Relative importance of body composition, osteoporosis-related behaviours and socioeconomic status on bone SOS in adolescent females

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ABSTRACT

The purpose of this study was to examine the associations between bone speed of sound (SOS) and body composition, osteoporosis-related health behaviours, and socioeconomic status (SES) in adolescent females. A total of 442 adolescent females in grades 9-11 participated. Anthropometric measures of height, body mass, and percent body fat were taken, and osteo-protective behaviours such as oral contraceptive use (OC), physical activity and daily calcium intake were evaluated using self-report questionnaires. Bone SOS was measured by transaxial quantitative ultrasound (QUS) at the distal radius and mid-tibia. The results suggest that fat mass is a significant negative predictor of tibial SOS, while lean mass is positively associated with radial SOS scores and calcium intake was positively associated with tibial SOS scores ($p<0.05$). Additionally, users of OC had higher radial SOS. No significant correlation was found between physical activity and bone SOS. Therefore bone strength measured by QUS is reduced in adolescents with an increased fat mass, and influenced positively by OC use, calcium intake and lean mass.

SUMMARY

Osteoporosis is a condition characterized by low bone mass resulting in reduced bone strength and increased susceptibility to fractures (Munch & Shapiro, 2006). There is increasing evidence that even though osteoporosis has geriatric consequences, it is actually a pediatric condition since most adult bone mass is acquired during adolescence and young adulthood (Fulkerson et al., 2004). Since peak bone mass (PBM) is usually attained at the end of the second decade in life, adolescence provides a unique opportunity to employ strategies aimed at optimizing and maintaining bone mass, such as adequate calcium intake, regular weight bearing physical activity, and proper lifestyle choices.

The objective of this study was to assess, by transaxial quantitative ultrasound (QUS), the bone properties of female adolescents, and to determine potential associations between body composition, osteoporosis-related behaviours, socioeconomic status (SES) and bone SOS. QUS has recently emerged as a promising method for the assessment of bone strength and fracture risk, since it has the capability to reflect both qualitative and quantitative aspects of bone (Njeh et al., 1999). It was hypothesized that: 1) there would be significant differences in bone SOS at the radius and tibia between students from each grade, with higher SOS scores found in older grades; 2) bone SOS at both sites would be positively associated with lean mass, daily calcium intake and physical activity in female adolescents; 3) fat mass would be negatively associated with bone SOS for both sites; 4) females on oral contraceptives would have lower SOS at both sites compared to females not using oral contraceptives;

5) females classified as overweight and obese according to BMI would have lower SOS scores at both sites compared to normal weight and underweight females; 6) females classified with lower parental income would have lower SOS scores at both sites, lower physical activity levels and lower calcium intake when compared to females classified as higher SES; 7) age, fat mass, lean mass, calcium intake and physical activity would predict bone SOS at both sites, with age, lean mass, calcium intake and physical activity being positively related to bone SOS, and fat mass being negatively related.

A total of 442 adolescent females participated in the study. Height, body mass, somatic maturity determined as years from age of peak height velocity (PHV), and percent body fat determined using bioelectrical impendence. Physical activity was assessed using the Godin-Shephard Leisure Time Exercise questionnaire, and calcium intake was assessed using the rapid assessment method (RAM). Bone SOS was measured by QUS at the distal one-third radius and mid-tibia. Pearson bi-variate correlations were used to determine relationships among study variables. Differences between grades and between users and non-users of oral contraceptives (OC) were examined using a series of ANOVAS and independent samples t-test respectively. Parental income was divided into high (>$70,000) and low (<$40,000), and a one way ANOVA was used to determine differences between the groups. Finally, a hierarchical regression analysis was used to determine how age, fat mass, lean mass, calcium intake and weekly physical activity were related to bone strength.

The results showed an increase in both tibial and radial SOS with increasing grades. Fat mass was a significant negative predictor of tibial SOS, while lean mass was positively associated with radial SOS scores. Additionally, users of OC had higher

radial SOS than non-users. Daily calcium intake demonstrated a weak yet positive effect on tibial SOS. Weekly physical activity, on the other hand, was not associated with bone SOS. Females with a higher parental income participated in healthier osteoporosis-related behaviours (higher calcium intake and weekly physical activity levels) than those with lower parental income.

In conclusion, we saw a negative association of fat mass on bone SOS, suggesting that bone strength in adolescent girls may be determined from dynamic loads from muscle force, not static loads such as fat mass. Moreover, radial SOS was higher in students who were on OC suggesting a potential positive effect of OC on non-weight bearing bones during late adolescent years. Additionally, an increased daily calcium intake was linked with increased tibial SOS scores, which was expected. Despite not finding any of the hypothesized benefits of physical activity, it is important for high school girls to be aware of the importance of weight-bearing physical activity for the prevention of osteoporosis later in life.

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Chapter 1: Introduction

Osteoporosis is a condition characterized by low bone mass resulting in reduced bone strength and increased susceptibility to fractures (Munch & Shapiro, 2006). Osteoporosis is often referred to as the "silent thief", as it is not until a person falls and breaks a bone that a physician realizes the patient has weak bones. There is increasing evidence that even though osteoporosis is known to affect the elderly, it is actually a pediatric disorder since most adult bone mass is acquired during adolescence and young adulthood (Fulkerson et al., 2004). Bone loss is a natural consequence of aging, and begins in the third decade of life, with a steady decline (approximately 1% annually) from the peak bone mass attained in early adulthood (Steelman & Zeitler, 2001). In their lifetime, women lose about 30-50% of their attained bone mass and, thus, they are at a higher risk for developing osteoporosis than men who lose 20-30% (Cromer & Harel, 2000) of their bone mass.

Peak bone mass (PBM) is generally defined as the highest level of bone mass achieved as a result of normal growth (Matkovic et al., 1994). The age at which PBM is attained continues to be debated since longitudinal studies of PBM attainment are rare (Tudor-Locke & McColl, 2000). For most sites of the skeleton, PBM seems to be established by late adolescence (Matkovic et al., 1994). Low PBM in early adulthood is a risk factor for osteoporosis later in life (Hansen, Overgaard, Riis & Christiansen, 1991; Heaney et al., 2000).

Preventive efforts undertaken in adolescents may decrease the prevalence of this condition, particularly given the clinical significance of bone mass accrual during adolescence. At least 90% of PBM is acquired by the age of 18 (Bachrach, 2001). Therefore, adolescence provides a unique opportunity to employ strategies aimed at optimizing and maintaining PBM, such as adequate calcium intake, regular weight-bearing physical activity, and proper lifestyle choices (related to smoking, alcohol consumption, and carbonated beverage consumption).

There are a number of genetic, hormonal, mechanical and dietary factors that contribute to bone mass accrual during puberty (Rizzoli, 2006). The genetic factors are non-modifiable, and include gender, family history, race/ethnic background and age (Ali & Siktberg, 2001). Certain hormones are needed for normal skeletal growth and include thyroid hormone, growth hormone, insulin-like growth factors and sex steroid production (Bachrach, 2001). Before puberty, bone growth is dependent on growth hormone; however sex steroids are essential for the completion of epiphyseal maturation and mineral accrual in adolescent years (Bachrach, 2001). The mechanical factors relate to the load imposed on these bones either by bearing its own body mass, or by adding physical stress during physical activity. There is evidence that bone mineral density (BMD) is positively related to body weight and body composition (Reid, 2002). Few studies have examined the relative contribution of fat mass (FM) and lean mass (LM) on the BMD and bone mineral content (BMC) in adolescents. Limited evidence suggests that FM and LM are positively related to BMD in

young females with LM being the stronger positive predictor of BMD in pre-pubertal girls while FM was the best positive predictor of BMD in adolescent girls (Hage et al., 2009).

It is also generally accepted that weight-bearing and high-impact activities provide an osteogenic mechanical stimulus to bone. A meta-analysis of bone mineral accrual in children and adolescents revealed that those who participated in physical activity, such as running or jumping, gained nearly 10% more BMC than controls and as much as 11% higher BMD at specific sites (Hind & Burrows, 2007).

In addition, calcium, in combination with vitamin D, plays an important role in bone formation and overall skeletal health. Optimal calcium intake is necessary to maximize and maintain PBM and to minimize bone loss during aging (Osteoporosis Canada, 2009). In retrospective studies, adequate calcium intake during childhood and adolescence was associated with a lower incidence of osteoporosis in postmenopausal women (Steelman & Zeitler, 2001).

There is limited research that has investigated the effects of socio-economic status (SES) on bone health in female adolescents, particularly in Canada. There is increasing evidence that SES is inversely related to most diseases (Adler et al., 1994; Brennan et al., 2009). SES has been less studied as a significant risk factor for musculoskeletal diseases such as osteoporosis (Brennan et al., 2009). For the purpose of this study, SES will be measured by parental income. Low income has been associated with inadequate intake of nutrients, low education level and a lack of health knowledge in Indian women

(Shatrugna et al., 2005). Interestingly, Gu et al., (2007) found that SES measured by annual income was positively associated with spine BMD in men, but not in women.

Based on the above evidence, diet and physical activity contribute to the health of bone by promoting bone formation until an individual reaches PBM. After this time, bone begins to break down faster than new bone can be formed. Therefore it is critical for individuals to engage in physical activity and consume a calcium-rich diet during adolescence and maintain these behaviours for life. Experts believe that if young women engage in these preventative behaviours, they can increase their bone mass by as much as 20%. This is essential in protecting them against the development of osteoporosis (National Osteoporosis Foundation, 2009).

Quantitative ultrasound (QUS) has recently emerged as a promising method for the assessment of bone strength and fracture risk, since it has the capability to reflect both qualitative and quantitative aspects of bone (Njeh et al., 1999). QUS measures the bone speed of sound (SOS) *along* the bone and so it is not affected by bone size, allowing for better comparisons between children of different sizes than other more popular techniques, such as dual-energy X-ray absorptiometry (DXA).

1.2 Objectives and Hypotheses

There are currently no studies on the relationship between parental income, body composition, osteoporosis-related behaviours (e.g. physical activity, calcium intake) and bone health status in adolescent females. The objective of this study was to assess by transaxial QUS the bone properties of female adolescents, and to determine potential associations between body composition, osteoporosis-related behaviours, SES and bone SOS.

It was hypothesized that: 1) there would be significant differences in bone SOS at the radius and tibia between students from each grade, with higher SOS scores found in older grades; 2) bone SOS at both sites would be positively associated with lean mass, daily calcium intake and physical activity in female adolescents; 3) fat mass would be negatively associated with bone SOS for both sites; 4) females on oral contraceptives would have lower SOS at both sites compared to females not using oral contraceptives; 5) females classified as overweight and obese according to BMI would have lower SOS scores at both sites compared to normal weight and underweight females; 6) females classified with lower parental income would have lower SOS scores at both sites, lower physical activity levels and lower calcium intake when compared to females from families with low parental income; 7) age, fat mass, lean mass, calcium intake and physical activity would predict bone SOS at both sites, with age, lean mass, calcium intake and physical activity being positively related to bone SOS, and fat mass being negatively related.

Chapter 2: Literature Review

Osteoporosis is a condition characterized by low bone mass resulting in reduced bone strength and increased susceptibility to fractures (Munch & Shapiro, 2006). Osteoporosis is often referred to as the "silent thief" as it is not until a person falls and breaks a bone that a physician realizes the patient has weak bones (Munch & Shapiro, 2006). While often identified as a natural consequence of aging, studies have shown that this is not the case and that this condition can be prevented (Cromer & Harel, 2000; Sharp & Thombs, 2003). Approximately 1.4 million Canadians suffer from osteoporosis, and 1 in 4 women over the age of fifty will develop the condition (Osteoporosis Canada, 2009). The estimated cost in Canada for treating osteoporosis-related fractures each year is 1.3 billion dollars. Due to the expected increase in the elderly population, this amount is predicted to increase to 32.5 billion dollars by 2018 (Osteoporosis Canada, 2009). Not only is there a large financial cost associated with this condition, osteoporosis also places a cost on individuals with the condition, as it compromises their quality of life. Osteoporosis can result in disfigurement in the spine, reduction or loss of mobility from fractures, lowered self-esteem, and decreased independence (Lips & van Schoor, 2005; Osteoporosis Canada, 2009).

2.1 Characteristics of Bone

Osteoporosis is coined from the Greek terms, *osteo (bone)* and *poros* (hole) and it means "hollow bone". Bone mineral density (BMD) is referred to as the amount of bone matter per cubic centimeter of bone (Osteoporosis Canada, 2009). Bones are constantly remodeled throughout life to replace fatigue-damaged bone tissue with new bone resulting in the continuous turnover of bone. This process helps to keep them strong and to maintain their integrity for withstanding stresses, and maintaining homeostasis (Bailey, Faulkner & McKay, 1996). Bone tissue is mineralized into two basic forms: cortical or compact bone and trabecular or cancellous bone. Our total skeletal mass is made up of 75-80% of cortical bone and 20-25% trabecular bone (Bailey et al., 1996). Cortical bone is the densely compacted tissue that forms the outer surface of all bones, including the shafts of the long bones. Trabecular bone consists of a meshwork of thin, bony horizontal and vertical plates, occurring inside the cortical shell in some of the flat bones, the vertebral bodies and the distal ends of the long bones (Bailey et al., 1996).

Growth, modeling and remodeling are three processes involved in the dynamic condition of bone. Growth in bone length occurs by a process called endochondral bone formation that involves two steps: 1) cartilage tissue is added to the growth plates of bones located at the proximal and distal ends of long bones; and 2) cartilaginous scaffold is transformed into bone tissue in the adjacent metaphyses (Schoenau et al., 2004). Modeling and remodeling occur

through bone deposition and resorption by bone cells, known as osteoblasts and osteoclasts. A group of osteoclasts remove a small quantity of bone tissue followed by the replacement of new bone by osteoblasts.

Modeling is the process that alters the shape and mass of bone in response to mechanical loading factors and causes growth in bone width (Bailey et al., 1996). Bone modeling involves osteoblasts and osteoclasts sitting on opposite sides of a given piece of bone. During bone growth in width, osteoblasts are typically located on the outer surface of a bone cortex, where bone matrix is deposited and later mineralized. This increases the outer circumference of a long bone or of a vertebral body (Schoenau et al., 2004). While this is occurring, osteoclasts located on the inner surface of the cortex are resorbing bone, thus increasing the size of the marrow cavity. Since osteoblasts are active without interruption in bone modeling, rapid increases in the amount of bone tissue can occur. Therefore during modeling, osteoclasts usually remove less bone tissue than is deposited by osteoblasts, resulting in a net gain of bone tissue (Schoenau et al., 2004).

