UNIVERSITY of HOUSTON

Department of Health and Human Performance
Houston, Texas

October 11, 2006

To: Dr. Joel A. Bloom, Chair, Undergraduate Studies Committee

Cc. Dr. Jay Gogue, Chancellor and President
Dr. Donald J. Foss, Provost
Dr. Robert Wimpelberg, Dean COE
Dr. Charles Layne, Chair, Department of HHP

From: TIGER Study Investigators [redacted]
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Dr. Brian K. McFarlin, Department of HHP, University of Houston
Dr. Molly Bray, Department of Pediatrics, Baylor College of Medicine and USDA/ARS Children's Nutrition Research Center

RE: Thank you for your advice and action

In the 1980s and early 1990s the HHP Department had a one-credit health and fitness course (PEP 1101) that was required of all UH undergraduate students. With the change to the current core requirements, the course was dropped as a core course. In 2003, we attempted to get the course re-instated as a required course. While the Undergraduate Studies Committee (UGC) did not approve adding PEP 1101 as a core course, the UGC did provide us with sound advice and an alternative, which was to propose a 3-credit course in the social science block. We developed and recommended a new course, Public Health Issues in Physical Activity and Obesity (KIN 1304), which was approved into the new core. The purpose of this letter is to thank you for that sound advice and to provide you with some relevant data that supports the need for such courses at UH, and a future need for a focused research and educational initiative.

For quite some time medical, public health and exercise science research has documented that obesity and sedentary lifestyle are major health risks. What we would like to share with you in this letter are data from UH students that graphically documents the problem. In 2001 we started the National Institutes of Health (NIH) funded project, the TIGER STUDY (Training Intervention and Genetic of Exercise Response). This is a joint study conduced by researchers from UH and the Baylor College of Medicine (please note that Dr. Bray got her master's degree in exercise science at UH - we consider her one of ours). The material from PEP 1101 provided the exercise model for the grant. Students who volunteer to participate in the study now have the choice of enrolling in either PEB 1101, as a 1-credit elective, or KIN 1304. The exercise component of 1101 was integrated into the expanded KIN course. We are into the fourth year with the TIGER study and moving to the stage of data analyses for publication.

I am sure all of you are aware of the mass media information on the growing levels of obesity in the United States. Among the greatest public health concerns today is the rapid rise in obesity in the pediatric population, which now exceeds 18% in children (6-11 y) and 17% in adolescents (12-19 y), while obesity among young adults (20-39 y) approaches 30% (Ogden, *JAMA*, 2006). What about UH students? What we would like to share with you is body composition and fitness data we have on UH students who were enrolled in PEP 1101 in 1989 and 1990 when the course was required and UH students from the TIGER study, i.e., years 2001-2005. The important health-related fitness variables we have measured are described next.

- **Body Mass Index (BMI):** BMI is the ratio of weight in kilograms per squared meter of height. The World Health Organization (WHO) adopted and published criteria for overweight and obesity for the BMI (*Report of WHO*, 1998). BMI is the public health variable used to define body composition.

- **Percent Body Fat:** Percent body fat is the percentage of total weight that is fat weight. It is considered a more accurate index of body composition because it accounts for fat weight, where BMI does not. We have percent body fat on both the PEP 1101 and TIGER students. We used the method of estimating percent body fat from skinfold fat thickness (Jackson, *Br J Nutr* 1978; Jackson, 1980 *Med Sci Sports Exerc*). Skinfold thickness is measured with a special caliper (see Figure 1).

Figure 1. The skinfold method of measuring body composition.

- **Aerobic Fitness (VO_{2max}):** Aerobic fitness is measured by maximum oxygen uptake, the maximum amount of oxygen one can consume during exercise at exhaustion. Having an adequate VO_{2max} is not only important for daily living, but also low aerobic fitness is a major risk factor of heart disease and all-cause mortality of men and women (Blair, *JAMA*, 1989). We used a method to estimate VO_{2max} from a study published by UH and NASA/JSC researchers (Jackson, *Med Sci Sports Exerc*, 1990).

