

# The GH-Method

---

## **Viscoelastic or Viscoplastic Glucose Theory (VGT #112): A Study of the Influences of Diet and Exercise on 3 Deadly Diseases and Longevity Concerns Applying Time-Domain Observations and Space-Domain VGT Stress-Strain Curves from a Patient's Data Collected Over 10.5 Years from 1/1/2012 to 7/14/2022 Based on GH-Method: Math-Physical Medicine (No. 702)**

**Gerald C. Hsu\***

eclaireMD Foundation, USA

**Keywords:** Viscoelastic; Viscoplastic; Diet; Exercise; Carbohydrates; Sugar; Postprandial plasma glucose; Fasting plasma glucose; Type 2 diabetes

**Abbreviations:** T2D: type 2 diabetes; PPG: postprandial plasma glucose; FPG: fasting plasma glucose; SD: space domain; TD: time domain; MPM: math-physical medicine

### 1. PREFACE

Recently, the author has read a medical report which has inspired him to write his version regarding the same subject. Although in this referenced paper, Professor Melody Ding's applied hazard ratio of Cox regression statistical method and the author's applied VGT of math-physical medicine research method are different in nature, their conclusions match each other along with the conclusions from other published medical papers. To reduce the time for searching the literature and to serve his future reference convenience, the author decided to cite an excerpt of the original reference paper (817 words or 16% of this article) below:

“Originally published on MedicalXpress Breaking News-and-Events

Can you outrun a poor diet?  
Updated July 12, 2022 by University of Sydney

New research has found that high levels of physical activity do not counteract the detrimental effects of a poor diet on mortality risk. The University of Sydney-led study

found participants who had both high levels of physical activity and a high-quality diet had the lowest risk of death, showing that you cannot "outrun" a poor diet.

Published today in the British Journal of Sports Medicine, the researchers examined the independent and joint effects of diet and physical activity on all-cause, cardiovascular disease, and cancer mortality using a large population-based sample (360,600) of British adults from the UK Biobank. The UK Biobank is a large-scale biomedical cohort study containing in-depth biological, behavioral, and health information from participants.

High-quality diets included at least five portions of fruit and vegetables every day, two portions of fish per week, and lower consumption of red meat, particularly processed meat.

The study revealed that for those who had high levels of physical activity and a high-quality diet, their mortality risk was reduced by 17% from all causes, 19% from cardiovascular disease, and 27% from

selected cancers, as compared with the worst diet who were physically inactive.

Lead author Associate Professor Melody Ding from the Charles Perkins Center and the Faculty of Medicine and Health at the University of Sydney said:

"Both regular physical activity and a healthy diet play an important role in promoting health and longevity.

"Some people may think they could offset the impacts of a poor diet with high levels of exercise or offset the impacts of low physical activity with a high-quality diet, but the data shows that unfortunately, this is not the case."

"Adhering to both a quality diet and sufficient physical activity is important for optimally reducing the risk of death from all causes, cardiovascular disease, and cancers," says co-author Joe Van Buskirk, from the School of Public Health, Faculty of Medicine and Health.

A small number of studies have previously found that high-intensity exercise may counteract detrimental physiological responses to over-eating. However, the long-term effects on how diet and physical activity interact with each other remained less explored. The findings from this study confirm the importance of both physical activity and quality diet in all-cause and cause-specific mortality.

"This study reinforces the importance of both physical activity and diet quality for achieving the greatest reduction in mortality risk," said Associate Professor Ding.

"Public health messages and clinical advice should focus on promoting both physical activity and dietary guidelines to promote healthy longevity."

British Journal of Sports Medicine  
Original research

Abstract:

**Objectives** To examine independent and interactive associations of physical activity and diet with all-cause, cardiovascular disease (CVD) and physical activity, diet and adiposity-related (PDAR) cancer mortality.

**Methods:**

This population-based prospective cohort study (n=346 627) is based on the UK Biobank data with linkage to the National Health Service death records to 30 April 2020. A left-truncated Cox proportional hazards model was fitted to examine the associations between exposures (self-reported total moderate-to-vigorous intensity physical activity (MVPA), vigorous-intensity physical activity (VPA) and a diet quality index (score ranging 0–3)) and outcomes (all-cause, CVD and PDAR cancer mortality).

