

A Different Methodologic Approach to "Ideal Weight"

A Study of Body Mass Index (BMI)

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Abstract

This is, as far as we can determine, the first attempt to develop the "ideal" weight in terms of health versus morbidity and mortality analyses from a study of 621 presumably healthy doctors and their spouses. The evidence suggests, within the limits of this methodology, that the "ideal" weight is probably within a more narrow range than generally accepted. Additionally, it is clear that the body mass index (BMI) is significantly different in men versus women.

Introduction

An earlier report¹ made several points. Firstly, weight is a sensitive barometer of health and sickness. Secondly, weight problems are extremely common. Thirdly, the bulk of published information regarding so-called desirable weight is derived from mortality studies and specific morbidity analyses. Fourthly, very little attention has been directed to "optimal" weight. Lastly, an earlier report attempted to develop "ideal weight" in terms of health rather than disease utilizing the *ponderal index*, the height (in inches) divided by the cubed root of the weight (in pounds).

This report is designed to reexamine the same data in terms of another height/weight ratio, namely body

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TABLE I
An Analysis of the Body Mass Index in a Progressively Healthier Sample of the Population

Line	Groups	Sample Size	Clinical Findings		Body Mass Index	
			Range	Mean	Range	Mean & S.D.
1	entire sample	621	0-125	18.0	18.0-43.1	25.34 ± 3.21
2	<50	604	0- 49	16.7	18.0-43.1	25.34 ± 3.21
3	<40	576	0- 39	15.4	18.0-38.6	25.31 ± 3.16
4	<30	516	0- 29	13.3	18.0-38.6	25.29 ± 3.14
5	<20	399	0- 19	10.2	18.0-38.6	25.36 ± 3.20
6	<10	193	0- 9	6.0	18.8-38.6	25.08 ± 3.06
7	< 5	49	0- 4	2.9	19.4-32.1	24.48 ± 3.00
8	< 4	30	0- 3	2.1	19.4-30.6	24.14 ± 3.00
9	< 3	17	0- 2	1.5	19.4-29.0	23.61 ± 2.84
10	< 2	6	0- 1	0.5	19.4-25.5	22.70 ± 2.33
11	0	3	0	0.0	21.9-25.5	23.98 ± 1.52

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TABLE 2
An Analysis of the Body Mass Index in a Progressively Healthier Male Sample

Line	Groups	Sample Size	Clinical Findings		Body Mass Index	
			Range	Mean	Range	Mean & S.D.
1	entire sample	351	0-82	15.3	18.8-38.6	26.56 ± 2.70
2	50	347	0-45	14.7	18.8-38.6	26.57 ± 2.71
3	40	335	0-38	13.7	18.8-38.6	26.56 ± 2.75
4	30	312	0-29	12.2	18.8-38.6	26.50 ± 2.77
5	20	254	0-19	9.7	18.8-38.6	26.55 ± 2.83
6	10	133	0- 9	6.0	18.8-38.6	26.05 ± 2.75
7	5	32	0- 4	3.0	20.8-32.1	25.94 ± 2.44
8	4	18	0- 3	2.2	22.7-30.6	26.07 ± 2.21
9	3	10	0- 2	1.5	23.1-29.0	25.66 ± 1.72
10	2	3	0- 1	0.3	24.5-25.5	24.89 ± 0.44
11	0	2	0	0.0	24.5-25.5	25.01 ± 0.50

mass index (BMI) which is the weight (in kilograms) divided by the square of the height (in meters). Clearly, utilizing this ratio, one finds that, as the number increases, one approaches heaviness; as the number declines, one moves toward thinness.

Method of Investigation

As has been pointed out earlier, it is fair to assume that, all other factors being equal, persons without clinical symptoms and signs are probably healthier than subjects who are symptomatic. Based on this hypothesis, 621 presumably healthy doctors and their spouses completed the Cornell Medical Index Health Questionnaire (CMI).² The total number of affirmative responses may be utilized as a measure of clinical state. Additionally, all of the subjects were graded for height and weight and height/weight relationships; in this instance, body mass index (BMI).

Results

Table 1 summarizes the findings with regard to the BMI. Included are the sample sizes, the ranges of affirmative scores utilizing the Cornell Medical Health Index Health Questionnaire along with the means for the CMI responses. Finally, also shown in Table 1 are the ranges for the indices and their means and standard deviations. For example, for the entire sample of 621 subjects, one finds a spread of CMI scores from 0 to 125 with a mean of 18.0 (line 1). The BMI ranges from 18.0 to 43.1 with a mean and standard deviation of 25.34 ± 3.21 .

Line 2 represents a similar analysis for those subjects with <50 symptoms and signs. One finds now in this presumably healthier group only 604 subjects with a spread of CMI responses from 0 to 49 and with a mean of 16.7. The BMI range is still from 18.0 to 43.1 with a mean and standard deviation of 25.34 ± 3.21 . In other words, there is practically no difference in the BMI for the entire group (line 1) versus the more select group (line 2) showing <50 clinical symptoms and signs.