Table 1 gives the means and standard deviations for the UH males and females for the years 1989-90 and 2004-06. Analysis of variance evaluated the differences between these two time periods and showed that 2004-06 students had increased their BMI and percent body fat and decreased their aerobic fitness. These differences are startling and dramatic. While the 2004-06 students were slightly shorter, the 2004-06 males were 10.62 kg (23.4 lb.) heavier than the 1989-90 UH men. The same trend exists for females; the 2004-06 females were about 9 kg (≈ 20 lb.) heavier than the 1989-90 women. The decrease in average height is likely due to the increase in diversity of the UH students. Hispanic, Asian and Asian-Indian students are shorter than white and African-American students. The difference in percent body fat showed the same change. The mean change between the two time periods is over 6% for men and 5% for women. This is a substantial change, about 1 standard deviation. This is not good news in terms of public health.

Table 1. Descriptive statistics of UH males and females for the years 1989-90 and 2004-06.

Variable	Males				Females			
	1989-90 (n=341)		2004-06 (n=272)		1989-90 (n=440)		2004-06 (n=496)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Age	23.94	6.00	21.85	2.93	25.23	7.48	21.16	2.77
Height	177.49	7.88	175.57	7.48	164.17	7.44	162.35	6.54
Weight	74.89	13.04	85.51	21.01	60.18	11.17	69.23	18.05
BMI	23.71	3.42	27.71	6.243	22.33	3.93	26.21	6.24
%fat	14.65	6.29	20.85	11.10	25.03	6.29	30.17	9.07
$VO_{2\,Max}$	46.43	5.78	43.67	7.51	37.28	6.00	33.47	4.85

The WHO has established the following criteria for BMI: ***normal weight***, < 25 kg/m^2; ***overweight***, 25 to < 30 kg/m^2; and ***obese***, ≥ 30 kg/m^2. An examination of the data in Table 1 documents that the 2004-06 BMI means of both the males (26.21 kg/m^2) and females (27.71 kg/m^2) are in the WHO level of "Overweight." To examine this further, the data were partitioned into the WHO normal, overweight and obese categories. Table 2 provides these data. In 1989-90, approximately 29.6% of male and 17.9% of the female UH students were in the overweight and obese categories. By 2004-06, this has jumped to nearly 62% of the male and about 45% of the female students. What is especially alarming is the change in the obese category. Over 27% of the men and 20% of women are now in the WHO obese category. In this time period of about 15 years, the incidence of obesity of UH students has increased by nearly 5 times (i.e., 5.2 for men and 4.5 for women).

Table 2. Contrast of 1989-90 and 2004-06 UH students by WHO BMI criteria.

BMI Category	Males		Females	
	1989-90 n (%)	2004-06 n (%)	1989-1990 n (%)	2004-06 n (%)
Normal <25 kg/m^2	240 (70.4%)	104 (38.2%)	361 (82.1%)	275 (55.4%)
Overweight 25.0 to ≤ 30 kg/m^2	83 (24.3%)	93 (34.2%)	59 (13.4%)	120 (24.2%)
Obese ≥ 30 kg/m^2	18 (5.3%)	75 (27.6%)	20 (4.5%)	101 (20.4%)
Total	341 (100%)	272 (100%)	440 (100%)	496 (100%)

Table 1 shows that the aerobic fitness (VO_{2max}) of both male and female UH students has decreased significantly between these two time periods. The decrease was about 3 ml/kg/min for men and 4 ml/kg/min for women. While this difference may seem small, it is substantial in terms of public health. Research from the Cooper Institute in Dallas has documented that low aerobic fitness is a risk factor of cardiovascular and all-cause mortality (Blair, *JAMA*, 1989), and changes in aerobic fitness are related to changes in cardiovascular and all-cause mortality risk (Blair, *JAMA*, 1995). The cut-score for low aerobic fitness for 35-year-old men and women is 35 and 32 ml/kg/min, respectively. Using the data in Table 1 and assuming a normal distribution, the percentage of UH students in the aerobic health-related risk category by time pe-

riod are: males, 1989-90, 2.4%, 2004-06, 12.5%; females, 1989-90, 19.0%, 2004-06, 38.2%. These data show that the health-related risk of low aerobic fitness for female and male UH students increased 2.0 and 5.2 times. It is important to note that the low fitness standards are for men and women, age 35 years. The mean age of the 2004-06 students is only about 21 years. It is well documented (Jackson, *Med Sci Sports Exerc*, 1995 & 1996) that aerobic fitness declines with age. Following the typical aging decline in VO_{2max} of ≈ 0.50 ml/kg/min/year, the proportion of individuals at risk will increase.