**Results:**

During a median follow-up of 11.2 years, 13 869 participants died from all causes, 2650 from CVD and 4522 from PDAR cancers. Compared with quartile 1 (Q1, 0–210 min/week), Q2–Q4 of MVPA were associated with lower risks of all-cause (HR ranged from 0.87 (95% CI: 0.83 to 0.91) to 0.91 (95% CI: 0.87 to 0.96)), CVD (HR ranged from 0.85 (95% CI: 0.76 to 0.95) to 0.90 (95% CI: 0.81 to 1.00)) and PDAR cancer mortality (HR ranged from 0.86 (95% CI: 0.79 to 0.93) to 0.94 (95% CI: 0.86 to 1.02)). Compared with no VPA, any VPA was associated with lower risk for all-cause and CVD mortality (HR ranged from 0.85 (95% CI: 0.80 to 0.89) to 0.88 (95% CI: 0.84 to 0.93) and from 0.75 (95% CI: 0.68 to 0.83) to 0.90 (95% CI: 0.80 to 1.02), respectively). Although not reaching statistical significance for all-cause and CVD mortality, being in the best dietary category (diet quality index=2–3) was associated with a reduction in PDAR cancer mortality (HR=0.86, 95% CI: 0.78 to 0.93). No additive or multiplicative interactions between physical activity categories and dietary quality was found. When comparing across physical activity and diet combinations, the lowest risk combinations consistently included the higher levels of physical activity and the highest diet quality score.

**Conclusions:**

Adhering to both quality diet and sufficient physical activity is important for optimally reducing the risk of mortality from all causes, CVD and PDAR cancers."

## 2. INTRODUCTION

Utilizing the author's 3+ million personal health data collected over the past 13 years and his developed Metabolism index (MI) model in 2014 with 3 risk prediction models for cardiovascular diseases (CVD), chronic kidney diseases (CKD), and cancers, this particular study investigates the close relationship of 4 outputs, CVD, CKD, Cancers, and Longevity versus 2 common inputs of diet and exercise. The data covers 10.5 years from 1/1/2012 to 7/14/2022. It should be noted that his MI score includes 4 chronic medical conditions, obesity, diabetes, hypertension, hyperlipidemia, and 6 lifestyle details, diet and food, water intake, exercise, sleep, stress, and daily life routines. The diet data in this article is his combined score of food and meals (food) which includes both food quantity and food quality. His food quality includes the following 20 items (listed below and also see Figure 1).

- Food portion control (<75% of normal)
- Avoid processed food
- Limit carbohydrates (<15 grams)
- No fatty food, desserts, snacks
- Avoid sugar and sweet stuff
- Limit salt intake (<2,300 mg)
- Eat white meat, not red meat
- Limit egg yolk, no internal organs
- Eat white fish, limit shellfish
- Eat high-quality protein & dairy food
- Eat lots of vegetables and high fiber
- Eat a variety of fruits
- Drink water, not beverages
- No alcohol drinking, no smoking
- No junk food at all
- Do not eat food after 8 pm
- Take vitamins and supplements if necessary
- Maintain a regular meal pattern
- Chew and eat slowly
- Brush, floss, and protect teeth

The above list has more diet items than the mentioned paper that is referenced. As a matter of fact, his high-quality diet includes more than 5 portions of fruit and vegetables every day, more than 5 portions of white fish per week, and the appropriate amount of nuts, avoiding any red meat, particularly any processed meat/food, and many other related disciplines. His diet standards exceed the number of mentioned diet items in the above-referenced paper.

The exercise data used in this study is his recorded daily walking steps (ksteps). His average daily walking is 16,240 steps or 16.24 ksteps (about 7 miles or 11 km per day). Incidentally, his exercise target is 10,000 steps per day (about 4 miles or 7 km per day). The mathematical model of calculating various deadly disease risk probability % (mortality rate) of developing into cardiovascular diseases (CVD), chronic kidney disease (CKD), or a variety of Cancers (cancers) are mainly based on his developed MI model with differently assigned weighting factors related to certain biomarkers, such as blood pressure and glucose on the macrovessel's rupture; lipids and glucose on the macrovessel's blockage; albumin to creatinine ratio (ACR) and glucose on microvessels damage in the kidney; obesity, glucose, and environmental factors on certain cancers, such as adiposity-related (PDAR) cancers.

The space-domain strain-stress curve's energy analysis method is chosen as the primary research tool which will be described briefly in the Methods section. To save this article's number of words, he decides to omit the more detailed explanation of his research method in this article.