Remodeling is the process where successive cycles of bone resorption and formation occur on the same bone surface (Schoenau et al., 2004). Osteoclasts remove a small quantity of bone tissue while osteoblasts replace it with new bone tissue. This entire process is named the remodelling unit with the interaction of osteoblasts and osteoclasts being referred to as 'coupling' (Schoenau et al., 2004). The difference in the amounts of bone which are removed and added in one remodeling cycle is called remodeling balance. The

remodeling balance is typically close to zero so that there is no or little net effect on the amount of bone. However, the remodeling process renews the bone tissue and thereby prevents tissue damage from accumulating (Schoenau et al., 2004). Remodeling is the dominant bone process modifying shape and mass in adult bones with both resorption and deposition occurring at equilibrium. Over time however, remodeling results in a net loss of bone since new bone never completely replaces the bone that has been resorbed (Bailey et al., 1996). This contributes to the decrease in bone mineral that is associated with aging.

2.2 Osteoporosis Risk Factors

2.2.1 Peak Bone Mass

A primary risk factor for the development of osteoporosis is the inability to attain peak bone mass (PBM). PBM is defined as achieving the full genetic potential for bone strength, which implies that the skeleton has reached a size and mass that was not restricted by an insufficient supply of nutrients and/or suboptimal mechanical loading (Heaney et al., 2000). PBM can be measured in terms of BMD or bone mineral content (BMC, the absolute amount of mineral present in a bone or region of bones). Adolescence is a critically important period for bone growth. Longitudinal studies of changes in bone mass during growth have shown that the greatest increases in bone mass occur between the ages of 12-15 years in females (Ralston, 1997). There is some dispute about the age at which PBM is attained, some studies suggest that bone mass is maximal by age

20 (Ali & Siktberg, 2001; Katzman, Bachrach, Carter & Marcus, 1991; Slemenda et al., 1994) whereas others document its attainment between 25 and 35 years of age (Matkovic et al., 1994; Ralston, 1997; Teegarden et al., 1995). At this time, the bone loss from osteoclastic bone resorption is exactly matched by the amount of bone laid down as a result of osteoblastic activity. Loss in bone mass due to natural aging involves a steady decline (about 1% annually) from the PBM attained in early adulthood (Steelman & Zeitler, 2001). Therefore, maximizing PBM is encouraged as the best way to prevent osteoporosis as it is generally accepted that those who achieve a higher PBM are at less risk of experiencing an osteoporotic fracture later in life (Durst, 2000). Studies completed previously in children and adolescents have indicated a rapid increase in BMC during linear growth, with continued accumulation occurring after peak linear height has been reached, marking the period between 9-20 years of age critical in attaining peak BMC (Bonjour et al., 1991; Bailey et al., 1996). Furthermore, the amount of bone mineral laid down during the 4-year period surrounding peak linear growth velocity during adolescence is equivalent to the amount of bone mineral most people lose during all of their adult life (Fulkerson et al., 2004). At peak height velocity (PHV, the adolescent growth spurt in height), females have reached 90% of their adult stature but have acquired only 57% of their adult total body BMC. Bone mineral accrual continues once linear growth is complete, with 5-10% of total body bone mass achievable into the third decade of life (Bachrach, 2001; Cadogan, Blumsohn, Barker & Easterll, 1998). Since bone mass later in life is determined by PBM attained and rate of loss, individuals who achieve a higher

PBM during adolescence are more likely to prevent the consequences of age-related bone loss later in life, compared to individuals who have acquired a lower PBM. Even small gains in bone mass during the attainment of PBM may have a significant effect on the prevention of osteoporotic fractures later in life (Matkovic et al., 1994). As shown in Figure 2.1, failure to achieve optimal bone mass at the end of adolescence leaves an individual with much less reserve to withstand the normal losses during later life (Heaney et al, 2000). Since lifestyle factors made during the bone-building phase affect the achievement of PBM, these lifestyle factors are critically important to bone health throughout life.

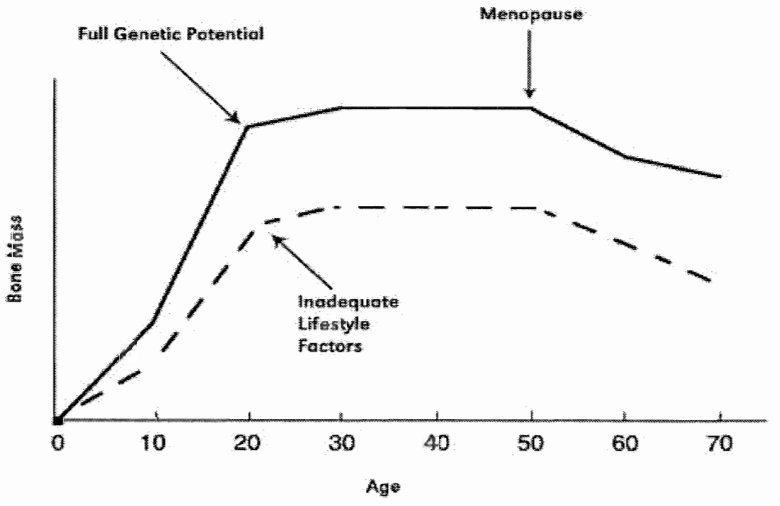

Figure 2.1 (Heaney et al., 2000) Bone Mass vs. Age with Optimal and Suboptimal Bone Acquisition

2.2.2 Intrinsic and Extrinsic Risk Factors

There are both intrinsic and extrinsic factors that are determinants of normal bone mass. Unmodifiable intrinsic factors include genetics, family history, gender and ethnicity. Extrinsic factors include modifiable factors such as diet (calcium and vitamin D intake), physical activity and hormonal milieu. Genetic factors account for 60-80% of the variance seen in strength of bone tissue and BMD (Heaney et al., 2000; Schoenau, 2004), although certain modifiable lifestyle factors can also influence bone health (Figure 2.2). Daughters of postmenopausal women with a family history of osteoporosis were found to have a lower BMD than those without a family history of osteoporosis (Steelman & Zeitler, 2001; Gordon, 2003). Gender and ethnicity are also important factors of BMD. Men have a higher bone mass, including PBM, at all ages, compared to females (Gordon, 2003). This is largely due to a difference in body size, since bone mass in males and females is roughly equal when the data is corrected for LM (Ralston, 1997). Rates of osteoporosis and fractures are lowest among African Americans compared with other ethnicities, with a higher PBM seen in both males and females (Bell et al., 1991; Gilsanz et al., 1991). Classifying by ethnicity, bone mass is higher in individuals of African American vs. Hispanic vs. Caucasian vs. Asian descent (Gordon, 2003). Luckey, Wallenstein, Lapinskiand, and Meier (1996) conducted a study comparing bone mass between African American and Caucasian premenopausal women with similar patterns of calcium intake and smoking status. They concluded that higher bone mass in African-American women is largely due to both attainment of greater PBM and slower

rates of loss during menopause, therefore reducing their risk of fracture with age (Tudor-Locke & McColl, 2000). Bachrach et al. (1999) examined the influence of gender and ethnicity on bone mineral acquisition in youth aged 9-25, and found African-American youth to have an increased BMD compared to non African-American youth in both males and females. Differences among white, Hispanic, and Asian females were not significant (Bachrach et al., 1999).

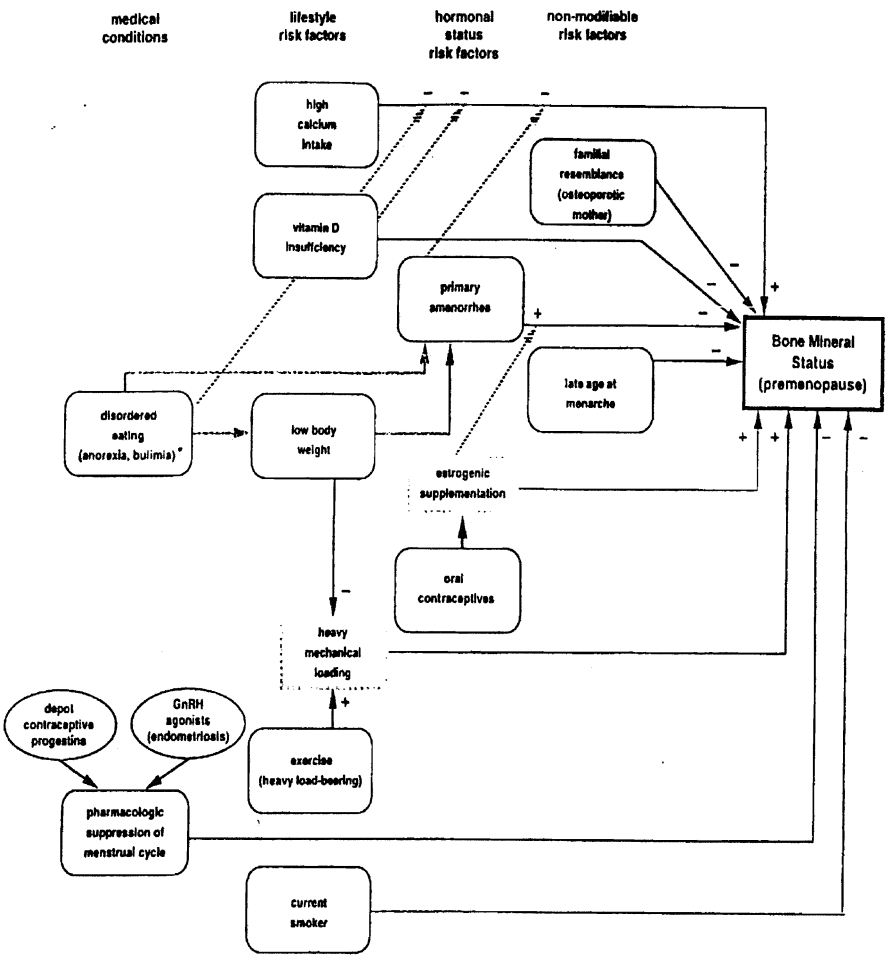

Figure 2.2 (From Tudor-Locke & McColl, 2000)
Risk factors related to variation in premenopausal bone mineral status.

Extrinsic factors account for 20-40% of bone density, with calcium intake and physical activity having the greatest impact. Calcium, in combination with vitamin

D, plays an important role in bone formation and overall skeletal health. Optimal calcium intake is necessary to maximize and maintain PBM and to minimize bone loss during aging (Osteoporosis Canada, 2009). In retrospective studies, adequate calcium intake during childhood and adolescence was associated with a lower incidence of osteoporosis in postmenopausal women (Steelman & Zeitler, 2001). Calcium requirements increase during periods of rapid growth, therefore the recommended daily allowance (RDA) for calcium for girls aged 9-18 years is 1300 mg (Osteoporosis Canada, 2009). Studies, however, have indicated that the average dietary calcium intake is about 50% of the RDA in most adolescents, particularly in girls (Steelman & Zeitler, 2001).

Vitamin D is critical for normal calcium absorption from the diet. In addition to being absorbed through the intestine, vitamin D is synthesized endogenously in the skin under the influence of ultraviolet sunlight (Gordon, 2003). Risk factors for vitamin D deficiency include inadequate diet, deficient sunlight exposure, low body weight and body mass index, anticonvulsant use, and mal-absorption. A concern for vitamin D deficiency is that it can lead to the impairment of calcium absorption and that it could cause an increase in the bone remodeling rate which could potentially impair bone accretion during skeletal growth (Steelman & Zeitler, 2001; Gordon, 2003).

Physical activity (PA) has been suggested as one of the most important extrinsic factors as it can have a major impact on bone development, maintenance and strength (Vicente-Rodriguez et al., 2008). PA plays an important role in maximizing bone mass during childhood and early adult years,

maintaining bone mass through the fifth decade of life, attenuating bone loss with aging, and reducing falls and fractures in the elderly (Kohrt et al., 2004). Most research suggests that bone adaptation is load-driven (Vicente-Rodriguez et al., 2008; Bachrach, 2001; Bailey et al., 1996), which implies that bone will not respond unless it perceives that it has not adapted to the new mechanical load. This is also known as the 'Mechanostat Theory' which is used to describe the relationship between the intensity of strain on bone and the adaptation of bone to that stimulus (Bachrach, 2001; Bailey et al., 1996). Strain is a measurement of the deformation of bone that results from an external load. Our bones will only respond within certain ranges of loading. Inducing strains must be above or below threshold levels for bone to have an adaptive response (Bailey et al., 1996). When activity falls below the physiological minimal effective strain threshold, bone resorption will exceed formation. Within the physiological loading zone, bone is maintained; net gains only occur when a higher intensity of loading is achieved (Bachrach, 2001).

Research has shown that weight-bearing physical activity (WBPA) positively influences bone mineral acquisition in adolescence (Fulkerson et al., 2004; Warburton, Nicole & Bredin, 2006). At this point, WBPA is not well-defined, but has been described as activity during which gravity exerts force on bones while performed in upright position (e.g. walking, jogging, running, aerobics, dancing, stair-climbing, tennis and weight-lifting) (Fulkerson et al., 2004). Strain placed on bone above the threshold level will induce a modeling response to increase bone mass to meet the increasing load requirement. This modeling

response occurs mainly during the years of growth (Fulkerson et al., 2004), therefore it is important to investigate the effects of WBPA on bone mineralization during the growing years.

There are numerous studies examining the relationship between PA and bone health across all age groups. It has been observed that bone mass is higher in children who are physically active than in those who are less active, and higher in children who participate in activities that generate high impact forces (e.g. WBPA) than those who engage in activites that are non-weight bearing (Kohrt et al., 2004). Previous studies have indicated that WBPA during adolescence and early adulthood was a far more important predictor of PBM than calcium intake, accounting for up to 17% of the variance in BMD between individuals in their late 20's (Ralston, 1997). Various studies by Lehtonen-Veromaa, Mottonen, Irjala, et al. (2000) and Lehtonen-Veromaa, Mottonen, Nuotio, et al. (2000) have demonstrated the beneficial influence of PA on bone mineral acquisition in peri-pubertal (aged 9-16 years) girls, with high-impact WBPA having the greatest effect on BMD increase at the femoral neck. Furthermore, when comparing BMD through the use of DXA and QUS, girls participating in gymnastics and/or running had higher femoral neck BMD and calcaneal SOS values than their non-athletic age-matched controls (Lehtonen-Veromaa, Mottonen, Irjala, et al., 2000; Lehtonen-Veromaa, Mottonen, Nuotio, et al., 2000). Simple jumping exercises have been shown to improve BMC at the hip and femoral neck in pre-pubescent children, with gains in BMC being retained after an equivalent period of detraining (Fuchs, Bauer, & Snow, 2001; Fuchs &

Snow, 2002). Based on this evidence, it is recommended that adolescents participate in activities (such as running and jumping) that generate relatively high ground-reaction forces, to increase bone mass to prevent osteoporosis during older age. General guidelines for PA include moderate intensity activity (e.g. walking) daily, or intense activity (e.g. weight training) every other day for 30 minutes at a time (Osteoporosis Canada, 2009); however, type of activity, the intensity, duration and frequency of activity will depend on various factors such as level of fitness, age, gender, and experience.