As one proceeds downward from line 2 to line 11, the calculations are derived from a systematically healthier group as judged by the fact that they report progressively fewer clinical symptoms and signs.

Several points are worthy of special mention. It will be noted that, as one proceeds from line 1 through line 11, the lowest BMI scores (representing the lightest individuals) seem to progressively fall out. In other words, as one builds a progressively healthier sample, the very thin subjects with BMIs such as 18.0 and then 19.4 seem to vanish. Additionally, precisely the same pattern prevails at the upper limit (especially heavy subjects). As one progressively builds a so-called healthier group, the very high BMI scores (suggesting those who are heavy) seem also to be eliminated. Thus one notes the falling out of 43.1 and then 38.6 and so forth.

Finally, it becomes evident from these calculations that the mean body mass index moves in a most orderly and progressive fashion slightly down as one proceeds from line 1 to line 11. The one major exception is line 11 and this may well be because of the small sample size of three persons. As or more importantly, the spread of values shrinks in an orderly and progressive manner from 3.21 (line 1) to 1.52 (line 11).

Discussion

Thus far, the evidence indicates that, as one constructs a relatively symptomless and signfree group of subjects, the BMI shrinks in a most orderly and consistent manner to a relatively more narrow range.

Parenthetic mention should be made that this is precisely the pattern earlier observed with regard to the ponderal index (PI).¹

Since it is obvious that men are generally taller and heavier than women, this raises the question as to whether the BMI corrects for this clinical discrepancy or whether there are in fact different "ideal" BMIs for the two sexes.

To help answer this question, Table 2 summarizes

Line	Groups	Sample Size	Clinical Findings		Body Mass Index	
			Range	Mean	Range	Mean & S.D.
1	entire sample	270	0-125	21.4	18.0-43.1	23.74 ± 3.12
2	< 50	257	0- 49	19.3	18.0-43.1	23.67 ± 3.09
3	< 40	241	0- 39	17.8	18.0-34.7	23.57 ± 2.88
4	< 30	204	0- 29	15.0	18.0-34.7	23.43 ± 2.72
5	< 20	145	0- 19	11.2	18.0-34.7	23.29 ± 2.72
6	< 10	60	0- 9	6.0	19.0-30.5	22.91 ± 2.55
7	< 5	17	0- 4	2.7	19.4-27.0	21.73 ± 1.79
8	< 4	12	0- 3	2.1	19.4-23.3	21.24 ± 1.03
9	< 3	7	0- 2	1.4	19.4-21.9	20.66 ± 0.84
10	< 2	3	0- 1	0.7	19.4-21.9	20.51 ± 1.05
11	0	1	0	0.0	—	—

the BMI for the male group. The analysis follows the pattern earlier described for the entire sample. It is clear that, as one progressively builds a healthier group of male individuals, the range and the mean and the standard deviation shrink once again in a very orderly fashion. Additionally, it is obvious that the results are different than earlier observed (Table 1) for the entire group.

Also, as shown in Table 3, the pattern is essentially the same for the female subset, namely that as one builds a healthier group, the range and the mean and standard deviation shrink in a systematic fashion. Once again, it is clear that the scores for the females appear to be different than for the male subset.

Finally, Table 4 attempts to establish the statistical significance of the difference of the means³ for the two sexes. There is no question but that, at every so-called health point, there is a statistically significant difference of the BMI in the two genders. Also, it is clear

that the "ideal" weight as measured by the BMI is lower, suggesting greater thinness, in the female than in the male.

Summary and Conclusions

This study on body mass index (BMI) is a companion to an earlier report on ponderal index (PI). The pattern in these two papers is essentially the same. Firstly, as one builds a progressively healthier sample, the mean "ideal" weight moves slowly toward thinness. Secondly, the standard deviation shrinks suggesting greater homogeneity. Finally, the "ideal" female norm seems to suggest greater thinness. □

References

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Line	Groups	Male		Female		t
		Sample Size	B.M.I. mean & S.D.	Sample Size	B.M.I. mean & S.D.	
1	entire sample	351	26.56 ± 2.70	270	23.74 ± 3.12	11.828**
2	< 50	347	26.57 ± 2.71	257	23.67 ± 3.10	11.991**
3	< 40	335	26.56 ± 2.75	241	23.57 ± 2.87	12.557**
4	< 30	312	26.50 ± 2.77	204	23.43 ± 2.73	12.426**
5	< 20	254	26.55 ± 2.83	145	23.29 ± 2.72	11.333**
6	< 10	133	26.05 ± 2.75	60	22.91 ± 2.55	7.730**
7	< 5	32	25.94 ± 2.44	17	21.73 ± 1.79	6.884**
8	< 4	18	26.07 ± 2.21	12	21.24 ± 1.03	8.040**
9	< 3	10	25.66 ± 1.72	7	20.66 ± 0.84	7.953**
10	< 2	3	24.89 ± 0.44	3	20.51 ± 1.05	6.652
11	0	2	25.01 ± 0.50	1	—	—

Statistically significant difference **p<0.01.