

According to the World Cancer Research Fund (WCRF), obesity is associated with an increased risk of several cancers, including breast (postmenopausal), colorectal, endometrial, kidney, ovarian, pancreatic, and liver cancers.

The American Cancer Society estimates that approximately 8% of all cancers in the United States are due to obesity.

The International Agency for Research on Cancer (IARC) states that around 20% of cancer-related deaths in the United States are attributed to excess body weight.

2. Diabetes and cancer

A study published in the Journal of the American Medical Association (JAMA) found that individuals with diabetes had a higher risk of developing several types of cancer, including liver, pancreatic, colorectal, bladder, and postmenopausal breast cancers.

According to the American Diabetes Association, people with type 2 diabetes are twice as likely to develop liver and pancreatic cancers compared to individuals without diabetes.

The World Health Organization (WHO) estimates that approximately 2.2 million cancer cases globally in 2020 were attributable to diabetes.

It's crucial to note that these statistics provide associations, and individual risk may vary based on multiple factors, including genetics, lifestyle, and other comorbidities. Early detection, regular screenings, and lifestyle modifications, such as maintaining a healthy weight and managing blood glucose levels, are essential for preventing and managing both obesity-related and diabetes-related cancers. Consulting healthcare professionals for personalized advice and guidance is recommended.

Pathophysiological explanations and statistical data regarding relationships between cancers versus food portion, food quality and physical exercises:

Pathophysiological explanations

1. Food Portion

Overeating and calorie excess: Consuming larger food portions than necessary can lead to calorie excess, which contributes to weight gain. Excess weight and obesity have been strongly linked to an increased risk of various cancers.

Hormonal imbalance: Overeating can disrupt the balance of hormones involved in regulating appetite and metabolism, such as leptin and ghrelin. This imbalance may promote tumor growth and development.

2. Food quality

Poor nutrition and nutrient deficiencies: A diet lacking in essential nutrients, such as fruits, vegetables, whole grains, and lean proteins, can weaken the immune system and increase the risk of cancer.

Carcinogenic substances: Certain foods, particularly processed and red meats, have been associated with an increased risk of colorectal cancer. Some cooking methods, like grilling or frying at high temperatures, can also produce carcinogenic compounds (e.g., heterocyclic amines) that may promote cancer development.

3. Physical exercises

Physical inactivity and sedentary lifestyle: Lack of physical activity is considered an independent risk factor for several types of cancer. Regular exercise can help maintain a healthy weight, improve insulin sensitivity, and reduce inflammation, decreasing the risk of cancer.

Enhanced immune function: Exercise has been shown to boost immune function, improve circulation, and decrease chronic inflammation, which can strengthen the body's defenses against cancer cells.

Reduced hormone levels: Regular physical activity can help regulate hormonal levels, including insulin and estrogen, which may

contribute to cancer development when imbalanced.

Statistical data

1. Food portion

The American Cancer Society suggests that larger portion sizes and calorie-rich diets contribute to the rising rates of obesity and overweight, which increase the risk of various cancers.

According to a study published in the International Journal of Obesity, larger portion sizes may contribute to weight gain and obesity, predisposing individuals to an increased risk of cancers such as breast, colorectal, endometrial, and kidney.

2. Food quality

The World Cancer Research Fund (WCRF) states that poor diet, including low intake of fruits, vegetables, and high consumption of processed and red meats, is associated with increased cancer risk.

A meta-analysis published in the Journal of the National Cancer Institute found that a higher intake of processed meat was associated with an elevated risk of colorectal cancer.

3. Physical exercises

According to the American Cancer Society, regular physical activity reduces the risk of several cancers, including breast, colorectal, and endometrial cancers.

A study published in the British Journal of Cancer found that individuals who engaged in physical activities had a reduced risk of developing various types of cancer, including lung, colon, and breast cancers. Thes statistics emphasize the importance of maintaining a healthy lifestyle, including portion control, consuming a balanced diet, and engaging in regular physical exercise, to reduce the risk of cancer. It's important to note that individual risk may vary, and lifestyle modifications should be tailored to individual needs and medical guidance.