2.2.3 Other Risk Factors – Oral Contraceptives

The question of whether oral contraceptive (OC) use influences bone mass in adolescent females is of considerable interest, not only since achieving maximal bone mass is important, but also because this form of contraception is commonly used in this age group (Heaney et al., 2000). Previous studies comparing OC users to non-users have inconsistent findings; some report that OCs have positive or no effects on bone (Lloyd, Petit, Lin, & Beck, 2004; Recker et al., 1992) while more recently, others report a negative effect on bone health (Elgan, Dykes, & Samsioe, 2003; Weaver et al. 2001). When looking at long term use of OCs, Hartard et al. (1997) reported that long-term OC use prevented the beneficial effect of long-term exercise on bone mass in a cross-sectional study in women aged 20-35 years. It is possible that the influence of age when beginning OCs on BMD is more evident in young women, as Hartard et al. (2004)

found that age when OC use was initiated proved to be a major determinant of spine BMD. The available data on the skeletal effects of OCs in adolescent females are limited, and there is an important lack of data in this area.

2.2.5 Other Risk Factors – Body Composition

Body weight is consistently associated with positive measurements of BMD (Valdimarsson et al., 1999; Tudor-Locke & McColl, 2000). Body mass index (BMI) a measure which reports body density as a function of height and weight, demonstrates a consistent positive relationship with bone mineral measurements, but is reported less often (Tudor-Locke & McColl, 2000). Weight, height, lean and fat mass, age, and pubertal age have been positively associated with whole-body bone mass (Weiler et al., 2000). Larger body size and higher fat mass have been also positively associated with bone mass in young adults (Teegarden et al., 1998). This implies that overweight individuals have lower risk for developing osteoporosis. However, Weiler et al. (2000) demonstrated when body fat mass is expressed as a percentage of body weight, whole-body BMC is negatively influenced, by contradicting previous studies (Ilich et al., 1998; Rico et al., 1994). The conclusion that fat mass is positively related to bone mass in children could be misleading when not expressed as a percentage of body weight, because as children mature, all tissues increase in size due to growth and are thus not necessarily linked in a causal relationship (Weiler et al., 2000). The lack of concrete evidence on the association between body composition and

bone health in adolescents only highlights the need for more research in adolescents of different weights.

2.3 Socioeconomic Status

Socioeconomic status (SES) is a measure that typically incorporates economic status, measured by income; social status, measured by education; and work status, measured by occupation (Adler, Boyce, Chesney, Cohen, Folkman, Kahn et al., 1994). There is limited research on socioeconomic status (SES) and bone health in the adolescent population. There is increasing evidence that SES is inversely related to most diseases (Adler et al., 1994; Brennan, Pasco, Urquhart, Oldenburg, Hanna, and Wluka, 2009). SES has been less studied as a significant risk factor for musculoskeletal diseases such as osteoporosis (Brennan et al., 2009). Studies have shown a lower prevalence of fractures in rural populations compared with their urban counterparts. Low income has been associated with inadequate intake of nutrients, low education level and a lack of health knowledge in Indian women (Shatrugna et al., 2005). Gu et al. (2007) found that SES measured by annual income was positively associated with spine BMD in men, but not in women. However, a study in India showed that low-income middle-aged women had lower BMD and body size than high-income women (Shatrugna et al., 2005). It is evident that more research

needs to be performed on the relationship between bone health and SES, particularly in Canada.

2.4 Bone Assessment Techniques

2.4.1 Dual-Energy X-ray Absorptiometry (DXA)

Dual-energy x-ray absorptiometry (DXA) is one of the most widely used methods for bone mineral measurement because it is quick and accurate, radiation exposure is low and relatively safe (Baroncelli & Saggese, 2000; Gordon, 2003). DXA can measure central skeletal sites as well as peripheral sites, and can also assess body composition. DXA technology measures the transmission of x-rays of two different photon energies through the body. The attenuation of these transmitted energies depends on the composition of the tissues through which the beam passes. A detector measures the energies passing out of the body, and computer-calculated values of BMC and BMD are reported (Steelman & Zeitler, 2001; Njeh et al., 1999). Bone density is a measure of mass per unit volume. The BMD reported by DXA scanners is expressed as mineralized calcium per unit area in grams per square centimeter (g/cm^2).

BMD results are generally compared to either Z-scores or T-scores in order to group the individual according to his/her risk of osteoporosis. Z-scores reflect the amount of bone an individual has compared to an appropriate age-

matched mean value in standard deviations (SD) (Wahner, 1996). A Z-score of zero reflects the mean value and all other values are either positive or negative with respect to this. T-scores are used primarily with young adults and are also expressed in units of SD (Wahner, 1996). T-scores compare an individual's BMD to the specific gender-appropriate young adult normal mean. The World Health Organization uses T-scores to categorize BMD values and these categories are as follows: high BMD (+1 to +4); normal (-1 to +1); osteopenia (-2.5 to -1); osteoporosis (-4 to -2.5); and severe osteoporosis (-2.5 to -4) including one or more fragility fractures. If measured values of Z- and T-scores are unusually high or low, it may indicate a need for further medical testing. In adolescents, interpretation of these scores becomes challenging as normative data for adolescents is still sparse.

It is important to note that bone mass is a function of both bone density and size. The major limitation of DXA is that it uses a 2-dimensional technique to quantify the 3-dimensional structure of bone (Gordon, 2003; Schoenau et al., 2004). DXA was originally developed for use in adults, particularly for the diagnosis and management of postmenopausal osteoporosis (Schoenau et al., 2004). Children are not just small adults and therefore the assessment and interpretation of DXA scans in children need to be undertaken with caution (Schoenau et al., 2004; Steelman & Zeitler, 2001). There can be large differences in body size and physical maturity in adolescents of the same age, which need to be accounted for when reading a DXA report. As a result, those with larger bones resulting from growth will show higher BMD values in

comparison to smaller bones, even when there are no actual differences in BMD. Therefore DXA will overestimate volumetric BMC in taller adolescents or those with large bone size and underestimate it in those adolescents who are short or have small bones (Bailey et al., 1996; Fulkerson et al., 2004).

2.4.2 Quantitative Computed Tomography

Quantitative computed tomography (QCT) and peripheral computed tomography (pQCT) measure volumetric BMD directly. The advantages of QCT compared to DXA are its capabilities for precise 3-D anatomic localization, providing a direct density measurement, and spatial separation of highly responsive cancellous bone from less responsive cortical bone (Njeh et al., 1999). pQCT most commonly measures 3-D bone of one or several slices of the forearm or the tibia, with a beamer (x-ray) and a detector that rotates around the limb to be investigated. The slices of bone that are scanned are taken at a distance a certain percentage of total bone length from a reference line, at the growth plate (Schoenau et al., 2004). pQCT has the ability to determine bone mass, bone density, bone geometry and even bone strength by measuring parameters such as BMC, volumetric BMD of cortical and trabecular bone, and stress-strain index (SSI), respectively (Dambacher et al., 2004, Schoenau et al., 2004). However, pQCT is expensive, uses radiation and has no reference database for children and adolescents, and therefore is not commonly used.

2.4.3 Quantitative Ultrasound (QUS)

An emerging technique to measure bone strength and fracture risk in children and adolescents is the transaxial quantitative ultrasound (QUS) as it is portable, inexpensive and emits no radiation (Bachrach et al., 1999). QUS assesses bone through bone speed of sound (SOS) in m/s and the attenuation of the ultrasound wave known as broadband ultrasound attenuation (BUA) (Njeh et al., 1999). To measure the SOS, the QUS uses two transducers. One acts as a transmitter and the other as a receiver, and calculates the SOS by dividing the propagation distance by the transit time (Njeh et al., 1999) (Figure 2.4). Ultrasound waves will travel faster through bone than soft tissue, thus the basis of the SOS measurement (Schoenau et al., 2004).

QUS has the ability to measure SOS in two ways, through or along the bone. Measurements through the bone affect the velocity of transmission and the amplitude of the wave, allowing for bone to be characterized in terms of ultrasound velocity and attenuation (Njeh, Boivin, & Langton, 1997). Through bone (transverse) measurements are dependent on the size of the bone, and can assess SOS and BUA in trabecular bone sites, such as the calcaneus, that are accessible from two opposite sides (Barkmann et al., 2000). In contrast, when SOS is measured along the bone (transaxially), it is measured from the same side of the bone, is not size dependent and can only assess cortical bone (Barkmann et al., 2000). As a result, transaxial measurements along the length of bone limit the QUS to peripheral sites of the body such as the tibia and radius.

SOS measurements reflect several different characteristics of bone, including BMD, microarchitectural structure, geometry, cortical thickness, and elasticity (Njeh et al., 1999). QUS does not allow one to determine the percent contribution of each these characteristics to SOS scores, but it does allow for the simultaneous measurements of each of these factors, whereas other more popular techniques do not.

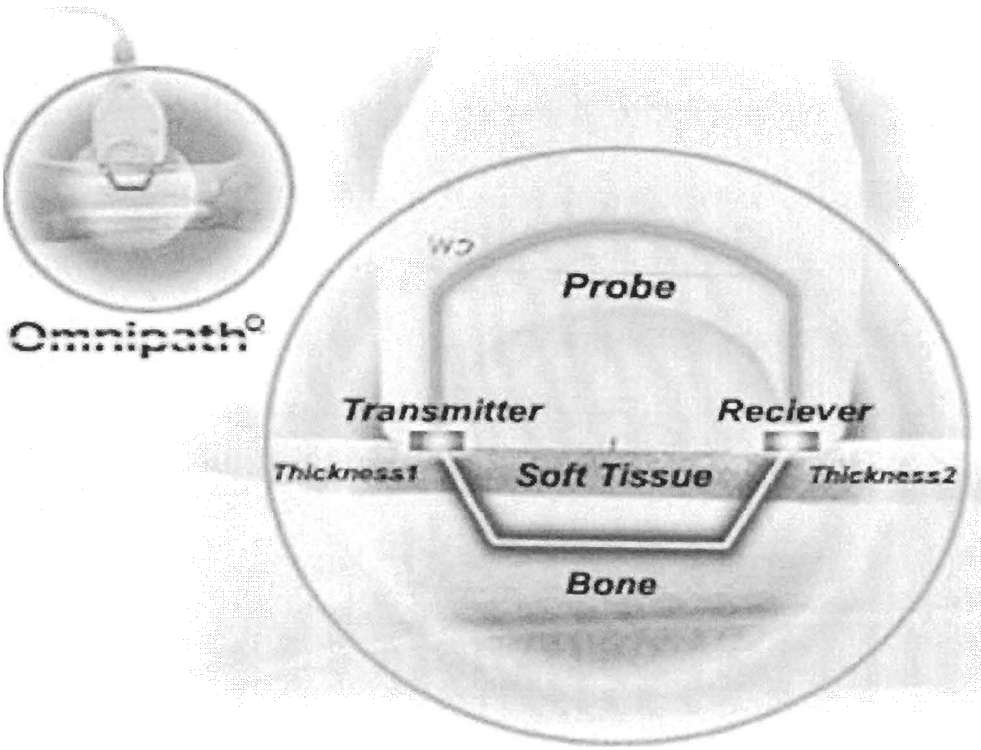

Figure 2.4 Schematic Diagram of the Ultrasonic Wave Propagator. Diagram represents position of probe on radius and pathway of ultrasound as it travels along the bone from transmitter to receiver.

Chapter 3: Methods

3.1 Participants

A total of 510 Caucasian adolescent females aged 14-18 years from grades 9-11 were recruited from randomly selected high schools within the Niagara, and Hamilton-Wentworth regions. Approval of this project was obtained from the Brock University Ethics Board, the Niagara Catholic District School Board and the Hamilton-Wentworth District School Board. Only Caucasian females (n=442) were included in data analysis. Participants were excluded from analysis if they indicated that they smoked cigarettes (n=49) or if they were on any medication such as corticosteroids (n=19) as these are both known to affect bone negatively. See Table 3.1 for total cohort characteristics and Table 3.2 for PA levels, and daily calcium intake of the total cohort.

TABLE 3.1 Characteristics of the total cohort (values are means ± SD).

Characteristics	Mean (N=442)
Age (years)	15.7 ± 1.0
Age from PHV (years)	-0.05 ± 0.7
Height (cm)	162.8 ± 6.7
Weight (kg)	59.3 ± 11.9
BMI (kg/m^2)	22.4 ± 4.0
BF (%)	27.0 ± 8.3
Fat Mass (kg)	16.7 ± 8.4
Lean Mass (kg)	42.6 ± 5.8

TABLE 3.2 PA levels, and daily calcium intake of the total cohort (values are means ± SD).

PA Level	Mean
Mild activity (score)	3.3 ± 2.5
Moderate activity (score)	3.2 ± 2.2
Strenuous activity (score)	3.4 ± 2.5
WA_{eq} (score)	56.1 ± 30.4
Daily calcium intake	1316.0 ± 478.5

3.2 Procedures

Once selected schools were identified, the research team scheduled an information visit to discuss the requirements of the study with the principal and physical education teachers. The information letter and informed consent were then distributed to the students to be signed by their parents. Parents were also asked to return a demographic questionnaire asking for household income. Upon return of the informed consent letters, the research team scheduled the two assessment visits. During the first visit, participants completed the questionnaire package. The second visit consisted of the anthropometric assessment and the bone quantitative ultrasound measurements of the dominant and non-dominant tibia and radius.

3.3 Measurements

The questionnaire package consisted of questionnaires that assessed weekly physical activity levels and daily calcium intake. This package also included general information concerning demographics, medical information, menstrual history (age of menarche and regularity of cycle), and use of oral contraceptives. The questionnaires were administered by the same researcher during the participants' physical education class and took approximately 1 hour to complete.

3.3.1 Physical activity

The Godin-Shephard Leisure Time Exercise Questionnaire, a self-report method assessing the weekly physical activity metabolic equivalent (WPA_{eq}) was used (Godin & Shephard, 1985). Participants were asked to indicate the number of times in a typical week they engaged in mild, moderate and strenuous physical activity for at least 15 minutes in their free time. These frequencies are then multiplied independently by known energy consumption values (in metabolic equivalents [METs]) and summed, in order to obtain total WA_{eq} values in arbitrary units. The energy consumption values for strenuous, moderate and mild exercise frequencies are 9, 5 and 3 METs, respectively. This questionnaire has demonstrated adequate validity and reliability in the adolescent population (Wolf et al., 1993).