Low aerobic fitness is a real health risk. The relative risk of all-cause mortality of low aerobic fitness, with other known risk factors controlled, is over 3 times higher for both men and women. The public health community has become keenly aware of the health risk of low aerobic fitness. The Web of Science showed that the Blair et al. 1989 and 1995 papers are classic research studies. The 1989 paper has been cited 1,186 times and the 1995 paper on changes in fitness and risk has been cited 501 times in the scientific literature. In a recent study of adolescents, it was concluded that there is "a significant relationship between adolescent cardiorespiratory fitness and adult body fatness," (Eisenmann, *Am Heart J*, 2005). In addition, Hasselstrom et al. reported that changes in aerobic fitness during adolescence and young adulthood seemed to be the best predictor of CVD risk factor levels in young adulthood (Hasselstrom, *Int J Sports Med*, 2002).

We are concerned by the trends of these preliminary data. We are also very excited to be in a position to study the problem. We have developed an extensive database with behavioral, genetic, nutrition, cardiovascular risk and exercise physiological data. What you may not be aware of is that we also have the "gold standard" method of measuring body composition, dual energy X-ray absorptiometry (DXA) (see Figure 2). The DXA unit is fully functional and housed in the HHP Department. This unit greatly the enhances capacity of the UH scholarly community to conduct quality obesity and fitness research.

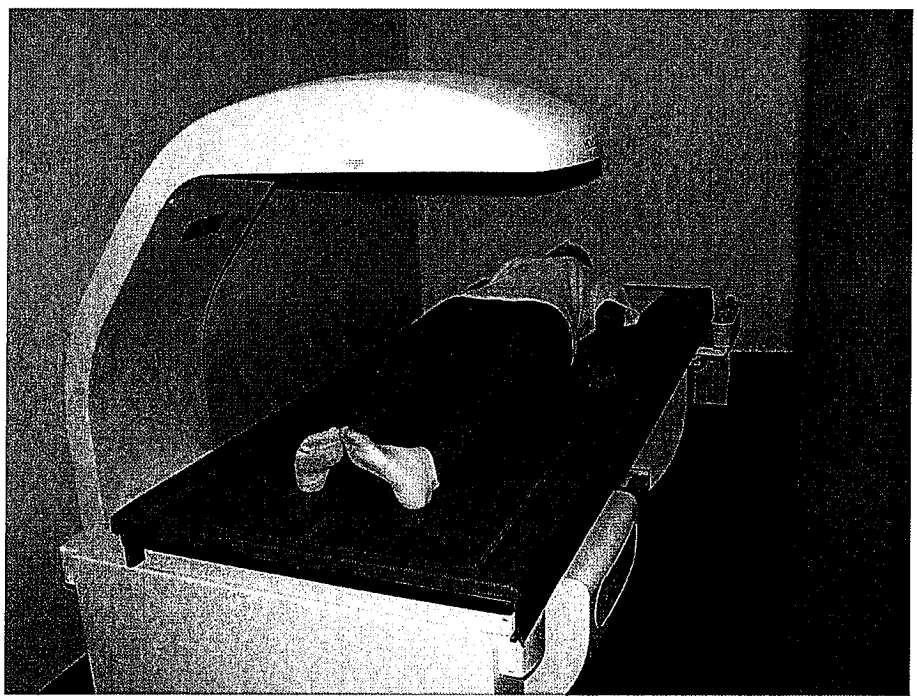

Figure 2. DXA, The "gold standard" method of measuring body composition.

Again, we would like to thank the UGC for hearing our concerns and providing us with a reasonable alternative. Obesity and low aerobic fitness are a major public health problems in the United States and other industrialized societies. While we are well aware of the mass media reports warning us about the growth of obesity in our country, they seemed to be quite distant. These UH data are a real "eye opener," "UH, we have a problem."