These two selected inputs or causes, Food and Ksteps, have gone through a "normalization process" by dividing his Food score by 1 (food scores have already been normalized) and dividing his daily walking ksteps by 10. Using this "normalization process", he can then remove the dependency of the individual unit or certain unique biophysical characteristics associated with each influential cause, i.e. food and ksteps.

In the field of medical research, hidden biophysical behaviors and complex inter-relationships exist among lifestyle details, medical conditions, chronic diseases, and certain medical complications, such as heart attacks, stroke, kidney failure, cancers, dementia, and even longevity concerns. He has noticed that most medical subjects with their associated data, medical symptoms, and influential causes, are "time-dependent" which means that all biomedical variables change from time to time because body living cells are organic and dynamically changing. This is what Professor Norman Jones, the author's adviser at MIT, suggested to him in December of 2021 and why he utilizes the

VGT tools from physics and engineering to conduct his medical research work since then. Of course, one of the major challenges of VGT analysis is always related to data mining, data selection, and data preparation.

The organization of this article has three parts.

The first part is the investigation of 3 risk curve behaviors of CVD, CKD, and Cancers in a time domain (TD).

The second part is conducting three separate SD-VGT studies of CVD, CKD, and Cancers versus the same Food and Ksteps. This analysis provides 3 deadly diseases versus both Food and Ksteps which explains the differences in the degree of influence from Food and Ksteps on these 3 deadly diseases, respectively. Furthermore, it also investigates the 3 risks within 3 different periods.

The third part is the comparison between the case of longevity versus the same Food and Ksteps and the case of longevity versus 3 deadly diseases, CVD, CKD, and Cancers. Longevity is defined as the age difference between the effective health age (MI-based formula) and the biological real age. A negative age difference means higher longevity.

## 2.1 The author's medical history

The author's case of diabetes, obesity and other complications

The author has been a severe T2D patient since 1996. He weighed 220 lb. (100 kg, BMI 32.5) at that time. By 2010, he still weighed 198 lb. (BMI 29.2) with average daily glucose of 250 mg/dL (HbA1C of 10%). During that year, his triglycerides reached 1161 and ACR at 116. He also suffered from five cardiac episodes within a decade. In 2010, three independent physicians warned him regarding his need for kidney dialysis treatment and his future high risk of dying from his severe diabetic complications. Other than the cerebrovascular disease (stroke), he has suffered most of the known diabetic complications, including both macrovascular and micro-vascular complications.

In 2010, he decided to launch his self-study on endocrinology, diabetes, and food nutrition

to save his own life. During 2015 and 2016, he developed four prediction models related to diabetes conditions: weight, PPG, fasting plasma glucose (FPG), and A1C. As a result, from using his developed mathematical metabolism index (MI) model in 2014 and the four prediction tools, by end of 2016, his weight was reduced from 220 lbs. (100 kg, BMI 32.5) to 176 lbs. (89 kg, BMI 26.0), waistline from 44 inches (112 cm) to 33 inches (84 cm), average finger glucose reading from 250 mg/dL to 120 mg/dL, and lab-tested A1C from 10% to ~6.5%. One of his major accomplishments is that he no longer takes any diabetes medications as of 12/8/2015.

In 2017, he has achieved excellent results on all fronts, especially glucose control. However, during the pre-COVID period of 2018 and 2019, he traveled to approximately 50+ international cities to attend 65+ medical conferences and made ~120 oral presentations. This hectic schedule inflicted damage to his diabetes control, through dining out frequently, post-meal exercise disruption, jet lag, and along with the overall metabolic impact due to his irregular life patterns through a busy travel schedule; therefore, his glucose control and overall metabolism state were somewhat affected during this two-year heavier traveling period.

Since 2020, living in a COVID-19 quarantined lifestyle, not only has he published 400+ medical papers in 100+ journals, but he has also reached his best health conditions in the past 26 years. By the beginning of 2022, his weight was further reduced to 168 lbs. (BMI 24.8) along with a 5.8% A1C value (beginning level of pre-diabetes), without having any medication interventions or insulin injections. These good results are due to his non-traveling, low-stress, and regular daily life routines. Of course, his knowledge of chronic diseases, practical lifestyle management experiences, and the development of various high-tech tools contribute to his excellent health status since 1/19/2020, the beginning date of his self-quarantined life.