The ratio of importance or contribution between metabolic disorders of obesity & diabetes versus lifestyle details of diet & exercises:

The precise ratio of importance or contribution between metabolic disorders, obesity, and diabetes versus lifestyle details, diet, and exercises is not easily quantifiable as each factor can interact and influence one another. However, it is generally accepted that lifestyle factors, such as diet and physical exercise, play a significant role in the development and management of metabolic disorders, including obesity, and diabetes.

1. Lifestyle factors

Diet: Poor dietary choices, including excessive calorie intake, consumption of processed foods, high sugar and fat content, and inadequate intake of fruits, vegetables, and whole grains, can contribute to the development of metabolic disorders, obesity, and diabetes. A healthy diet, on the other hand, can help manage and prevent these conditions.

Physical exercise: Sedentary behavior and lack of exercise contribute to weight gain, insulin resistance, and the progression of metabolic disorders, obesity, and diabetes. Regular physical activity can help improve insulin sensitivity, manage weight, and reduce the risk of these conditions.

2. Metabolic disorders including obesity, and diabetes

Metabolic disorders: Conditions such as metabolic syndrome, insulin resistance, and dyslipidemia are often precursors or comorbidities of obesity and type 2 diabetes. These disorders involve abnormalities in metabolic processes, including insulin function, lipid metabolism, and glucose regulation.

Obesity: Obesity is strongly associated with an increased risk of metabolic disorders and type 2 diabetes. Excessive body weight contributes to insulin resistance, chronic inflammation, and hormonal imbalances that can lead to the development of these conditions.

Diabetes: Type 2 diabetes is closely linked to obesity and metabolic disorders. In this condition, the body becomes resistant to the effects of insulin or fails to produce enough insulin, leading to elevated blood sugar levels.

While the precise contribution of lifestyle factors to metabolic disorders, obesity, and diabetes may vary among individuals, evidence suggests that making positive lifestyle changes, including adopting a healthy diet and engaging in regular physical exercise, can significantly reduce the risk and improve the management of these conditions.

It is worth noting that in some cases, metabolic disorders, obesity, and diabetes may have underlying genetic or hormonal factors contributing to their development. In such instances, lifestyle modifications may be essential in managing these conditions, but they may not be the sole or primary cause. Individualized medical attention and guidance are crucial for understanding and addressing the unique factors contributing to each person's metabolic health.

The ratio of importance or contribution between diet and exercises on cancers:

The importance or contribution of diet and exercises in maintaining a healthy lifestyle and managing various health conditions can vary depending on individual circumstances and goals. However, in general, both diet and exercise are considered to be key components of a healthy lifestyle and have significant impacts on overall health and well-being.

1. Diet

Importance: Diet plays a fundamental role in providing essential nutrients, maintaining a healthy weight, preventing chronic diseases, and supporting overall health. It is crucial to consume a balanced diet that includes a variety of fruits, vegetables, whole grains, lean proteins, and healthy fats while limiting the intake of processed foods, added sugars, and unhealthy fats.

Contribution: A well-balanced and nutritious diet provides the body with essential vitamins, minerals, antioxidants, and other compounds necessary for optimal functioning. It helps maintain a healthy weight, supports proper digestion, strengthens the immune system, and reduces the risk of conditions such as obesity, heart disease, type 2 diabetes, and certain cancers.

2. Exercise

Importance: Regular physical exercise is vital for maintaining a healthy weight, improving cardiovascular health, enhancing muscle strength and flexibility, reducing stress, boosting mood, and promoting overall physical and mental well-being. It is recommended to engage in at least 150 minutes of moderate-intensity aerobic exercise or 75 minutes of vigorous-intensity aerobic exercise per week, along with muscle-strengthening activities.