3.3.2 Daily Calcium Intake

Daily calcium intake was assessed using the rapid assessment method (RAM) (Hertzler & Frary, 1994). The questionnaire consists of six food categories: milk-yogurt-cheese, fruits-vegetables, breads-cereals-rice-pasta, meat-fish-poultry, dry beans-nuts-seeds, and other (sugar, oils, carbonated beverages, etc.). Two categories were added to the original RAM questionnaire, namely calcium enriched orange juice and specific nutritional supplements. The questionnaire measures the number of milligrams of daily calcium consumed, by asking individuals to record the number of servings they ate in a typical day during the last week. The RAM was successfully validated against a 24-hour

recall in adults (r = 0.97), and has demonstrated a strong test-retest reliability (r = 0.80). In addition, this tool has been previously used to assess daily calcium intake in young women (Hertzler & Frary, 1994; Peterson et al., 2000).

3.3.3 Anthropometric measurements

All measures of height, sitting height, body mass and relative body fat were made by the same trained researchers for all participants. Height (without shoes) and sitting height were measured to the nearest 0.1 cm. Body mass (kg), lean mass (LM) and relative body fat (% BF) were measured using the InBody520 BIA machine (Biospace Inc., Beverly Hills, U.S.A). The InBody520 is a tetrapolar 8-point tactile electrode system that uses a direct segmental multi-frequency (5, 50, and 500 kHz) bioelectrical impedance method to analyze body composition in both the left and right arm and legs, and trunk (Biospace, 2008). The reliability and validity of this method has been demonstrated successfully in children and adolescents (Azcona, Koek, & Fruhbeck 2006; Kriemler et al., 2008). Peak height velocity (PHV) was then calculated according to the equation by Mirwald, Baxter-Jones, Bailey, and Beunen (2002), to estimate skeletal maturity. Body mass index (BMI) was calculated by dividing the subject's body mass (kg) by their height squared (m^2).

3.3.4 Parental Income

Parental income was assessed by a questionnaire that was sent home to the parents asking them to indicate their household yearly income. Their options

were: less than $20,000; $20,000-40,000; $40,000-70,000 or more than $70,000. The questionnaire was then either returned by the student in a sealed envelope or mailed directly to us.

3.3.5 Bone Speed of Sound (SOS)

Bone SOS was measured by transaxial Quantitative Ultrasound (QUS, Sunlight Omnisense™ 7000S, Sunlight Medical, Israel) as previously described in the literature (Falk et al. 2004). This system consists of a main unit and a hand-held probe that measures SOS (m/s) of the mid-shaft tibia and the distal 1/3 of the radius. For a detailed description of the device and technique, see Njeh et al. (1999). Briefly, the probe contains a set of two transmitters and two receivers, housed in a compact holder. The SOS measurement reflects the shortest time that elapses between pulse transmission and the first reception of a signal. The exact path of the signal is determined by Snell's law; as the signal enters the bone from the soft tissue, it is refracted through a critical angle, which is a function of the ratio of the SOS in soft tissue and bone. After it propagates along the bone, the sound wave emerges at the same critical angle. The time taken for the signal to travel between the transmitting and receiving transducers is used to determine the SOS in bone (Barkmann et al., 2000). As ultrasound waves pass along the bone, the SOS is influenced by the density, elasticity and cohesiveness of the bone. The higher the density of the bone, the greater its modulus of elasticity and the more cohesive its microstructure, the faster the

speed of propagation. Therefore, the faster the speed of propagation, the stronger the bone (Barkmann et al. 2000; Njeh et al. 1997; 1999).

QUS fits World Health Organization criteria for osteoporosis diagnosis and has been shown to be sensitive enough to detect changes in tibial SOS among pre-pubertal boys over an 8-month period (Falk et al., 2004). *In vitro* studies indicate that the QUS assesses previously unquantified properties of bone fragility (Gluer, Wu, & Genant, 1993). QUS has also been shown to predict vertebral and hip fracture (Bauer, Gluer, Genant, & Stone 1995; Njeh et al. 1997).

To measure the SOS of the dominant and non-dominant distal radius, a line is marked midway between the olecranon process of the elbow and the extended third phalanx. The probe is placed parallel to the radius on its medial surface, and a wide scan (about 140°) from side-to-side is performed. The measurement consists of three consistent cycles, each of which is comprised of several bone scans. To measure the SOS of the dominant and non-dominant tibial shaft, a line is marked midway between the apex of the top of the knee and the sole of the foot, with the subject in a sitting position and the knee at a 90° angle. The probe is placed parallel to the tibial bone surface, and a scan from the medial to lateral side is performed, through three consistent cycles. A system quality verification procedure is performed daily according to the manufacturer's recommendations using a standard Perspex phantom. The phantom SOS changes with any change in room temperature. Thus, the system quality verification is temperature dependent and the correction is made by using a

temperature conversion table. QUS measurements were conducted by two trained investigators with no significant differences in the average SOS scores measured by each investigator.

3.4 Data Analysis

Descriptive statistics were calculated for all study variables. Differences between grades and between users and non-users of OC were examined using a series of ANOVAs and independent samples t-tests. Pearson bi-variate correlations were used to determine relationships among study variables. Parental income was classified as high (>$70,000) and low (<$40,000) and a series of independent samples t-tests were used to determine differences in physical activity, calcium intake and bone SOS. Furthermore, hierarchical regression analysis was used to determine the influence of age, body composition variables and lifestyle behaviours on radial and tibial SOS. The variables were entered separately into the model as followed: age, fat mass, lean mass, daily calcium intake and physical activity. All data are expressed as mean ± standard deviation (SD). An alpha level of ≤0.05 was used as the criteria for significance for all statistical analyses, which were conducted using SPSS version 16 for Windows (SPSS Inc., USA).

Chapter 4: Results

A total of 442 participants were included in the data analysis. Physical characteristics, bone SOS and osteoporosis-related behaviours for each grade are presented in Table 4.1. There were significant differences in age, age from PHV, and non-dominant tibia and radius SOS between all grades ($p<0.05$), with both radial and tibial scores increasing with age and grade. SOS scores for both the tibia and radius for all ages were within the normal range for SOS values (Zadik, Price, & Diamond, 2003). There were no significant differences in weekly physical activity levels or calcium intake between grades. Bone SOS scores for the dominant and non-dominant tibia ($r= 0.78$) and radius ($r=0.67$) were moderately correlated, therefore only the non-dominant tibia and radius SOS scores were used in the analysis.

Table 4.1 Physical characteristics, bone SOS and osteoporosis-related behaviours of female high school students by grade.

	Grade 9 (n=163)	Grade 10 (n=127)	Grade 11 (n=126)	Grade 12 (n=21)
Age (years)	14.7 ± 0.4*	15.7 ± 0.4	16.7 ± 0.4	17.8 ± 0.3
Height (cm)	161.9 ±6.3	162.8 ± 7.2	163.4 ± 6.7	165.1 ± 6.1
Weight (kg)	57.7 ± 12.3	59.2 ± 12.1	60.9 ± 11.3	63.2 ± 9.2
Body Fat (%)	26.23 ± 9.1	27.34 ± 8.4	27.74 ± 7.1	27.52 ± 8.2
BMI (kg/m^2)	22.04 ± 4.5	22.24 ± 3.9	22.74 ± 3.5	23.22 ± 3.6
Fat Mass (kg)	15.96 ± 9.0	16.90 ± 8.6	17.45 ± 7.4	17.71 ± 7.6
Lean Mass (kg)	41.82 ± 5.4†	42.30 ± 6.0	43.47 ± 5.8	45.45 ± 6.2
WPA_{eq} (METS)	57.3 ± 29.1	52.1 ± 27.6	57.1 ± 34.4	59.0 ± 27.1
Calcium Intake (mg/day)	1258 ± 509.9	1285 ± 492.4	1394 ± 417.0	1374 ± 525.2
Tibia SOS (m/s)	3782 ± 105.5*	3829 ± 91.7	3859 ± 77.4	3870 ± 109.0
Radius SOS (m/s)	3924 ± 126.0*	3974 ± 90.6	4006 ± 94.4	4034 ± 91.0

Values are expressed as means ± SD. **denotes significant differences between all groups ($p<0.05$); † denotes significant differences between grade 9 and grade 12 ($p<0.05$)*

Pearson bi-variate correlations were computed for the total cohort and are shown in table 4.2. Age was positively correlated with both tibial and radial SOS scores. BMI, BF% and FM were significant negative correlates for tibia SOS, while BMI, BF% and LM were positive correlates for radial SOS. Daily calcium intake was positively correlated with tibia SOS, while weekly physical activity had no significant correlations with SOS at either site. Interestingly, there was a significant negative correlation between BMI, BF% and FM with daily calcium intake, and there was a significant negative correlation between BF% and WPA.

Table 4.2 Correlation coefficients of SOS scores, age, body composition, WA_{eq}, and daily calcium intake for the total cohort.

	Radius SOS	Tibia SOS	Age	BMI	BF%	FM	LM	WA_{eq}	Daily Calcium Intake
Radius SOS		0.22**	0.37**	0.14**	0.11*	0.09	0.12*	0.06	0.03
Tibia SOS			0.30**	-0.17**	-0.22**	-0.20**	0.09	0.08	0.18**
Age				0.09	0.10*	0.09	0.14**	0.04	0.05
BMI					0.84**	0.93**	0.44**	0.02	-0.17**
BF%						0.93**	0.09	-0.13**	-0.23**
FM							0.37**	-0.05	-0.20**
LM								0.28**	0.07
WAeq									0.07

**Denotes significance at p<0.01. *Denotes significance at p<0.05.

Anthropometric and descriptive measures between OC users and NOC are presented in Table 4.3. OC users had significantly higher radial SOS compared to NOC when controlling for age ($p<0.05$). No significant differences were found in tibial SOS, physical activity or calcium intake.

Table 4.3 Bone SOS, anthropometric and descriptive measures between oral contraceptive users (OC) and non-users (NOC).

	OC users (n=86)	NOC users (n=346)
Age (years)	16.3 ± 0.9*	15.5 ± 1.0
Body Fat (%)	28.4 ± 7.2	26.7 ± 8.5
BMI (kg/m^2)	22.5 ± 3.5	22.3 ± 4.1
Fat Mass (kg)	17.6 ± 7.8	16.6 ± 8.6
Lean Mass (kg)	42.3 ± 5.2	42.6 ± 5.9
WPA$_{eq}$ (METS)	58.0 ± 31.1	55.6 ± 30.3
Calcium Intake (mg/day)	1282 ± 463.9	1326 ± 484.6
Radius SOS (m/s)	4015 ± 96.0*	3957 ± 114.4
Tibial SOS (m/s)	3828 ± 102.5	3821 ± 98.0

*Values are expressed as means ± SD. *denotes significant differences between groups (p<0.05)*

In order to further examine the effect of body composition, the participants were grouped into BMI classifications according to their age (Cole, Bellizzi, Flegal, & Dietz, 2000; Cole, Flegal, Nicholls, & Jackson, 2007) and two one-way ANOVAs were run comparing radial and tibial SOS scores. Girls were classified according to their BMI in the following categories: underweight (*n*=52), normal weight (*n*=247), overweight (*n*=88) and obese (*n*=21). Results are presented in Figure 4.1. Girls who were obese had significantly lower tibia SOS scores compared to all groups ($p<0.05$). Girls who were overweight also had significantly lower tibia SOS scores compared to underweight and normal girls. Girls who were normal or overweight, had significantly higher radial SOS scores compared to the obese and underweight girls ($p<0.05$). Girls who were obese had significantly lower radial SOS scores than overweight girls ($p<0.05$).

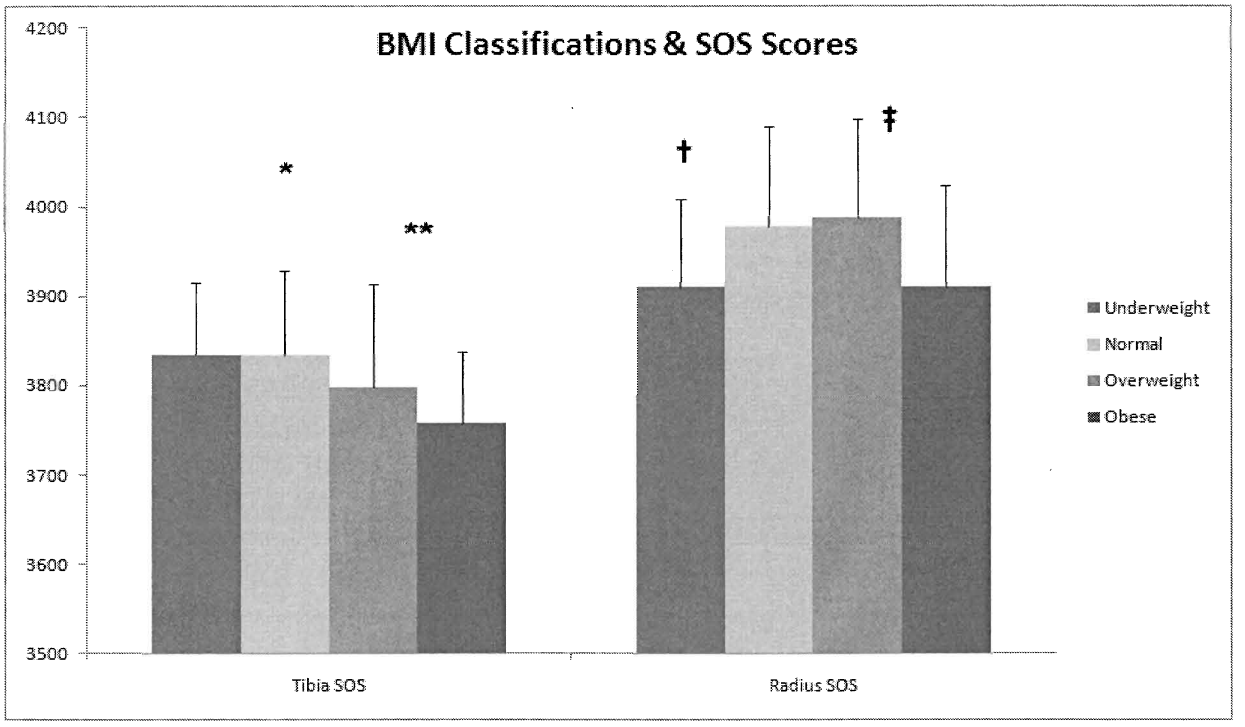

Figure 4.1 Bone SOS scores of female high school students by BMI Classification. Tibia SOS Scores: * denotes differences between underweight and obese ($p<0.05$); **denotes differences between normal, overweight and obese ($p<0.05$). Radius SOS Scores: †denotes differences between underweight, normal and overweight ($p<0.05$); ‡ denotes differences between overweight and obese ($p<0.05$).

