

Glycemic Index Analysis

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Reported On: 1/25/2007

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Definition of Glycemic Index (GI)

The GI is defined as the incremental area under the curve (AUC) for the test food expressed as a percent of the response after 50g anhydrous glucose taken by the same subject. In practice individual GI values are calculated for each test taken by each subject. The resulting values for each test food are averaged to give the food GI.

Method Used to Determine GI

- Recruit 10 volunteers, sign volunteering agreement with them. Inform them all the compensation they can get if chosen and all the risk and inconvenience they might face for volunteering this test.
- Perform medical examination and oral glucose tolerance (OGT) test over this group; take out any person that has related disease, such as diabetes, and any person that is not suitable to be a GI test volunteer for other reasons.
- Picked subjects are studied in the morning after a 10-14h overnight fast. Subjects are asked to do no unusually vigorous activities on the day before the test, to drink no alcohol and not to smoke for 24h before the test. After a fasting blood sample, subjects eat a test meal and have further blood samples at 15, 30, 45, 60, 90 and 120 minutes after starting to eat. Capillary blood is obtained by finger-prick and whole blood glucose determined with an automatic analyzer using the glucose oxidase method.

Each test meal contains 50g available carbohydrate (total carbohydrate minus dietary fiber). Unavailable carbohydrates such as fructo-oligosaccharides, resistant starch and sugar alcohols are not included as available carbohydrate. The GI is valid as a method of classifying the blood glucose responses of high carbohydrate foods.

Calculation of Area Under the Curve (AUC)

There are many ways to calculate the AUC, and the method used affects the GI value obtained. The correct method for GI is shown below.

Assuming that at times t_0, t_1, \dots, t_n (here equaling 0, 15, 30, 45, 60, 90, 120 min, respectively) the blood glucose concentrations are G_0, G_1, \dots, G_n , respectively.

$$AUC = \sum_{n=1}^{x=1} A_x$$

Where A_x = the AUC for the xth time interval and the xth time interval is the interval between times $t_{(x-1)}$ and t_x .

For the first time interval (ie. $X=1$):

if $G_1 > G_0$, $A_1 = (G_1 - G_0) \times (t_1 - t_0) / 2$ otherwise, $A_1 = 0$

For other time intervals (ie. $X > 1$):

if $G_x > G_0$ and $G_{(x-1)} > G_0$, $A_x = \{[(G_x - G_0) / 2] + (G_{(x-1)} - G_0) / 2\} \times (t_x - t_{(x-1)})$

if $G_x > G_0$ and $G_{(x-1)} < G_0$, $A_x = [(G_x - G_0)^2 / (G_x - G_{(x-1)})] \times (t_x - t_{(x-1)}) / 2$

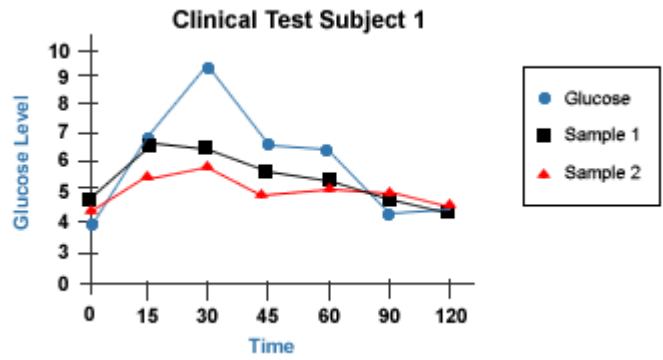
if $G_x < G_0$ and $G_{(x-1)} > G_0$, $A_x = [(G_{(x-1)} - G_0)^2 / (G_{(x-1)} - G_x)] \times (t_x - t_{(x-1)}) / 2$