Contribution: Exercise helps burn calories, build lean muscle mass, improve metabolism, and enhance cardiovascular and respiratory functions. It can aid in weight management, reduce the risk of chronic diseases, including obesity, type 2 diabetes, heart disease, and certain cancers. Exercise also plays a crucial role in improving mental health by reducing stress, anxiety, and symptoms of depression.

The ratio of importance or contribution between diet and exercise cannot be assigned a specific numerical value as they are interconnected and dependent on each other. A well-rounded approach that focuses on a balanced diet and regular exercise is generally recommended for optimal health and well-being. Both diet and exercise contribute significantly to maintaining overall health, managing weight, preventing chronic diseases, and improving quality of life.

The ratio of importance or contribution between food portion and food qualities on cancers:

The ratio of importance or contribution between food portion and food qualities depends on individual goals and circumstances. However, both aspects play crucial roles in maintaining a healthy diet and overall well-being.

1. Food portion

Importance: The portion size of food consumed is important for maintaining a healthy weight and preventing overeating. Controlling portion sizes helps ensure that

calorie intake is appropriate and aligned with energy needs. Consuming excessive portions can contribute to weight gain, obesity, and related health issues.

Contribution: Monitoring food portion sizes assists in controlling calorie intake and managing weight. It can also help individuals develop healthier eating habits and prevent the consumption of excessive amounts of specific foods or nutrient groups.

2. Food qualities

Importance: The quality of the food consumed is also essential for optimal nutrition and overall health. Consuming a variety of nutrient-dense foods provides the body with the necessary vitamins, minerals, antioxidants, and other beneficial compounds. Focusing on food quality helps ensure that the body receives the necessary nutrients for proper functioning and disease prevention.

Contribution: Choosing high-quality foods, such as fruits, vegetables, whole grains, lean proteins, and healthy fats, contributes to a balanced diet. These foods provide essential nutrients and support various bodily functions. Foods with high nutritional quality also help reduce the risk of chronic diseases and promote overall well-being.

While both food portion and food qualities are important, it is necessary to strike a balance and consider the overall dietary pattern. For weight management, portion control is crucial to prevent excessive calorie intake. However, the quality of the food consumed should not be compromised. Opting for nutrient-dense foods while being mindful of portion sizes is typically recommended for maintaining a healthy diet and achieving nutritional goals.

It's important to note that individual differences, such as specific dietary needs or specific health conditions, may impact the emphasis on food portion versus food qualities. Consulting with a healthcare professional or registered dietitian can provide personalized guidance and support in achieving a healthy and balanced diet.

2. METHODS

2.1 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 describes his MPM methodology in a general conceptual format. The second paper, No. 387 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 depicts a general flow diagram containing ~10 key MPM research methods and different tools.

2.2 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.

2.3 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. This 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.

2.4 Time-dependent output strain and stress of (viscous input*output rate)

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).

Note: For a more detailed description, please refer to the "consolidated method" section which is given at the beginning of the special issue.

3. RESULTS

Figure 1 shows supporting data.