A total of 129 parental questionnaires were returned, therefore we had a 29% response rate. Parental income was divided into two groups: high (> $70,000) and low (< $40,000) and a series of independent samples t-tests were run to determine differences among all study variables (Table 4.6). For this analysis, Levene's test was not violated and, thus, equal variance was assumed. Adolescent females of higher SES reported significantly higher calcium intake and weekly physical activity compared to lower SES ($p<0.05$). There were no significant differences for tibial and radial SOS scores.

Table 4.6 Bone SOS, anthropometric and descriptive measures between high and low parental income.

	High Parental Income (n=69)	Low Parental Income (n=15)
Body Fat (%)	25.4 ± 8.0	30.0 ± 9.8
BMI (kg/m^2)	22.0 ± 3.1	23.4 ± 5.0
Fat Mass (kg)	15.6 ± 7.1	19.9 ± 11.2
Lean Mass (kg)	43.8 ± 6.0	42.3 ± 4.1
WPA_{eq} (METS)	65.5 ± 38.9*	41.9 ± 32.9
Calcium Intake (mg)	1441 ± 457.8*	1068 ± 486.5
Radius SOS (m/s)	3971 ± 108.2	3963± 90.1
Tibial SOS (m/s)	3850 ± 82.7	3832 ± 97.5

*Values are expressed as means ± SD. *denotes significant differences between groups ($p<0.05$).*

Finally, a hierarchical regression was used to predict tibia SOS , with age entered on the first block, FM on the second, LM on the third, calcium intake on the fourth and WPA_{eq} on the fifth block. Age, FM and calcium intake predicted 17% of the variance in tibia SOS scores (Table 4.7). When a hierarchical regression was used (in the same manner as for the tibia SOS scores) to predict radial SOS, only age was a significant predictor, accounting for 10% of the variance seen in radial SOS scores.

Table 4.7 Hierarchical regression models predicting tibia SOS in female high school students who were non-users of oral contraceptives.

Variables	Model 1	Model 2	Model 3	Model 4	Model 5
Age	29.81** (0.29)	32.00** (0.32)	30.69** (0.30)	29.78**(0.29)	29.78**(0.29)
Fat Mass		-3.55** (-0.27)	-4.07** (-0.31)	-3.64**(-0.28)	-3.65**(-0.28)
Lean Mass			2.08 (0.11)	1.66 (0.09)	1.67 (0.09)
Calcium Intake				0.03* (0.13)	0.03* (0.13)
WPA_{eq}					-0.004 (-0.001)
Constant	3345.7	3372.2	3313.0	3298.3	3298.2
Adjusted R^2	0.08	0.15	0.16	0.17	0.17

Unstandardized b-coefficients are reported with Betas in parentheses; Note: *p<0.05; **p<0.01

Chapter 5: Discussion

The objective of this study was to assess by transaxial QUS the bone properties of female adolescents, and to determine associations between body composition, osteoporosis-related behaviours, parental income and bone SOS. As expected, we saw increasing SOS scores with increasing age and grade. Our main results showed that higher fat mass was negatively correlated with tibia SOS scores, while lean mass was positively associated with radial SOS scores. Significant differences were found in radial SOS scores, with females using oral contraceptives having higher SOS. When parental income was divided into high and low categories (more than $70,000 and less than $40,000, respectively) differences were found, with students of higher in SES having higher levels of calcium intake and weekly physical activity. When age, fat mass, lean mass, calcium intake and weekly physical activity were entered into a regression model for both the tibia and radius, age and fat mass were the most important predictors of the variance seen in tibial SOS scores, with calcium intake having a weaker, yet significant, positive association. Age was the most important predictor for radial SOS.

Overall, we saw an increase in both tibial and radial SOS scores with age, which is in accordance with the first hypothesis. Similarly, other studies have shown with increasing age, increasing SOS scores (Lappe et al., 2000; Zadik et al., 2003). This result is also in accordance with DXA studies that have shown increases in BMD with age (Bonjour et al., 1991; Maynard et al., 1998).

We suggested that lean mass, daily calcium intake and physical activity would be positively associated with bone SOS at both sites, however we only found a significant positive association with lean mass and radial SOS. Although lean mass was positively correlated with the radius SOS scores, the relationship was weak. This is in contrast to other studies who have found that bone-free, lean tissue was the most important predictor of total BMD (Pietrobelli et al., 2002; Valdimarsson et al., 1999; Young et al., 2001). A possible explanation for this difference in our study is that we used BIA to determine LM, while these other studies used DXA. DXA may be able to more accurately determine the difference between lean and fat tissues as it can scan the whole body (Pietrobelli et al., 2002). Lean mass reflects skeletal muscle mass, and bone and skeletal muscle form an operational unit (Frost & Schonau, 2000). Muscles exert their actions through insertion into bones, with both having positive effects from exercise (Reid, 2002). The bulk of muscles and other non-fat soft tissues contribute to the load carried by the human body, with a positive relationship seen between the masses of these two tissues. Additionally, skeletal muscles have been referred to as the primary osteogenic agents (Zanker & Cooke, 2004) and positive relationships have been observed between BMD measurements and muscle mass and strength (Marcus, 2001). Therefore it is important to distinguish between the tissue types to see if lean mass versus fat mass affects bone strength more.

We hypothesized that fat mass would be negatively associated with bone SOS at both sites, however we only found this relationship at the tibia.

Interestingly, we found a negative association between BMI, FM and body fat % with tibial SOS scores. Moreover, when entered into the regression model, age and fat mass predicted 15% of the variance seen in the tibia, with fat mass being a negative predictor. This is contrary to findings from various other studies reporting significant positive associations between BMI and bone mineral measurements in adults (Elgan, Dykes & Samsioe, 2002; Revilla et al., 1997; Ulrich, Georgiou, Snow-Harter, & Gillis, 1996). However these studies did not assess bone using QUS, and differences in instrumentation, skeletal site analyzed and bone mineral parameters selected can contribute to sources of conflict (Khosla, Atkinson, Riggs, & Melton, 1996). These studies were also conducted in adults, therefore age differences may contribute to the discrepancy in our results. On the other hand, the relationship we found with BMI and tibia SOS is in accordance with Pettinato et al. (2006) who found lower SOS in the tibia of girls with an increased BMI aged 11-26 years, and with Eliakim, Nemet, and Wolach (2001) who also found lower SOS in the tibia and radius of obese children aged 6-17 years. Moreover, Goulding et al. (2000) found that bone mass and bone area in overweight and obese girls aged 3-19 years was low for their body weight. Therefore we see more of a negative relationship of fat mass with bone health in the adolescent years as opposed to the adult years.

Overall, we see a negative contribution of adipose tissue that offsets its potential benefit as a mechanical load. Adipose tissue, once considered a metabolically passive fuel depot for energy substrate and insulation, has recently become apparent as a metabolically active tissue (Janicka et al., 2007). It

secretes multiple proteins into circulation, which play important roles in the modulation of various biological functions. Recent studies have shown a link between fat and bone tissues, demonstrating that osteoblasts and adipocytes originate from the same stem cells (Reid, 2002). These stem cells differentiate into either cell lineage in a mutually exclusive way (Janicka et al., 2007). In bone marrow, this could lead to a reciprocal relationship between fat and bone, depending on the local milieu. The balance between osteoblasts and adipocyte differentiation could be disrupted by environmental factors; decreased bone formation accompanied by increased adipogenesis occurs with immobility, whereas the opposite is associated with increased weight-bearing physical activity (Janicka et al., 2007). Therefore, it is suggested that bone strength is primarily determined by dynamic loads from muscle force, not static loads such as fat mass in adolescents. This may suggest that many years of increased mechanical strain are needed in order to achieve the "protective" effect of body weight on bone mineralization seen in adults (Eliakim et al., 2001).

It is also possible that higher proportions of fat mass could be a marker for lower activity levels, and we did find a significant negative correlation between body fat percentage and weekly physical activity levels. This suggests that increased physical activity levels are important to help decrease body fat. However, when grouped into BMI classifications, there were no differences in weekly physical activity levels between groups. Since our physical activity was gathered using self-report methods, perhaps differences would have been seen if

we used another measure such as accelerometry, which directly measures weekly physical activity levels.

Commonly used methods for evaluating bone health (e.g. DXA) measure quantitative aspects of BMD. QUS measurements of bone SOS reflect, however, not only quantitative aspects but also qualitative properties of bone, such as bone elasticity, microarchitecture and fatigue damage (Nemet, Berger-Shemesh, Wolach, & Eliakim, 2006). Thus, our results of reduced tibial SOS in subjects with higher fat mass suggest that qualitative properties of bone might be affected as well by obesity. Another possible explanation for the reduced bone SOS in those with higher fat mass is the increased thickness of the overlying fat tissue in those with higher fat mass, which could lead to false lower SOS readings. The speed of sound propagation depends on the density of the medium through which it is travelling. The ultrasound signal travels much faster through the relatively dense cortical layer of the bone than through the trabecular layer, and much faster than through soft tissue such as fat (Eliakim et al, 2001). QUS detects the fastest time taken for the ultrasound signal to travel between the transmitter and receiving transducer within the probe, and this propagation time is used by a proprietary algorithm to determine the bone SOS, independent of soft tissue thickness. However, recent studies have indeed demonstrated that bone measurements of SOS are not affected by the soft tissue thickness (Pearce, Hurtig, Runciman & Dickey, 2000).

A significant negative correlation was found between calcium intake and fat mass. These results are similar to Lin et al. (2000) who found that calcium

intake was inversely related to weight and fat gain over a period of two years. This finding may also suggest a possible explanation as to why we saw reduced tibial SOS in girls with a higher BMI. However, intervention studies have mostly not supported this finding in adults or children, and neither has a large 12-year prospective study (Reid, 2008).

The reported average daily calcium intake was 1316 mg for the whole group, which is just above the daily recommended intake from Osteoporosis Canada, which is 1300 mg per day. This finding is similar to Anderson, Chad, and Spink (2005) who found the average daily calcium intake in females aged 12-16 years to be 1235 mg. In the current study, 49.1% of the females fell short of the recommended daily intake, consistent with previous studies in adolescents, who found their daily calcium intake to be far below the recommended level (Hage et al., 2009; Nemet et al., 2006; Zadik et al., 2003); however these studies used different means of collecting calcium data such as a 3 day diet diary or a 24-hour food recall.

We suggested that females taking OC would have lower SOS at both sites compared to NOC users; however we found increased radial SOS scores in females taking OC. OC users had significantly higher radial SOS scores compared to the non-users, across all grade levels. This may suggest that oral contraceptives have a protective effect on non-weight bearing bones. This positive effect of oral contraceptives on bone strength has been demonstrated in some studies (DeCherney, 1996; Recker et al., 1992), but not all (Hartard et al., 2004; Polatti et al., 1995). However, these studies were conducted in young

adults and not in adolescents. Only a few studies have looked at the effects of oral contraceptive use on bone health in adolescents, and the results have been contradictory; Lloyd et al. (2000) found that oral contraceptive use in healthy white female teenagers did not affect acquisition of PBM compared to controls; Pikkarainen (2008) found that OC use seemed to suppress normal bone mineral accrual in adolescent females. Therefore, it is evident that more research needs to be performed to look at the effects of oral contraceptives on bone health in adolescent females.

We had a 29% response rate from the parents of the study who were asked to complete a questionnaire. When we divided the group into high (>$70,000) and low (<$40,000) parental income, we found significantly higher weekly PA and calcium intake in the high group, and higher bone SOS scores, although these results were not significant. These findings are in accordance with our original hypothesis that higher income would be associated with higher levels of physical activity and calcium intake. These results may suggest that girls with a higher parental income are more likely to participate in positive osteoporosis-related behaviours which in turn may increase their bone strength. To our knowledge, this is the first study that has examined differences in SES and bone health in adolescent girls, and future studies should look at reasons why girls in higher SES engage in healthier osteoporosis-related behaviours.

5.2 Limitations

Limitations of our study need to be acknowledged and considered. Nutritional and lifestyle information was acquired by self-report in adolescents, with its inherent limitations. When the questionnaires were completed, it was during class time with large class sizes, therefore it was difficult to monitor each individual as they answered the questions. The questionnaire package was not counter-balanced, therefore this may have affected the answering of questionnaires at the end of the package. Moreover, PA was only measured using self-report and not directly. The self-assessment of PA did not allow subjects to discriminate between different types of activities such as weight-bearing versus resistance training. This may prove to be useful information, and could explain why no correlations were found between WA_{eq} and SOS scores. The calcium RAM method of estimating usual calcium intake can result in over reporting in various populations (Hertzler & Frary, 1994; Moore, Johnson, Falk, & Klentrou, 2006); therefore, results from this method need to be interpreted with caution.

We measured body fat percentage at different times of the day within each school, therefore we tried to regulate their hydration levels by having them drink 250mL of water half an hour prior to stepping on the BIA scale. However BF% may have been overestimated in some participants, especially those that were measured right after lunch time.

Another limitation was that we did not ask what type of oral contraceptive the participants were using or the length of time that they had been on them for. This could have helped to see if the type or the length of time of using OC affected bone SOS scores. The OC group was limited in numbers, perhaps we would have seen more differences if the groups were equal in size.

Unfortunately, not all of the participants had their parents return a parental questionnaire. We only had a 29% response rate; therefore it is difficult to generalize our findings to our entire sample.

Lastly, we did not measure any biochemical markers of bone turnover to establish the dynamic state of bone. The advantage of measuring bone markers is that they allow us to determine and examine the current state of bone and act as a complement to such measures as QUS and DXA.

5.3 Conclusions

The present study aimed to assess the bone SOS in female adolescents and establish whether there any associations between body composition, osteoporosis-related health behaviours, SES and bone SOS. The results showed a negative relationship of FM on bone SOS, suggesting that bone strength may be determined from dynamic loads from muscle force, not static loads such as FM in adolescence. Moreover, radial SOS was higher in students who were on oral contraceptives, suggesting a potential positive effect of oral contraceptives on non-weight bearing bones during late adolescent years. Additionally, an

increased daily calcium intake was linked with increased tibial SOS scores, which was to be expected. Despite not finding any of the hypothesized benefits of PA on bone SOS, we did find a negative relationship with PA on body fat percentage. Therefore it is important for adolescent females to be aware of the many benefits of PA, such as decreasing fat, which will contribute to overall bone health.