if $G_x < G_0$ and $G_{(x-1)} < G_0$, $A_x = 0$

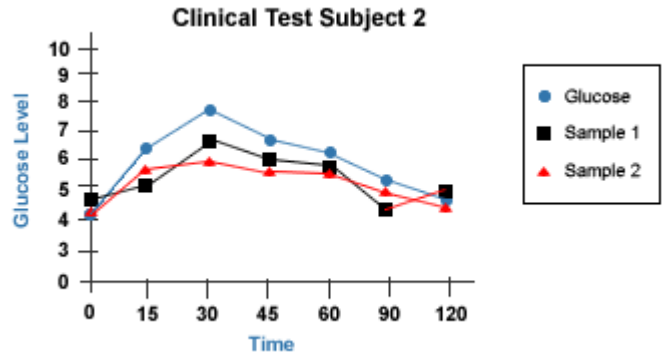
Raw Data From Study

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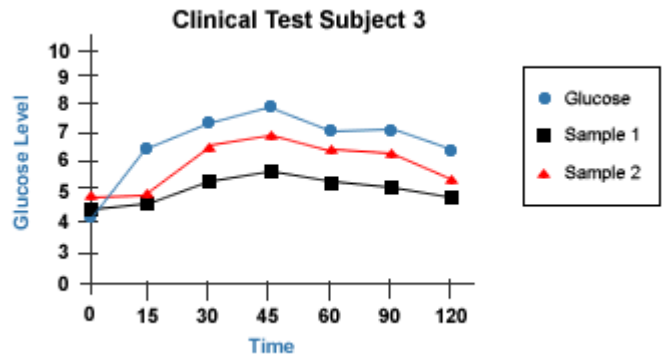
Clinical Test Subject 1			
Time	Glucose	Sample 1	Sample 2
0	3.9	4.6	4.3
15	6.9	6.8	5.4
30	9.3	6.7	5.7
45	6.8	5.9	4.8
60	6.6	5.1	5.0
90	4.1	4.6	4.9
120	3.9	4.2	4.3



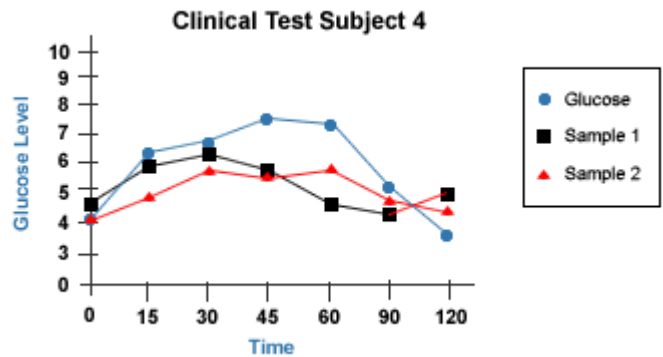
Clinical Test Subject 2			
Time	Glucose	Sample 1	Sample 2
0	4.2	4.3	4.2
15	6.4	5.1	5.4
30	7.7	6.6	5.9
45	6.7	6.1	5.3
60	6.3	5.2	5.1
90	5.3	4.4	4.7
120	4.2	4.3	4.1



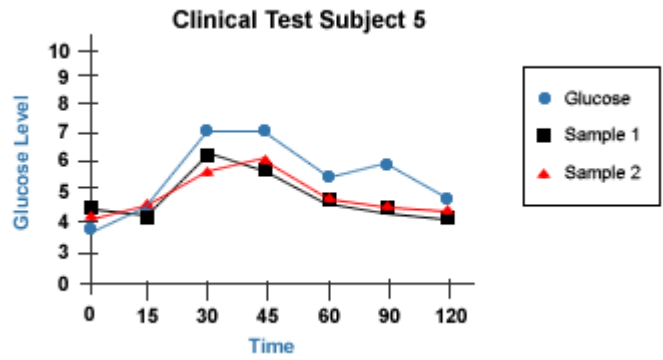
Clinical Test Subject 3			
Time	Glucose	Sample 1	Sample 2
0	4.3	4.3	4.6
15	6.7	4.8	4.9
30	7.5	5.6	6.5
45	8.1	5.9	6.9
60	7.0	5.0	6.3
90	7.0	4.6	6.1
120	6.2	4.8	5.0



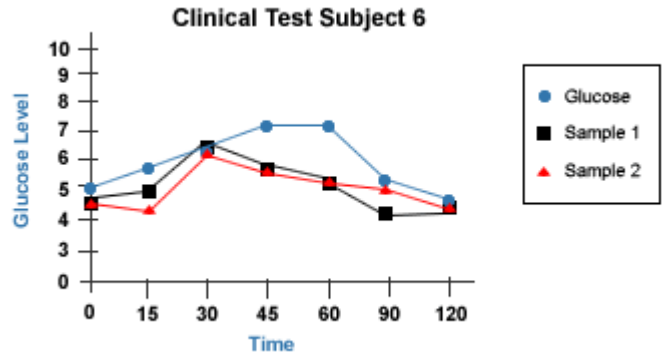
Clinical Test Subject 4			
Time	Glucose	Sample 1	Sample 2
0	4.1	4.5	4.1
15	6.1	5.7	4.7
30	6.6	6.3	5.7
45	7.3	5.9	5.8
60	7.1	4.1	5.5
90	5.5	4.1	4.2
120	3.9	4.9	4.2