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. He has maintained the same measurement pattern to the present day. In

his research work, he uses his CGM sensor glucose at a time interval of 15 minutes (96 data per day). Incidentally, the difference in average sensor glucoses between 5-minute intervals and 15-minute intervals is only 0.7% (average glucose of 112.15 mg/dL for 5-minutes and average glucose of 111.33 mg/dL for 15-minutes with a correlation of 96% between these two sensor glucose curves) during the period from 2/19/20- to 5/9/22.

Therefore, over the past 13 years, he could study and analyze the collected 3+ million data regarding his health status, medical conditions, and lifestyle details. He applies his knowledge, models, and tools from mathematics, physics, engineering, and computer science to conduct his medical research work. His research is based on the aims of achieving both “high precision” with “quantitative proof” in the medical findings of “preventive medicine”.

The following timetable provides a rough sketch of the emphasis in his medical research during each stage:

2000-2013: Self-study diabetes and food nutrition, developing a data collection and analysis software.

2014: Develop a mathematical model of metabolism, using engineering modeling and advanced mathematics.

2015: Weight & FPG prediction models, using neuroscience.

2016: PPG & HbA1C prediction models, using optical physics, artificial intelligence (AI), and neuroscience.

2017: Complications due to macrovascular research, such as cardiovascular disease (CVD), coronary heart diseases (CHD), and stroke, using pattern analysis and segmentation analysis.

2018: Complications due to micro-vascular research such as kidney (CKD), bladder, foot, and eye issues (DR).

2019: CGM big data analysis, using wave theory, energy theory, frequency-domain (FD) analysis, quantum mechanics, and AI.

2020: Cancer, dementia, longevity, geriatrics, DR, hypothyroidism, diabetic foot, diabetic

fungal infection, and linkage between metabolism and immunity, learning about certain infectious diseases, such as COVID-19.

2021: Applications of linear elastic glucose theory (LEGT) and perturbation theory from quantum mechanics on medical research subjects, such as chronic diseases and their complications, cancer, and dementia.

2022: Applications of viscoelastic/viscoplastic glucose theory (LEGT) on 108 biomedical research cases and 4 economics research cases.

Again, to date, he has spent around 40,000 hours self-studying and researching medicine, including reading 3000+ published medical papers. He has collected and calculated more than three million data regarding his medical conditions and lifestyle details. In addition, he has written 700+ medical research notes and published 650+ papers in 100+ various medical and engineering journals. Moreover, he has also given ~120 presentations at ~65 international medical conferences. He has continuously dedicated his time (11-12 hours per day and work each day of a year, without rest) and efforts to his medical research work and shared his findings and learnings with other patients worldwide.

### 3. RESEARCH METHODS

Here is a brief explanation of 3 distinctive energy analysis tools used in his recent medical research work. This description is aimed at readers who do not have an extensive background in the academic fields of engineering, physics & mathematics.

The first approach is to estimate the TD energy associated with different waveforms of influential causes and output symptom. The TD energy is calculated with the squared amplitudes of the average inputs (causes) or output (symptoms). Basic physics has taught us that “the energy carried by a wave is directly proportional to the square of this wave’s amplitude”.

The second approach is to apply the viscoelastic or viscoplastic glucose theory (VGT) from engineering and physics to construct a set of space-domain (SD)

diagrams with stress-strain curves and then by calculating the enclosed area of the SD strain-stress curve or “hysteresis loop” to obtain the associated SD-VGT energy or degree of influence. The SD-VGT method is useful for investigating the “time-dependent” biomarker behaviors which can be applied to the majority of subjects in the fields of medicine, engineering, economics, psychology, social science, and others. The created, stored, or dissipated energy during the process of uploading and downloading is estimated using the calculated hysteresis loop area size.

The author will describe in plain English words regarding the 6 steps of the VGT method, instead of using mathematical equations and numbers to explain the same concept.

The first step is to collect the output data or symptom (strain or  $\epsilon$ ) on a time scale. The second step is to calculate the output change rate with time ( $d\epsilon/dt$ ), i.e. the change rate of strain or symptom over each period. The third step is to gather the input data or cause (viscosity or  $\eta$ ) on a time scale. The fourth step is to calculate the time-dependent input or cause (time-dependent stress or  $\sigma$ ) by multiplying  $d\epsilon/dt$  and  $\eta$  together. The “time-dependent input or cause equation” is expressed by “stress  $\sigma =$  strain change rate of  $d\epsilon/dt * \text{viscosity } \eta$ ” which is the essential part of “time-dependency”. The fifth step is to plot the input-output (i.e. stress-strain or cause-symptom) curve in a 2-dimensional space-domain or SD (x-axis versus y-axis) with strain (output or symptom) on the x-axis and stresses (time-dependent inputs, causes, or stresses) on the y-axis. The sixth step is to calculate the total enclosed area within these stress-strain curves or input-output curves (i.e. the hysteresis loops) using the trapezoid formula, which is also an indicator of associated energies or degrees of influence of input on output (either created energy or dissipated energy through this process of inputting and outputting).