5.4 Recommendations for Future Studies

Further research is needed to determine what type of PA is associated with bone health and reducing fat mass in adolescent girls. This will encourage strategies and education programs to instruct the young to optimize their PBM in the growing years. Adolescents may be unaware of the negative relationship between fat mass and bone health, and are therefore not engaging in related health behaviours. Research aimed at designing comprehensive educational programs based around the healthy behaviour recommendations for this age group is necessary. Additionally, research assessing the biochemical markers of bone turnover in adolescents is necessary to see the relationship between body composition and osteoporosis-related behaviours. Finally, further investigation of the relationship between oral contraceptive use among adolescents (type of oral contraceptive and length of use) and its effect on bone health is also required.

5.5 Significance of Study

The significance of this study is that we found a negative association between fat mass and bone strength in weight-baring bones of adolescent females. This indicates that despite the heavier load that the bones in the legs are carrying due to an increased fat mass, they are not reaching their full potential in strength. Therefore it is important that we increase awareness in adolescent girls of the benefits of physical activity in helping to reduce fat mass and, in turn, indirectly protect their bone and overall health. Moreover, the use of OC during adolescent years may help to increase bone strength in the non-weight bearing bones such as the radius. Lastly, the information that female high school students with a higher parental income participate in healthier osteoporosis-related behaviours such as increased physical activity levels and calcium intake will help in the development of appropriate interventions to ensure that young girls of lower socio-economic status do not miss important educational opportunities related to health promotion and disease prevention.

Chapter 6: References

Adler, N., Boyce, T., Chesney, M., Cohen, S., Folkman, S., Kahn, R., Syme, S. (1994). Socioeconomic status and health: The challenge of the gradient. *American Psychologist, 49,* 15-24.

Ali, N. & Siktberg, L. (2001). Osteoporosis prevention in female adolescents: Calcium intake and exercise participation. *Pediatric Nursing, 27,* 132-139.

Anderson, K. D., Chad, K. E., & Spink, K. S. (2005). Osteoporosis knowledge, beliefs, and practices among adolescent females. *Journal of Adolescent Health, 36,* 305-312.

Azcona, C., Koek, N., & Fruhbeck, G. (2006). Fat mass by air-displacement plethysmography and impedance in obese/non-obese children and adolescents. *International Journal of Pediatric Obesity, 1*(3), 176-182.

Bachrach, L. (2001). Acquisition of optimal bone mass in childhood and adolescence. *Trends in Endocrinology & Metabolism , 12*, 22-28.

Bachrach, L. K., Hastie, T., Wang, M., Narasimhan, B., & Marcus, R. (1999). Bone mineral acquisition in health asian, hispanic, black and caucasian youth: A longitudinal study. *The Journal of Clinical Endocrinology & Metabolism, 84,* 4702-4712.

Bailey, D., Faulkner, R., & McKay, H. (1996). Growth, physical activity and bone mineral acquisition. *Exercise & Sport Science Reviews , 24*, 233-263.

Bauer, D.C., Gluer, C.C., Genant, H.K. & Stone, K. (1995). Quantitative ultrasound and vertebral fracture in postmenopausal women. *Journal of Bone Mineral Research,* 10, 353-358.

Barkmann, R., Kantorovich, E., Singal, C., Hans, D., Genant, H. K., Heller, M., et al. (2000). A new method for quantitative ultrasound measurements at multiple skeletal sites: first results of precision and fracture discrimination. *Journal of Clinical Densitometry, 3,* 1-7.

Baroncelli, G. I. & Saggese, G. (2000). Critical ages and stages of puberty in the accumulation of spinal and femoral bone mass: The validity of bone mass measurements. *Hormone Research, 54,* 2-8.

Bell, N., Shary, J., Stevens J, Garza, M., Gordon, L., & Edwards J. (1991). Demonstration that bone mass is greater in black than in white children. *Journal of Bone and Mineral Research, 6,* 719-723.

Biospace. (2008). InBody520. Retrieved October 20, 2008, from the World Wide Web: http://www.biospaceamerica.com/product/inbody _520_setting.asp

Bonjour, J.P., Theintz, G., Buchs, B., Slosman, D., & Rizzoli, R. (1991). Critical years and stages of puberty for spinal and femoral bone mass accumulation during adolescence. *Journal of Clinical Endocrinology and Metabolism,* 73, 555-563.

Brennan, S., Pasco, J., Urquhart, D., Oldenburg, B., Hanna, F., & Wluka, A. (2009). The association between socioeconomic status and osteoporotic fracture in population-based adults: A systematic review. *Osteoporosis International, 20,* 1487-1497.

Cadogan, J., Blumsohn, A. Barker, M.E., & Easterll, R. (1998). A longitudinal study of bone gain in pubertal girls: anthropometric and biochemical correlates. *Journal of Bone and Mineral* Research, *13*(10), 1602-1612.

Cole, T. J., Bellizzi, M. C., Flegal, K. M., & Dietz, W. H. (2000). Establishing a standard definition for child overweight and obesity worldwide: International survey. *BMJ, 320,* 1240-1246.

Cole, T. J., Flegal, K. M., Nicholls, D., & Jackson, A. A. (2007). Body mass index cut offs to define thinness in children and adolescents: International survey. *BMJ, 335,* 194-202.

Cromer, B. & Harel, Z. (2000). Adolescents: At increased risk for osteoporosis? *Clinical Pediatrics, 39,* 565-574.

Dambacher, M.A., Schmitt, S., Schacht, E., Ito, M., Neff, M., Muller, et al. (2004). Bone structures in vitro and in vivo in animals and in men: A view into the future. *Journal fur Mineralstoffwechese, 11*, 13-19.

DeCherney, A. (1996). Bone-sparing properties of oral contraceptives. *American Journal of Obstetrics & Gynecology, 174,* 15-20.

Durst, E. S. (2000). The A,B,C's of bone building in adolescence. *Clinical Practice,* 12, 135-140.

Elgan, C., Dykes, A.-K. & Samsioe, G. (2002). Bone mineral density and lifestyle among female students aged 16-24. *Gynecological Endocrinology,* 16, 91-98.

Elgan, C., Samsioe, G., & Dykes, A. (2003). Influence of smoking and oral contraceptives on bone mineral density and bone remodeling in young women: A 2 year study. *Contraception , 67*, 439-447.

Eliakim, A., Nemet, D., & Wolach, B. (2001). Quantitative ultrasound measurements of bone strength in obese children and adolescents. *Journal of Pediatric Endocrinology & Metabolism, 14,* 159-164.

Falk, B., Bronshtein, Z., Zigel, L., Constantini, N., & Eliakim, A. (2004). Higher tibial quantitative ultrasound in young female swimmers. *British Journal of Sports Medicine, 38,* 461-65.

Frost, H. M., & Schonau, E. (2000). The "muscle-bone unit" in children and adolescents: A 2000 overview. *Journal of Pediatric Endocrinology Metabolism, 13,* 571-590.

Fuchs, R.K., Bauer, J.J., and Snow, C.M. (2001). Jumping improves hip and lumbar spine bone mass in prepubescent children: a randomized control trial. *Journal of Bone and Mineral Research, 16,* 148-156.

Fuchs, R.K, & Snow, C.M. (2002). Gains in hip bone mass from high-impact training are maintained: A randomized controlled trial in children. *Journal of Pediatrics, 141*, 357-362.

Fulkerson, J., Jimes, J., French, S., Jensen, S., Petit, M., Stewart, C., et al. (2004). Bone outcomes and technical measurement issues of bone health among children and adolescents: Considerations for nutrition and physical activity intervention trials. *Osteoporosis International , 15*, 929-941.

Gilsanz, V, Roe, T, Mora, S, Costin, G & Goodman, W. (1991). Changes in vertebral bone density in black girls and white girls during childhood and puberty. *The New England Journal of Medicine, 325,* 1597-1600.

Godin, G. J. & Shepard, R. J. (1985). A simple method to assess exercise behavior in the community. *Canadian Journal of Applied Sport Sciences, 10,* 141-146.

Gordon, C. (2003). Normal bone accretion and effects of nutritional disorders in childhood. *Journal of Women's Health , 12*, 137-143.

Gluer, C-C., Wu, C.Y. & Genant, H.K. (1993). Broadband ultrasound attenuation signals depend on trabecular orientation: an in-vitro study. *Osteoporosis International,* 3, 185-191.

Goulding, A., Taylor, R.W., Jones, I.E., McAuley, K.A., Manning, P.J., and Williams, S.M. (2000). Overweight and obese children have low bone mass and area for their weight. *International Journal of Obesity, 24*, 627-632.

Gu, W., Rennie, K., Lin, X., Wang, Y., & Yu, Z. (2007). Differences in bone mineral status between urban and rural Chinese men and women. *Bone, 41*, 393-399.

Hage, R. P. E., Courteix, D., Benhamou, C., Jacob, C., & Jaffré, C. (2009). Relative importance of lean and fat mass on bone mineral density in a group of adolescent girls and boys. *European Journal of Applied Physiology, 105,* 759-764.

Hansen, M.A., Overgaard, K., Riis, B.J., & Christiansen, C. (1991). Role of peak bone mass and bone loss in postmenopausal osteoporosis: 12 year study. *British Medical Journal,* 303, 961-964.

Hartard, M., Kleinmond, C., Kirchbichler, A., Jeschke, D., Wiseman, M., Weissenbacher, E. R., Felsenberg, D., & Erben, R. G. (2004). Age at first oral contraceptive use as a major determinant of vertebral bone mass in female endurance athletes. *Bone, 35,* 836-841.

Hartard, M., Botterman, M.P., Bartenstein, P., Jeschke, D. and Schwaiger, M. (1997). Effects on bone mineral density of low-dose oral contraceptives compared to and combined with physical activity. *Contraception,* 55, 87-90.

Heaney, R., Abrams, S., Dawson-Hughes, B., Looker, A., Marcus, R., Matkovic, V., et al. (2000). Peak bone mass. *Osteoporosis International , 11*, 985-1009.

Hertzler, A. A., & Frary, R. B. (1994). A dietary calcium rapid assessment method (RAM). *Topics in Clinical Nutrition, 9*, 76-85.

Hind, K. & Burrows, M. (2007). Weight-bearing exercise and bone mineral accrual in children and adolescents: A review of controlled trials. *Bone, 40,* 14-27.

Ilich, J., Skugor, M., Hangartner, T., Baoshe, A. & Matkovic, V. (1998). Relation of nutrition, body composition and physical activity to skeletal development: A cross-sectional study in preadolescent females. *Journal of the American College of Nutrition, 17,* 136-147.

Janicka, A., Wren, T. A. L., Sanchez, M. M., Dorey, F., Kim, P. S., Mittelman, S. D., & Gilsanz, V. (2007). Fat mass is not beneficial to bone in adolescents and young adults. *The Journal of Clinical Endocrinology & Metabolism, 92,* 143-147.

Katzman, D. K., Bachrach, L. K., Carter, D. R., & Marcus, R. (1991). Clinical and anthropometric correlates of bone mineral acquisition in healthy adolescent girls. *Journal of Clinical Endocrinology Metabolism, 73,* 1332-1339.

Khosla, S., Atkinson, E.J., Riggs, B.L., & Melton, L.J. 3rd. (1996). Relationship between body composition and bone mass in women. *Journal of Bone Mineral Research,* 11, 857-863.

Kohrt, W. M., Bloomfield, S. A., Little, K. D., Nelson, M. E., & Yingling, V. R. (2004). Physical activity and bone health. *Medicine & Science in Sports & Exercise, 36,* 1985-1996.

Kriemler, S., Puder, J., Zahner, L., Roth, R., Braun-Fahriander, C., & Bedogni, G. (2008). Cross-validation of bioelectrical impedance analysis for the assessment of body composition in a representative sample of 6- to 13-year-old children. *European Journal of Clinical Nutrition*, 1-8.

Lappe, J. M., Stegman, M. R., Davies, K. M., Barber, S., & Recker, R. R. (2000). A prospective study of quantitative ultrasound in children and adolescents. *Journal of Clinical Densitometry, 3,* 167-175.

Lehtonen-Veromaa, M., Mottonen, T., Irjala, K., Nuotio, I., Leino, A., & Viikari, J. (2000). A 1-year prospective study on the relationship between physical activity, markers of bone metabolism, and bone acquisition in peripubertal girls. *The Journal of Clinical Endocrinology & Metabolism, 85*, 3736-3732.

Lehtonen-Veromaa, M., Mottonen, T., Nuotio, I., Heinonen, O.J., & Viikari, J. (2000).
Influence of physical activity on ultrasound and dual-energy x-ray absorptiometry bone measurements in peripubertal girls: A Cross-Sectional Study. *Calcified Tissue International, 66*, 248–254.

Lin, Y., Lyle, R., McCabe, L., McCabe, G., Weaver, C., Teegarden, D. (2000). Dairy calcium is related to changes in body composition during a two-year exercise intervention in young women. *American College of Nutrition, 19,* 754-760.

Lips, P. & van Schoor, N. M. (2005). Quality of life in patients with osteoporosis. *Osteoporosis International, 16,* 447-455.

Lloyd, T., Petit, M.A., Lin, H.M., & Beck, T.J. (2004). Lifestyle Factors and the Development of Bone Mass and Bone Strength in Young Women. *The Journal of Pediatrics,* 144, 776-782.

Luckey, M.M., Wallenstein, S., Lapinski, R., and Meier, D.E. (1996). A prospective study of bone loss in African-American and white women – a clinical research center study. *Journal of Clinical Endocrinology and Metabolism, 81,* 2948-2956.

Marcus, R. (2001). Role of exercise in preventing and treating osteoporosis. *Rheumatic Diseases Clinics of North America,* 27, 131-141.

Matkovic, V., T. Jelic, G. M. Wardlaw, J. Z. Ilich, P. K. Goel, J. K. Wright, M. B. Andon, K. T. Smith, and R. P. Heaney. (1994). Timing of peak bone mass in Caucasian females and its implication for the prevention of osteoporosis. Inference from a cross-sectional model. *The Journal of Clinical Investigation*, 93:799-808.

Maynard, L. M., Guo, S. S., Chumlea, W. C., Roche, A. F., Wisemandle, W. A., Zeller, C. M., et al. (1998). Total-body and regional bone mineral content and areal bone mineral density in children aged 8-18 y: The Fels longitudinal study. *American Journal of Clinical Nutrition, 68,* 1111-1117.

Moore, M., Johnson, S., Falk, B. & Klentrou, P. (2006). *Assessing the validity of the calcium rapid assessment method in male children and adolescents.* Manuscript submitted for publication.