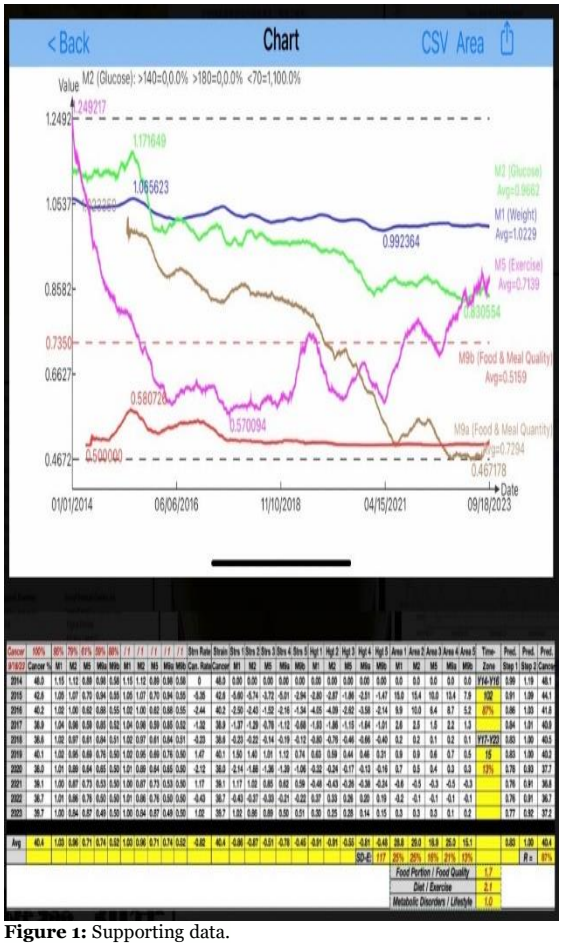

Figure 1: Supporting data.

Figure 2 shows output curves.

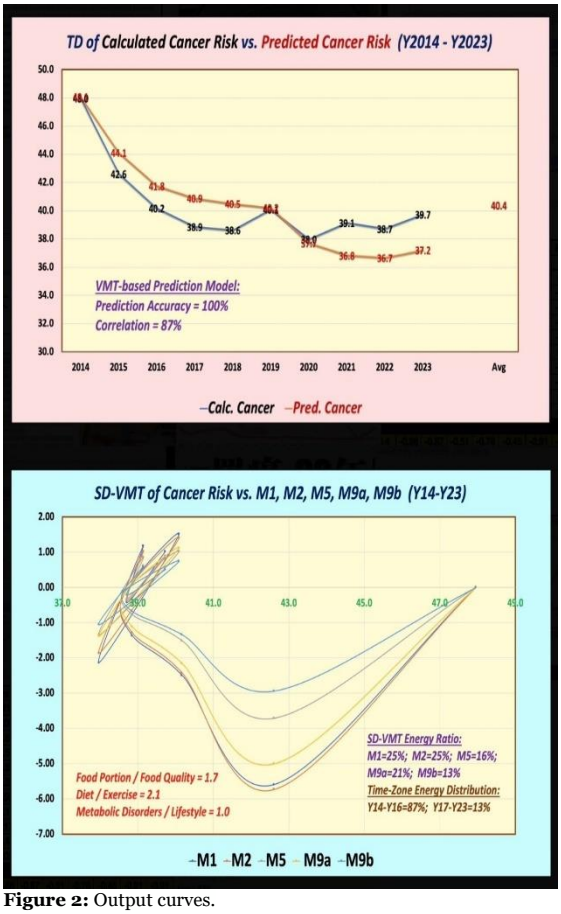

Figure 2: Output curves.

4. CONCLUSION

In summary, three key observations emerge:

1. Based on the SD-VMT analysis tesults, the following energy contributions were identified: 25% from obesity (m1), 25% from diabetes (m2), 16% from exercise (m5), 21% from meal portions (M9a), and 13% from food nutrition. Additionally, 87% of the total energy is associated with Y14-Y16, with the remaining 13% associated with Y17-Y23.

2. The energy contribution ratios derived from the SD-VMT analysis reveal the following relationships: 1.7 for meal portions versus food nutrition, 2.1 for diet versus exercise, and an equal split of 1.0 (indicating a 50% contribution each) for the two metabolic conditions of obesity and diabetes versus the three lifestyle factors of diet and exercise. These ratios lead to three significant conclusions: First, his continuous reduction of meal portions holds greater significance than his well-balanced food nutrition profile. Second, his dietary choices carry more weight than his physical exercise levels. Third, his two metabolic conditions are

equally influential as his three lifestyle factors.

3. The VMT-based prediction model and the metabolism index (MI)-based prediction model yield two distinct sets of cancer risks for the period between Y2024 and Y2023. These two datasets achieve a 100% prediction accuracy and demonstrate an 87% correlation, reflecting a high degree of similarity in these two cancer risk waveforms.

5. 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.

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.