After providing the above 6-step English description, the author also briefly provides the following VGT stress-strain mathematical equations in a space-domain to address the unique “time-dependent characteristics” of selected medical variables (both biomedical symptoms and influential causes). Here, he wants to use the strain rate

multiplied with the viscosity (input) as the stress component:

Strain

$= \epsilon$

= individual strain value at the present time duration

Stress

$= \sigma$  (based on the change rate of strain multiplying with a chosen viscosity factor  $\eta$ )

$= \eta * (d\epsilon/dt)$

$= \eta * (d\text{-strain}/d\text{-time})$

$= (\text{viscosity factor } \eta \text{ using individual viscosity factor at present time duration}) * (\text{strain at present quarter} - \text{strain at previous time duration})$

Some of these inputs (causes or viscosity factors) are further normalized by dividing them with certain established health standards or “break even” line values, such as 120 mg/dL for glucose, and 25.0 for body mass index, 25 for BMI. In this study, the chosen normalization factor for his diet is 1.0, i.e. the normalization process is not needed for his diet score; and 10 ksteps for his daily walking steps.

If using the originally collected data, i.e. the non-normalized data would distort the numerical comparison of the hysteresis loop areas. Using this “normalization process” can remove the dependency of the individual unit or certain unique characteristics associated with each variable. This process allows us to convert the originally collected variables into a set of “dimensionless variables” for easier numerical comparison and result interpretation.

The third approach is to develop a newly-defined variable of (strain \* stress) from SD as the new wave’s amplitude in a TD and then apply the wave theory to go through a fast Fourier transform (FFT) operation to calculate the enclosed area of this new variable created frequency curve in FD. The FD-FFT energy is the enclosed area of this frequency curve.

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

### 4. RESULTS

Figure 1 displays the author's table of food qualities.

Figure 2 shows the data table.

Figure 1: 20 food quality items.

Year	Chronic Disease	ChD Risk %	Food (mJ)	Ksteps	Stress	Strain Rate	f	σ	Strain	Strain 1	Strain 2	Area	Area	Sub-Period	Period ChD %	Strain*Stress	Strain*Stress	
Y2012	44	1.02	2.00	84	0.0	1.00	0.00	0.0	0.00	0.00	0	0	0	0	0	0	0	
Y2013	46	0.92	2.40	86	0.0	0.90	1.24	86	1.00	0.00	1.18	2.7			10	200		
Y2014	54	0.81	11.77	74	-0.0	0.80	0.80	71	-0.02	-0.00	0.11	60.3			-706	-234		
Y2015	61	0.84	15.00	61	-0.0	0.84	0.87	61	-0.02	-0.07	1.01	10.4	Y12-Y15	361	-404	-120		
Y2016	67	0.72	17.02	67	-0.0	0.72	0.89	67	-0.08	-0.10	2.01	20.0			-104	-134		
Y2017	65	0.80	17.00	65	-0.0	0.80	0.80	65	-0.06	-0.12	4.2	3.2			-75	-65		
Y2018	65	0.87	18.40	65	0.0	0.87	0.84	65	0.00	0.00	0.0	0.0			0	0		
Y2019	67	0.87	18.74	67	0.0	0.80	0.84	67	1.00	1.07	1.0	1.0	Y16-Y19	60	70	70		
Y2020	62	0.80	18.00	62	0.0	0.80	0.80	62	-0.00	-0.00	4.0	4.0			-75	-65		
Y2021	62	0.81	14.07	62	0.0	0.81	0.80	62	0.00	0.00	0.0	0.0			0	0		
Y2022	60	0.81	14.04	60	-0.0	0.81	0.80	60	-0.02	-0.10	1.0	1.0	Y20-Y22	60	-60	-60		
Avg	61	0.80	15.24	64	-0.17	0.80	0.80	64	-0.07	-0.10	2.0	2.0			402	19 Area		
Correlation	100%	90%	90%															

Figure 2: 4 data tables.

Figure 3 depicts the TD-correlation analysis results.