Mirwald, R., Baxter-Jones, A., Bailey, D. & Beunen, G. (2002). An assessment of maturity from anthropometric measurements. *Medicine & Science in Sports & Exercise, 34,* 689-694.

Munch, S., & Shapiro, S. (2006). The silent thief: Osteoporosis and women's health care across the life span. *Health & Social Work, 31,* 44-53.

National Osteoporosis Foundation (2009). http://www.nof.org Retrieved March 19, 2009.

Nemet, D., Berger-Shemesh, E., Wolach, B., & Eliakim, A. (2006). A combined dietary-physical activity intervention affects bone strength in obese children and adolescents. *International Journal of Sports Medicine, 27,* 666-671.

Njeh, C.F., Boivin, C.M., & Langton, C.M. (1997). The role of ultrasound in the assessment of osteoporosis: a review. *Osteoporosis International, 7,* 7-22.

Njeh, C.F., Hans, D., Wu, C., Kantorovich, E., Sister, M., Fuerst, T., et al. (1999). An in vitro investigation of the dependence on sample thickness of the speed of sound along the specimen. *Medical Engineering and Physiology, 21,* 651-659.

Osteoporosis Society of Canada (2009). http://www.osteoporosis.ca Retrieved March 19, 2009.

Pearce, S., Hurtig, M.B., Runciman, J., and Dickey, J. (2000). Effect of age, anatomic site and soft tissue on quantitative ultrasound. *Journal of Bone Mineral Research, 15,* S407.

Peterson, B.A., Klesges, R.C., Kaufman, E.M., Cooper, T.V., and Vukadinovich, C.M. (2000). The effects of an educational intervention on calcium intake and bone mineral content in young women with low calcium intake. *American Journal of Health Promotion 14*, 149-156.

Pettinato, A. A., Loud, K. J., Bristol, S. K., Feldman, H. A., & Gordon, C. M. (2006). Effects of nutrition, puberty, and gender on bone ultrasound measurements in adolescents and young adults. *Journal of Adolescent Health, 39,* 828-834.

Pietrobelli, A., Faith, M. S., Wang, J., Brambilla, P., Chiumello, G., & Heymsfield, S. B. (2002). Associations of lean tissue and fat mass with bone mineral content in children and adolescents. *Obesity Research, 10,* 56-60.

Pikkarainen, E., Lehtonen-Veromaa, M., Mottonen, T., Kautiainen, H., & Viikari, J. (2008). Estrogen-progestin contraceptive use during adolescence prevents bone mass acquisition: A 4-year follow up study. *Contraception, 78,* 226-231.

Polatti, F., Perotti, F., Filippa, N., Gallina, D., & Nappi, R. E. (1995). Bone mass and long-term monophasic oral contraceptive treatment in young women. *Contraception, 51,* 221-224.

Ralston, S.H. (1997). What determines peak bone mass and bone loss? *Bailliere's Clinical Rheumatology, 11,* 479-494.

Recker, R.R., Davies, M.K., Hinders, S.M., Heaney, R.P., Stegman, M.R., & Kimmel, D.B. (1992). Bone gain in young adult women. *JAMA, 268,* 2403- 2408.

Reid, I. R. (2002). Relationships among body mass, its components, and bone. *Bone, 31,* 547-555.

Reid, I.R. (2008). Relationships between fat and bone. *Osteoporosis International, 19,* 595-606.

Revilla, M., Villa, L.F., Sanchez-Atrio, A., Hernandez, E.R., & Rico, H. (1997). Influence of body mass index on the age-related slope of total and regional bone mineral content. *Calcification Tissue International,* 61, 134-138.

Rico, H., Revilla, M., Villa, L., Alvarez del Buergo, M. & Ruiz-Contreras, D. (1994). Determinants of total-body and regional bone mineral content and density in postpubertal normal women. *Metabolism, 43,* 263-266.

Rizzoli, R. (2006). Determinants of peak bone mass. *Ann Endocrinology (Paris), 67,* 114-115.

Schoenau, E., Saggese, G., Peter, F., Baroncelli, G., Shaw, N., Crabtree, et al. (2004). From bone biology to bone analysis. *Hormone Research, 61,* 257-269.

Sharp, K., & Thombs, D.L. (2003). A cluster analytic study of osteoprotective behavior in undergraduates. *American Journal of Health Behavior, 27,* 364-372.

Shatrugna, V., Kulkarni, B., Kumar, P., Rani, K., & Balakrishna, N. (2005). Bone status of Indian women from a low-income group and its relationship to the nutritional status. *Osteoporosis International , 16*, 1827-35.

Slemenda, C. W., Reister, T. K., Hui, S. L., Miller, J. Z., Christian, J. C., & Johnston, C. C. (1994). Influences on skeletal mineralization in children and adolescents : evidence for varying effects of sexual maturation and physical activity. *Journal of Pediatrics, 125,* 201-207.

Steelman, J., & Zeitler, P. (2001). Osteoporosis in pediatrics. *Pediatrics in Review , 22*, 56-65.

Teegarden, D., Proulx, W.R., Martin, B.R., Zhao, J., McCabe, G.P., Lyle, R.M. et al. (1995). Peak bone mass in young women. *Journal of Bone and Mineral Research,* 10, 711-715.

Teegarden, K., Lyle, R. M., McCable, G. P., McCabe, L. D., Proulx, W. R., Michon, K. M., et al. (1998). Dietary calcium, protein and phosphorous are related to bone mineral density and content in young women. *American Journal of Clinical Nutrition, 68,* 749-754.

Tudor-Locke, C. & McColl, R.S. (2000). Factors related to variation in premenopausal bone mineral status: a health promotion approach. *Osteoporosis International,* 11, 1-24.

Ulrich, C. M., Georgiou, C.C., Snow-Harter, C.M. & Gillis, D.E. (1996). Bone mineral density in mother-daughter pairs: Relations to lifetime exercise, lifetime milk consumption, and calcium supplements. *The American Journal of Clinical Nutrition, 63*, 72.

Valdimarsson, O., Kristinsson, J. O., Stefansson, S. O., Valdimarsson, S., & Sigurdsson, G. (1999). Lean mass and physical activity as predictors of bone mineral density in 16-20 year old women. *Journal of Internal Medicine, 245,* 489-496.

Vincente-Rodriguez, G., Urzanqui, A., Mesana, M. I., Ortega, F. B., Ruiz, J. R., Ezquerra, J., Casajus, J. A., Blay, G., Blay, V. A., Gonzalez-Gross, M., & Moreno, L. A. (2008) Physical fitness effect on bone mass is mediated by the independent association between lean mass and bone mass through adolescence: A cross-sectional study. *Journal of Bone Mineral Metabolism, 26,* 288-294.

Wahner, H.W. (1996). Use of Densiometry in management of Osteoporosis. In R. Marcus, D. Feldman & J. Kelsey (Eds.), *Osteoporosis* (pp. 1055-1074). San Diego, California: Academic Press.

Warburton, D. E., Nicole, C. W., & Bredin, S. S. (2006). Health benefits of physical activity : The evidence. *Canadian Medical Association Journal, 174,* 801-809.

Weaver, C.M., Teegarden, D., Lyle, R.M., McCabe, G.P., McCabe LD, Proulx W. et al. (2001). Impact of exercise on bone health and contraindication of oral contraceptive use in young women. *Medicine and Science in Sports and Exercise, 33*, 873-880.

Weiler, H., Janzen, L., Green, K., Grabowski, J., Seshia, M., & Yuen, K. (2000). Percent body fat and bone mass in health Canadian females 10 to 19 years of age. *Bone , 27*, 203-207.

Wolf, A. M., Gortmaker, S. L., Cheung, L., Gray, H. M., Herzog, D. B., & Colditz, G. A. (1993). Activity, inactivity, and obesity: Racial, ethnic, and age differences among schoolgirls. *American Journal of Public Health, 83,* 1625-1627.

Young, D., Hopper, J., Macinnis, R., Nowson, C., Hoang, H., & Wark, J. (2001). Changes in body composition as determinants of longitudinal changes in bone mineral measures in 8 to 26-year-old female twins. *Osteoporosis International, 12,* 506-515.

Zadik, Z., Price, D., & Diamond, G. (2003). Pediatric reference curves for multi-site quantitative ultrasound and its modulators. *Osteoporosis International, 14,* 857-862.

Zanker, C.L. and Cooke, C.B. (2004). Energy Balance, Bone Turnover, and Skeletal Health in Physically Active Individuals. *Medicine and Sciences in Sports and Exercise,* 36(8), 1372-1381.

Brock University Research Ethics Board (REB)

Application for Ethical Review of Research Involving Human Participants

Please refer to the documents "Brock University Research Ethics Guidelines", which can be found at http://www.brocku.ca/researchservices/, prior to completion and submission of this application.

If you have questions about or require assistance with the completion of this form,

please contact the Research Ethics Office at (905) 688-5550 ext. 3035, or reb@brocku.ca.

Return your completed application and all accompanying material **in triplicate** to the

Research Ethics Office in MacKenzie Chown D250A.

Please ensure all necessary items are attached prior to submission.

Otherwise, your application will not be processed (see checklist below).

No research with human participants shall commence prior to

receiving approval from the research ethics board.

DOCUMENT CHECKLIST **3 complete sets of the following documents (one original + 2 copies)** Please Note: Handwritten Applications will ***not*** be accepted.	✓ if applicable
Recruitment Materials • Letter of invitation • Verbal script • Telephone script • Advertisements (newspapers, posters, SONA) • Electronic correspondence guide	[x] [ ] [ ] [ ] [ ]
Consent Materials • Consent form • Assent form for minors • Parental/3rd party consent • Transcriber confidentiality agreement	[x] [x] [ ] [ ]
Data Gathering Instruments • Questionnaires • Interview guides • Tests	[x] [ ] [ ]
Feedback Letter	[x]
Letter of Approval for research from cooperating organizations, school board(s), or other institutions	[ ]
Any previously approved protocol to which you refer	[ ]

Request for use of human tissue sample in research Please Note: this form is required for all research projects involving human tissue, bodily fluids, etc.	[ ]
Signed Application Form	[x]

Office of Research Services

Brock University • 500 Glenridge Ave • St. Catharines, ON • L2S 3A1 • Fax: 905-688-0748

Revised: August 2006

SIGNATURES

Principal Investigator:

Please indicate that you have read and fully understand all ethics obligations by checking the box beside each statement.

[x] I have read Section III:8 of Brock University's Faculty Handbook pertaining to Research Ethics and agree to

comply with the policies and procedures outlined therein.

[x] I will report any serious adverse events (SAE) to the Research Ethics Board (REB).

[x] Any additions or changes in research procedures after approval has been granted will be submitted to the

REB.

[x] I agree to request a renewal of approval for any project continuing beyond the expected date of completion or

for more than one year.

[x] I will submit a final report to the Office of Research Services once the research has been completed.

[x] I take full responsibility for ensuring that all other investigators involved in this research follow the protocol as

outlined in this application.

Signature _____ Date: _____

Signature _____ Date: _____

Co-Investigators:

Signature _____ Date: _____

Signature _____ Date: _____

Faculty Supervisor:

Please indicate that you have read and fully understand the obligations as faculty supervisor listed below by checking the box beside each statement.

[ ] I agree to provide the proper supervision of this study to ensure that the rights and welfare of all human

participants are protected.

[ ] I will ensure a request for renewal of a proposal is submitted if the study continues beyond the expected date

completion or for more than one year.

[ ] I will ensure that a final report is submitted to the Office of Research Services.

[ ] I have read and approved the application and proposal.

Signature _____ Date: _____

SECTION A – GENERAL INFORMATION

1. **Title of the Research Project:** Socio-behavioural determinants of bone health in adolescent females

2. **Investigator Information:**

	Name	**Position** (e.g., faculty, student, visiting professor)	**Dept./Address**	**Phone No.**	**E-Mail**
Principal Investigator	Nota Klentrou	Faculty	PEKN	4538	nota.klentrou@brocl
Principal Investigator	Kimberley Gammage	Faculty	PEKN	3772	kgammage@brocku

3. **Proposed Date (dd/mm/yyyy)** (a) of commencement: **June 2007** (b) of completion: June 2010

4. **Indicate the location**(s) where the research will be conducted:

Brock University [**x**]

Community Site [ ] Specify

School Board [**x**] Niagara Catholic District School Board, Halton District School Board

Hospital [ ] Specify

Other [ ] Specify

5. **Other Ethics Clearance/Permission:**

(a) Is this a multi-centered study? [ ] **Yes** [**x**] **No**

(b) Has any other University Research Ethics Board approved this research? [ ] **Yes** [**x**] **No**

If **YES**, there is no need to provide further details about the protocol **at this time,** provided that **all** of the following information is provided:

Title of the project approved elsewhere:

Name of the Other Institution:

Name of the Other Board:

Date of the Decision:

A contact name and phone number for the other Board:

Please provide a copy of the application to the other institution together with all accompanying materials, as well as a copy of the clearance certificate / approval.

If **NO**, will any other Research Ethics Board be asked for approval? [x] **Yes** [ ] **No**

Specify University/College Niagara Catholic District School Board, Halton District School Board

(d) Has any other person(s) or institutions granted permission to conduct this research? [ ] **Yes** [x] **No**

Specify (e.g., school boards, community organizations, proprietors)

6. **Level of the Research:**

[x] Undergraduate [x] Masters Thesis/Project [x] Ph.D.

[ ] Post Doctorate [x] Faculty Research [ ] Administration

[ ] Undergraduate Course Assignment [ ] Graduate Course Assignment [ ] Other (specify)

(specify course) (specify course)

7. **Funding of the Project:**

(a) Is this project currently being funded [x] **Yes** [ ] **No**

(b) If **No**, is funding being sought [ ] **Yes** [ ] **No**

If Applicable:

(c) Period of Funding (dd/mm/yyyy): From: April 2007 To: April 2010

(d) Agency or Sponsor (funded or applied for)

[ ] CIHR [ ] NSERC [x] SSHRC [ ] Other (specify):

(e) Funding / Agency File # (not your personal PIN)

8. **Conflict of Interest:**

(a) Will the researcher(s), members of the research team, and/or their partners or immediate family members receive any personal benefits related to this study – Examples include financial remuneration, patent and ownership, employment, consultancies, board membership, share ownership, stock options. Do not include conference and travel expense coverage, possible academic promotion, or other benefits which are integral to the general conduct of research.

[ ] **Yes** [x] **No**

If **Yes**, please describe the benefits below.

(b) Describe any restrictions regarding access to or disclosure of information (during or at the end of the study) that the sponsor has placed on the investigator(s).

SECTION B – SUMMARY OF THE PROPOSED RESEARCH

9. **Rationale:**

Briefly describe the purpose and background rationale for the proposed project, as well as the hypothesis(es)/research question(s) to be examined.