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Viscoelastic and Viscoplastic Glucose Theory Application in Medicine

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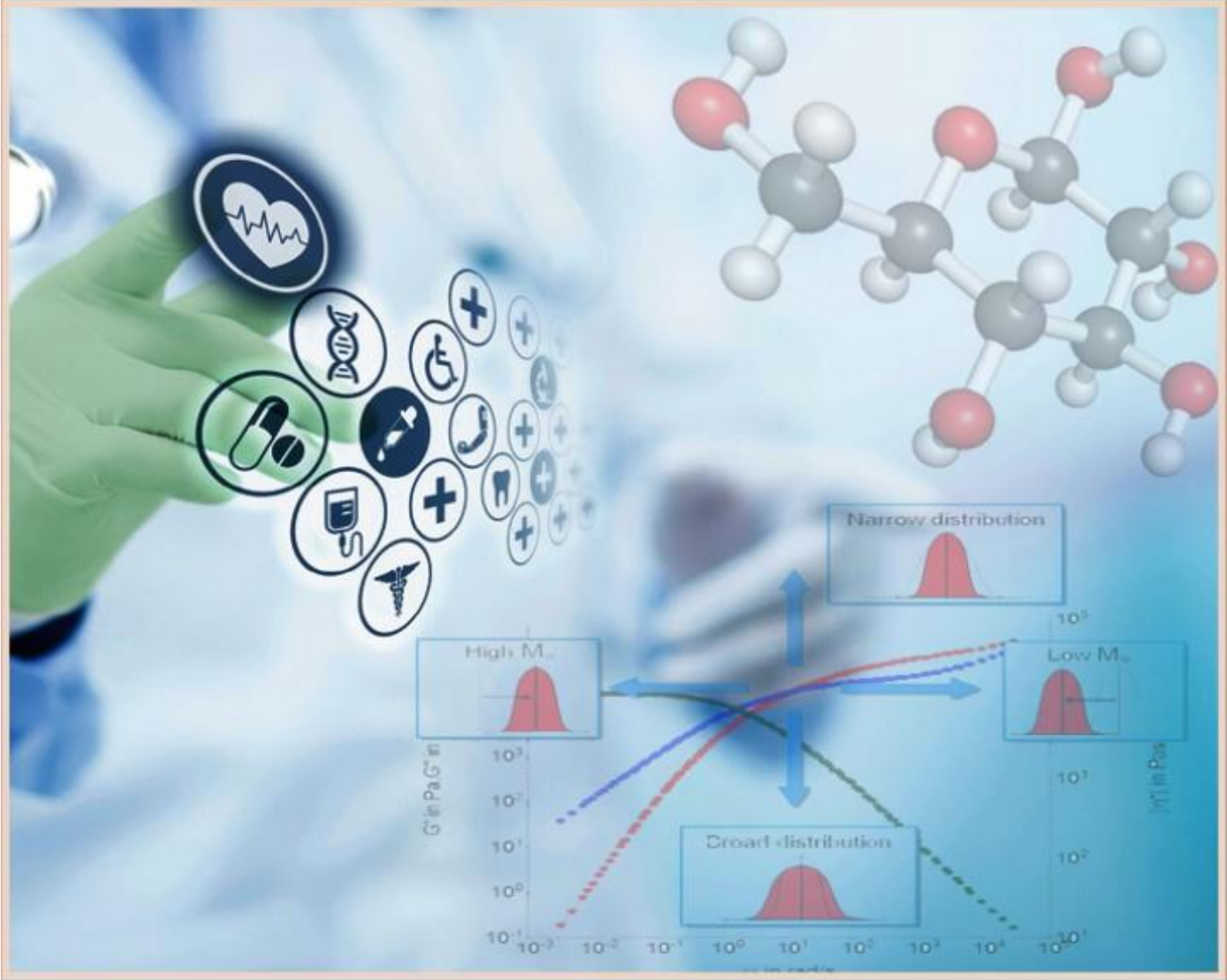

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