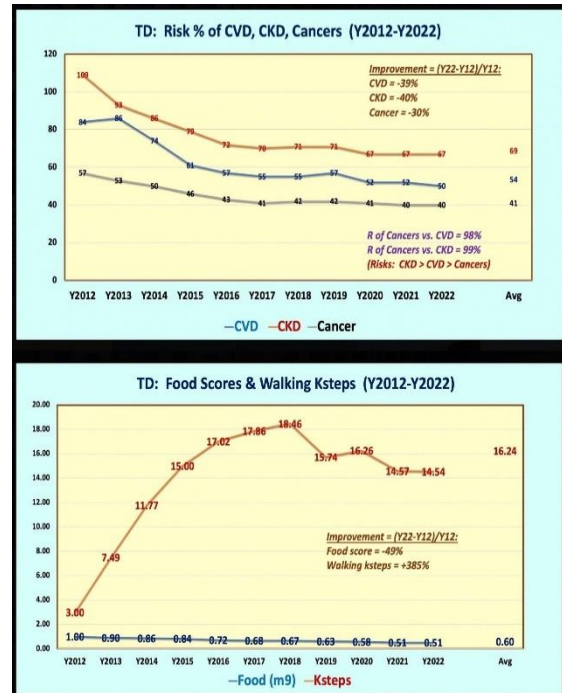


Figure 3: TD observations.

Figure 4 reflects three SD-VGT analysis results of CVD, CKD, and cancers versus the same causes of food and k-steps.

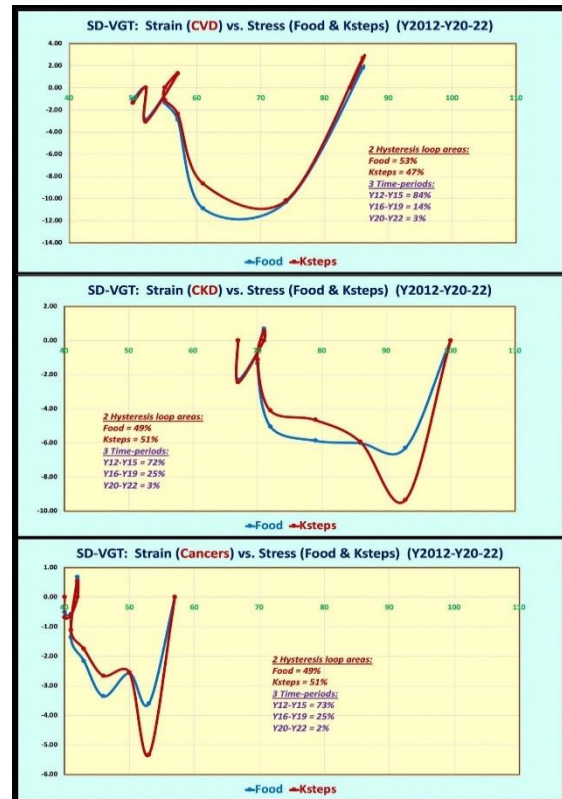


Figure 4: SD-VGT analysis results of CVD, CKD, cancers versus food and k-steps.

Figure 5 depicts the SD-VGT analysis results of longevity versus the same causes of food and k-steps, and longevity versus 3 deadly diseases, CVD, CKD, and cancers.

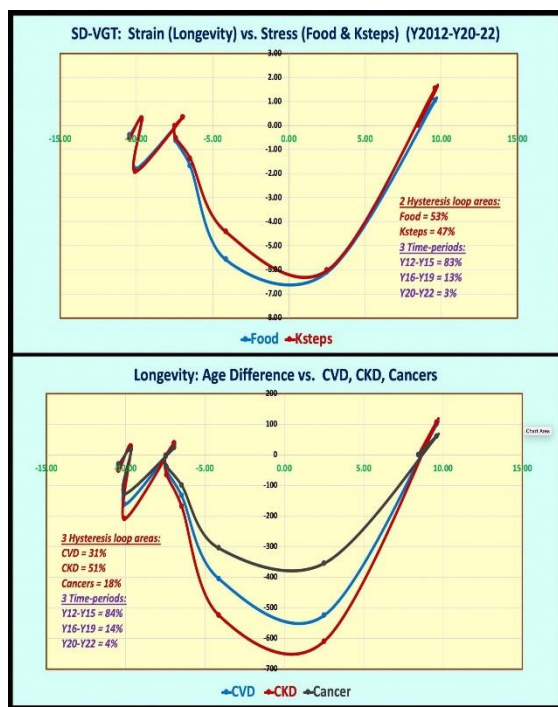


Figure 5: SD-VGT analysis results of longevity vs. food & k-steps and longevity vs. CVD, CKD, cancers.