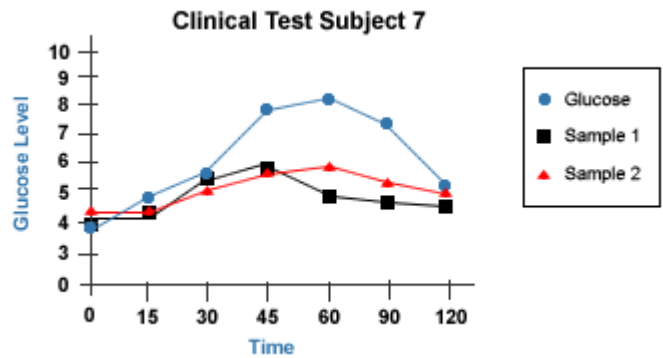
Clinical Test Subject 5			
Time	Glucose	Sample 1	Sample 2
0	3.8	4.4	4.1
15	4.3	4.2	4.4
30	7.1	6.4	5.8
45	7.1	6.0	6.1
60	5.6	4.7	4.7
90	5.6	4.3	4.3
120	4.6	4.1	4.4



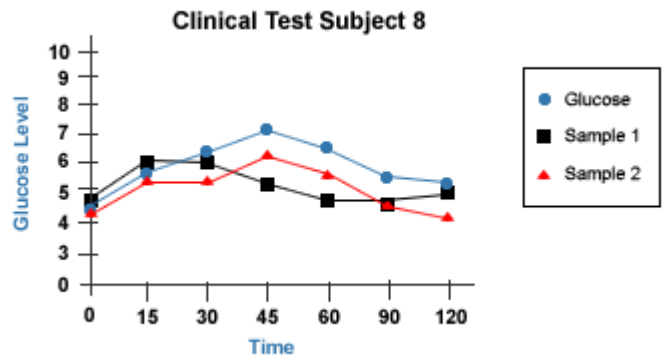
Clinical Test Subject 6			
Time	Glucose	Sample 1	Sample 2
0	4.9	4.4	4.4
15	5.8	4.9	4.2
30	6.5	6.6	6.1
45	7.1	5.3	5.4
30	7.1	5.0	5.0
90	5.1	4.1	4.8
120	4.4	4.2	4.2



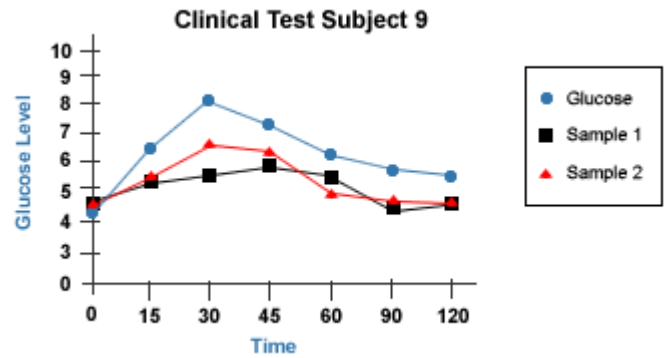
Clinical Test Subject 7			
Time	Glucose	Sample 1	Sample 2
0	3.8	3.9	4.1
15	5.8	5.3	4.8
30	6.2	6.6	5.8
45	8.0	5.9	5.7
30	8.4	4.6	5.8
90	7.2	4.3	4.8
120	4.8	4.3	4.4



Clinical Test Subject 8			
Time	Glucose	Sample 1	Sample 2
0	4.4	4.6	4.1
15	5.8	6.0	5.4
30	6.3	6.0	5.4
45	7.1	5.2	6.1
30	6.8	4.6	5.3
90	5.7	4.5	4.4
120	5.2	5.0	4.0



Clinical Test Subject 9			
Time	Glucose	Sample 1	Sample 2
0	4.1	4.3	4.2
15	6.5	5.2	5.3
30	8.4	5.4	6.9
45	7.1	5.9	6.2
30	6.2	5.8	4.6
90	5.8	4.1	4.3
120	5.3	4.3	4.2



Glycemic Index Results Summary

Glycemic Index Result		
Clinical Test Subject 1	40	33
Clinical Test Subject 2	48	46
Clinical Test Subject 3	27	50
Clinical Test Subject 4	30	42
Clinical Test Subject 5	27	39
Clinical Test Subject 6	52	51
Clinical Test Subject 7	36	35
Clinical Test Subject 8	29	53
Clinical Test Subject 9	33	38
Average	36	43
90% Confidence Interval	± 15	± 12

References for Method

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References for AUC Calculation

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