Figure 6 depicts 2 bar charts of energy's numerical comparison.

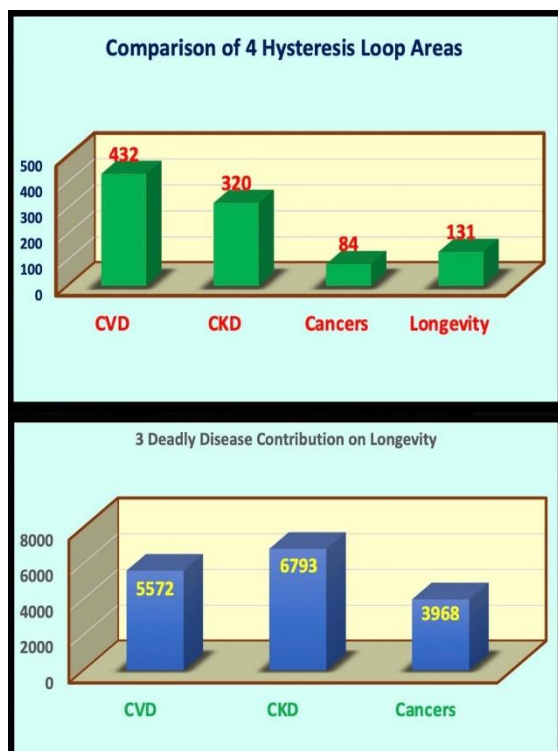


Figure 6: 2 bar chart comparisons of hysteresis loop areas.

## 5. CONCLUSION

In summary, there are 8 observations from the TD curve observations and the 5 separate SD-VGT analysis results comparison, for studying different relationships of Longevity, CVD, CKD, Cancers versus Food and Ksteps, or Longevity versus CVD, CKD, and Cancers.

(1) From 3 time-domain curves of CVD, CKD, and Cancers, the average risk levels are 69% for CKD (highest), 54% for CVD (middle), and 41% for cancers (lowest). As mentioned in the section of the author's medical history, he suffered 5 cardiac episodes from 1993 to 2005. He also faced kidney dialysis treatment in 2010. Thus far, he has not discovered any threat of cancer. This study's chosen period only covers a 10.5 years period from 2012 to 2022. Therefore, the realities in his past medical history have also been quantitatively re-confirmed by the TD averaged risk ranking of "CKD > CVD > Cancers". Furthermore, by improving 49% of his food score and increasing 385% of his daily walking steps, the reductions of his 3 deadly disease risks are: 39% for CVD, 40% for CKD, and 30% for cancers.

(2) He faced a death threat in 2010, therefore, he has changed his lifestyle since 2010 and also stopped taking all of his medications on 12/8/2015. His collected biomarkers have demonstrated his body's natural reaction to existing medical conditions, including obesity, diabetes, hypertension hyperlipidemia, CVD, CKD, and other complications under the strong and effective influences of lifestyle modifications. These lifestyle standards he adopted are stricter than other people, for example, food portions less than 67% of his normal consumption, carbs/sugar intake below 20 grams per meal, walking ~16k steps each day, and 4K+ after each meal. Therefore, this study's results have shown the direct linkage between his chosen 3 medical complications (CVD, CKD, and Cancers) and lifestyle details, especially diet, and exercise, without any medication intervention.

(3) In his 3 space-dimension VGT analyses of comparing CVD, CKD, Cancers vs. the same diet and exercise, the ratio of disease contribution % by food versus ksteps are: 53% : 47% for CVD; 49% : 51% for CKD; 49% : 51% for Cancers. In other words, both diet and

exercise are almost having “equal weight” on risks of developing CVD, CKD, and Cancers.

(4) The author has purposely placed the 3 diseases’ risk curves on the same x-axis scales, i.e. between 40% to 110%. As we can see, the CVD curve covers the range of 50% to 84%; the CKD curve covers the range of 67% to 100%; the Cancer curve covers the range of 40% to 57%. Therefore, the strain-stress curves are located according to the order of CKD > CVD > Cancer (from higher% right to lower% left) which is the same as the Time-domain’s observed average risk percentages.

(5) In the same set of 3 SD-VGT curves, the disease risk distribution of 3 time-periods: Y2012-Y2015 (Uncontrolled period), Y2016-Y2019 (controlled period), Y2020-Y2022 (the best controlled of COVID-19 period) are below: 84% : 14% : 3% for CVD; 72% : 25% : 3% for CKD; 73% : 25% : 2% for Cancer. The 3 time-period risk contributions are extremely close to each other for these 3 diseases, i.e. 72-84% : 14-25% : 2-3%. The recent 2.5 years’ COVID-19 period is the best-controlled one which is better than the middle 4 years in the controlled period. The earlier 4-year period is the worst one with the highest risks of having CVD, CKD, and Cancer.

(6) The author also wondered which scenario revealed more truthful and useful facts, whether “diet and exercise influencing Longevity” and/or “CVD, CKD, Cancers influencing Longevity”. Therefore, he has further conducted two separate but related SD-VGT studies. As he expected, all 5 curves looked similar with a “bowl shape”. These 5 curve patterns (resulting from the strain change rate) looked similar since they are using identical strain change rates, i.e. the identical Longevity (Age Difference) change rates. However, the hysteresis loop area sizes varied due to the different stress values, i.e. causes. The ratio of Longevity contribution % by food versus ksteps is 53% vs. 47% which is identical to the CVD case and very close to 49% : 51% for both CKD and Cancer cases. This finding proves that both diet and exercise are very important to longevity concerns. Incidentally, longevity time-period distribution is 83% : 13% : 3% which is almost identical to CVD cases and close to both CKD and Cancer cases.

(7) The author tried another different SD-VGT analysis of Longevity versus CVD, CKD, and Cancers. The energy distributions are 31% from CVD; 51% from CKD; 18% from Cancers. This specific risk ranking order is similar to the findings of other TD and SD analysis results of CKD > CVD > Cancer.

(8) The final 2 bar chart diagrams show the calculated hysteresis loop areas for different cases. Although the absolute numbers do not have much meaning, their loop area size comparisons reveal one specific and significant viewpoint mathematically. In the upper diagram with loop areas from 4 cases, CVD, CKD, Cancers, and Longevity, their different bar heights (area sizes) are the results of different (square of disease risk change rate) with the same causes of food and ksteps. In the lower diagram with loop areas from 3 cases, CVD, CKD, and Cancers, their different bar heights (area sizes) are the results of different (individual disease risks) with the same Longevity change rates. This explains the varying bar heights between CVD and CKD.

The SD-VGT quantitative findings from this particular study have matched the referenced paper and the public domain’s healthcare recommendations of “maintaining a good diet and sufficient exercise in parallel” in order to reduce the mortality rates from CVD, CKD, and Cancers, and then achieve the ultimate goal of longevity.

This SD-VGT energy tool adopted from engineering and physics has further provided some useful hints and realistic interpretations of complex biomedical results from CVD, CKD, Cancers, and longevity resulting from good diet habits and sufficient exercise. Certain deeper or subtle biomedical findings via math-physical medicine tools are not easily obtained via traditional statistics tools.

## 6. ACKNOWLEDGMENT

Without Professor Norman Jones at MIT as his academic advisor, the author would not be able to conduct this particular research work and published 700+ medical research papers. The author has never forgotten his advice to him that he should always focus on and enhance his basic strength in foundations, such as mathematics and physics, in order to

make further improvements and advancements in science and engineering. More importantly, Professor Jones has also provided him with a personal example of doing outstanding teaching and research job with an excellent work attitude, extreme focus and total dedication, and ultimate commitment to advancing both science and engineering.

## **7. REFERENCES**

For editing purposes, the 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.eclaircmd.com](http://www.eclaircmd.com).

Readers may use this article as long as the work is properly cited, their use is educational and not for profit, and the author's original work is not altered.

To read more of the author's published VGT analysis on medical research, please view the three specific journals:

- (1) Special Issue. The GH-Method. (<https://www.theghmethod.com>)
- (2) Journal of Applied Material Science & Engineering Research (contact: Catherine)
- (3) Advances in Bioengineering and Biomedical Science Research (contact: Sonny Hazi).

### **Outside reference**

- 1) Ding D, Van Buskirk J, Nguyen B, et al. Physical activity, diet quality and all-cause cardiovascular disease and cancer mortality: a prospective study of 346 627 UK Biobank participants. *British Journal of Sports Medicine*. Published Online First: 10 July 2022.

# Viscoelastic and Viscoplastic Glucose Theory Application in Medicine

Gerald C. Hsu