Osteoporosis is a disease that affects bone mass and in turn the quality of life of more than 25% of women after menopause (Osteoporosis Society of Canada, 2003). In fact, it is well established in the literature that peak bone mass is established by late adolescence (Matkovic et al., 1994). Therefore, adolescence provides a unique opportunity to employ strategies aimed at optimizing and maintaining bone mineral status, such as adequate calcium intake, regular weight-bearing physical activity, and proper lifestyle choices (smoking, alcohol consumption, carbonated beverages). Only a few researchers have assessed knowledge of osteoporosis among younger women, their beliefs about the disease, and to what extent they practiced preventative behaviours; these studies report a lack of knowledge about osteoporosis risk factors, inadequate calcium intake and exercise, and perceptions of low risk for developing osteoporosis among college women (Kasper et al., 2001; Kasper et al., 1994) whereas there are no studies on the relationship between specific social constructs, osteoporosis-related behaviours and bone health status in adolescent females.

This novel research program aims to examine the socio-behavioural determinants of optimal bone health and osteoporosis risk factors in adolescent females, and to develop, implement and evaluate potential population specific interventions sensitive to the pathways that connect socio-behavioural determinants to this chronic health problem. The first stage of this research that is the focus of this Ethics application will examine young females' specific socio-behavioural factors related to osteoporosis, and will evaluate lifestyle risk factors and preventative behaviours, such as menstrual history, smoking, caffeine intake, and dietary and exercise habits. Participants will be recruited from six randomly selected high schools from the population of all schools within the Niagara and Halton Regions.

10. **Methods:**

Are any of the following procedures or methods involved in this study? Check **all** that apply.

[ ] Questionnaire (mail)

[ ] Questionnaire (email/web)

[x] Questionnaire (in person)

[ ] Interview(s) (telephone)

[ ] Interview(s) (in person)

[ ] Secondary Data

[ ] Computer-administered tasks

[ ] Focus Groups

[ ] Journals

[ ] Audio/video taping (specify)

[ ] Observations

[ ] Invasive physiological measurements (e.g., venipuncture, muscle biopsies)

[x] Non-invasive physical measurement (e.g., exercise, heart rate, blood pressure)

[ ] Analysis of human tissue, body fluids, etc. (Request for Use of Human Tissue Sample attached)

[ ] Other: (specify)

Describe sequentially, and in detail, all of the methods involved in this study and all procedures in which

the research participants will be involved (e.g., paper and pencil tasks, interviews, questionnaires,

physical assessments, physiological tests, time requirements, etc.)

Attach a copy of all questionnaire(s), interview guides, or other test instruments.

Methodology

Once selected schools have been identified, the research team will schedule an information visit to each school during which they will: (1) further discuss the

requirements of the study with teachers and participants, and (2) distribute the information letter and informed consent to be signed by the parents. Parents will also be asked to return a questionnaire on: parent education and household income, family history of osteoporosis, family physical activity and leisure, and family/parental smoking. Upon return of the informed consent letters, the research team will then schedule the first assessment visit during which participants will complete the written questionnaire packet which will be composed of several questionnaires.

Questionnaires: (Each requires 10-15 min to fill out)

Subject Screening and Medical history questionnaire (Appendix A). This general questionnaire will be used to assess menstrual history, smoking history, alcohol and caffeine consumption. A similar questionnaire has already been approved by the Ethics Committee (file #04-284-Falk).

Perceived Stress level (Appendix B) will be assessed using a stress scale, which has been already evaluated for use with adolescents (Cohen et al., 1983).

The PedsQL Multidimensional Fatigue Scale. This fatigue scale (Appendix C) has been previously evaluated for use with adolescents, aged (13-18 years) and having proven reliability and validity (Varni et al., 1998).

Osteoporosis Knowledge (Allinger, 1998) (Appendix D) was developed based on the self-care theory (Orem, 1995), and designed to assess women's level of osteoporosis knowledge. Initial validation of the scale on University students demonstrated acceptable content validity (0.92), a Kruder-Richardson index = 0.83, and was written at a sixth grade reading level.

Osteoporosis Health Beliefs will be measured using the 35-item Osteoporosis Health Belief Scale (OHBS-Appendix E), which is based on the Health Belief Model (Kim et al., 1991). It is designed specifically to assess beliefs related to exercise behaviours and calcium intake, and consists of seven sub-scales: Seriousness, Susceptibility, Health Motivation, Calcium Benefits, Calcium Barriers, Exercise Benefits, and Exercise Barriers. Concurrent validity of the measure has been demonstrated (Stillman et al., 1986) and internal consistency for the OHBS subscales range from 0.61 for health motivation to 0.80 for susceptibility.

Osteoporosis Self-efficacy will be evaluated using the Osteoporosis Self-Efficacy Scale (Appendix F), which consists of 21 items to measure self-efficacy, or confidence, for behaviours related to physical activity and calcium intake (Horan et al., 1998). Criterion-related validity was evaluated (Baecke et al., 1982) and internal consistency was >0.90.

During the second assessment visit, the participants will undergo a Quantitative Ultrasound (QUS) test and will be asked to complete nutritional and physical activity questionnaires:

Dietary Restraint will be assessed using the Three-factor Eating Questionnaire (Stunkard & Messick, 1985) (Appendix G). The cognitive dietary restraint subscale will be used to assess cognitive dietary restraint. This scale has shown adequate validity and reliability (Stunkard & Messick, 1985) and has been used successfully with adolescent populations (Williams et al., 1996).

Dietary Calcium Intake will be estimated using the youth and adolescent food frequency questionnaire (YAQ-Appendix H) (Rockett et al. 1997). This instrument has been developed in a multi-ethnic sample of US children aged 9 to 18 years. Pearson correlation coefficients for reproducibility for nutrients ranged from 0.26 for protein and iron to 0.58 for calcium, and for foods it ranged from 0.39 to 0.57 (Rockett et al. 1995). This questionnaire was previously approved by the Brock University Ethics Committee (file #04-284-Falk).

Physical activity questionnaires: (Godin & Shephard 1985 and Fels Physical Activity Questionnaire – Treuth et al. 2005) (Appendix I). These questionnaires are designed to assess physical activity and have demonstrated adequate validity and reliability in adolescent populations (Sallis et al., 1993). Both questionnaires were previously approved by the Ethics Committee (file # 04-284-Falk).

Bone strength will be determined from the speed of sound (SOS) measured by QUS (Sunlight Omnisense^{TM} 7000S, Sunlight Medical, Ltd., Israel) as previously described (Falk et al. 2004).

This ultrasound system consists of a main unit and a hand-held probe that measures the SOS (m/s) of the mid-shaft tibia and the distal 1/3 of the radius. For a detailed description of the device and technique, see Njeh et al. (1999). QUS fits World Health Organization criteria for Osteoporosis diagnosis and has been shown to be sensitive enough to detect changes in tibial QUS scores among pre-pubertal boys over an 8-month period (Falk et al. 2004). In vitro studies suggest that QUS parameters may measure previously unquantified properties of bone fragility (Gluer et al. 1993). Previous studies using calcaneal ultrasound have also demonstrated that QUS can predict vertebral and hip fracture (Bauer et al.1995; Njeh et al. 1997; Porter et al. 1990). This procedure was previously approved by the Ethics Committee (file #04-284-Falk).

Anthropometric measures, including body mass & height, segmental/limb lengths and circumferences, will be measured using standard methods (Durnin and Whomersley 1974). This procedure was previously approved by the Ethics Committee (file #04-284-Falk).

Body fat composition using bio-electrical impedance analysis (BIA): The BIA device creates a mild electrical current (50kHz, 800μA) that passes from electrodes situated on the dorsal part of the hand to electrodes on the dorsal part of the foot. This current is very low and one cannot feel it. There is no discomfort is associated with this measurement (files # Gurd-00-082, Cieslak 01-010).

11. **Professional Expertise/Qualifications:**

Does this procedure require professional expertise/recognized qualifications (*e.g.*, registration as a clinical psychologist, first aid certification)?

[ ] **Yes** [x] **No**

If **YES**, indicate whether you, your supervisor, or any members of your research team have the professional expertise/recognized qualifications required?

12. **Participants:**

Describe the number of participants and any required demographic characteristics (e.g., age, gender).

Seven hundred students in grades 9, 10 and 11 will be recruited from high schools within the Niagara and Halton Regions. The following will serve as general eligibility criteria: Caucasian females, between the ages of 14 – 17 years; able to read, write and understand English. This age group was selected because peak bone mass is usually reached by late adolescence (Fares et al., 2003; Osteoporosis Society of Canada, 2003).

13. **Recruitment:**

Describe how and from what sources the participants will be recruited, including any relationship between the investigator(s), sponsor(s) and participant(s) (e.g., family member, instructor-student; manager-employee).

Attach a copy of any poster(s), advertisement(s) and/or letter(s) to be used for recruitment.

Students will be recruited from six randomly selected high schools from the population of all schools within the Niagara and Halton Regions. Ethics approval from the Board and permission of the Principal will be required prior to recruitment. However, in order to submit an Ethics application to the School Boards the protocol must receive approval by Brock's REB.

14. **Compensation:**	**Yes**	**No**
(a) Will participants receive compensation for participation?	[ ]	[x]

(b) If yes, please provide details.

SECTION C – DESCRIPTION OF THE RISKS AND BENEFITS OF THE PROPOSED RESEARCH

15. **Possible Risks:**

1. Indicate if the participants might experience any of the following risks:

a) Physical risks (including any bodily contact, physical stress, or administration of any substance)? **[x] Yes** **[ ] No**

b) Psychological risks (including feeling demeaned, embarrassed worried or upset, emotional stress)? **[ ] Yes** **[x] No**

c) Social risks (including possible loss of status, privacy, and/or reputation)? **[ ] Yes** **[x] No**

d) Are any possible risks to participants greater than those that the participants might encounter in their everyday life? **[ ] Yes** **[x] No**

e) Is there any deception involved? **[ ] Yes** **[x] No**

f) Is there potential for participants to feel coerced into contributing to this research (*e.g.*, because of regular contact between them and the researcher)? **[ ] Yes** **[x] No**

2. If you answered **Yes** to any of 1a – 1f above, please explain the risk.

The anthropometric and bone assessments involve minor bodily contact.

1. Describe how the risks will be managed and include the availability of appropriate medical or
   Clinical expertise, qualified persons. Explain why less risky alternative

   approaches could not

   be used.

This level of bodily contact is familiar to all subjects through their regular medical check-ups. No researcher will ever be left alone with a participant.

16. **Possible Benefits:**

Discuss any potential direct benefits to the participants from their involvement in the project. Comment on the (potential) benefits to the scientific community/society that would justify involvement of participants in this study.

Participants will gain personal and general knowledge about the human body. In addition, they can gain knowledge about their own bone health.

SECTION D – THE INFORMED CONSENT PROCESS

17. **The Consent Process:**

Describe the process that the investigator(s) will be using to obtain informed consent. Include a description of who will be obtaining the informed consent. If there will be no written consent form, explain why not.

For information about the required elements in the letter of invitation and the consent form, as well as samples, please refer to:
http://www.brocku.ca/researchservices/Certification&Polices/Certification&Polices_App_Guidelines.html

If applicable, attach a copy of the Letter of Invitation, the Consent Form, the content of any telephone script, and any other material that will be utilized in the informed consent process.

18. **Consent by an authorized party:**

If the participants are minors or for other reasons are not competent to consent, describe the proposed alternative source of consent, including any permission form to be provided to the person(s) providing the alternative consent.

The participants will an assent to participate and one of their parents will sign an informed consent form, which will be administered and explained in person by one of the investigators (Appendix J).

19. **Alternatives to prior individual consent:**

If obtaining individual participant consent prior to commencement of the research project is not appropriate

for this research, please explain and provide details for a proposed alternative consent process.

20. **Feedback to Participants:**

Explain what feedback/ information will be provided to the participants after participation in the project. Include, for example, a more complete description of the purpose of the research, and access to the results of the research. Also, describe the method and timing for delivering the feedback.

When data collection is complete, a letter of information, including personal and, if available, standardized results will be sent to all participants upon request. If any problematic cases appear during data collection, such as unusual low bone strength, the parents will be informed in order to contact their physician for follow up.

21. **Participant withdrawal:**

a) Describe how the participants will be informed of their right to withdraw from the project. Outline the procedures that will be followed to allow the participants to exercise this right.

Participants will be informed orally and in the consent form of their right to withdraw from the project at any time. Data, if collected, will be discarded.

b) Indicate what will be done with the participant's data and any consequences that withdrawal might have on the participant, including any effect that withdrawal may have on participant compensation.

Data, if collected, will be discarded.

SECTION E – CONFIDENTIALITY & ANONYMITY

***Confidentiality*:** information revealed by participants that holds the expectation of privacy. This means that all data collected will not be shared with anyone except the researchers listed on this application.

***Anonymity of data*:** information revealed by participants will not have any distinctive character or recognition factor, such that information can be matched **(even by the researcher)** to individual participants. Any information collected using audio-taping, video recording, or interview cannot be considered anonymous. **Please note that this refers to the anonymity of the data itself and not the reporting of results.**

22. Given the definitions above,

a) Will the data be treated as confidential? [**x**] **Yes** [ ] **No**

b) Are the data anonymous? [ ] **Yes** [**x**] **No**

c) State who will have access to the data.

Only the investigators

d) Describe the procedures to be used to ensure anonymity of participants and/or confidentiality of data both during the conduct of the research and in the release of its findings.

The research will be conducted in a room designated for the study and participants will be tested individually. Therefore, data will be seen only by the subject and the investigators. Results will be published anonymously and only as group data (i.e. centrality and variability measures only). No individual data will be published.

e) If participant anonymity and/or confidentiality is not appropriate to this research project, explain, providing details, how all participants will be advised that data will not be anonymous or confidential.

Confidentiality will be explained orally and in the consent form.

f) Explain how written records, video/audio tapes, and questionnaires will be secured, and provide details of their final disposal or storage (including for how long they will be secured and the disposal method to be used).

Records will be stored in a locked cabinet the lab of the principle investigator. Final disposal (shredding) will not take place until 5 years after publication.

SECTION F -- SECONDARY USE OF DATA

23. a) Is it your intention to reanalyze the data for purposes other than described in this application?

[ ] **Yes**

[x] **No**

b) Is it your intention to allow the study and data to be reanalyzed by colleagues, students, or other researchers outside of the original research purposes? If this is the case, explain how you will allow your participants the opportunity to choose to participate in a study where their data would be distributed to others (state how you will contact participants to obtain their re-consent)

No. Participants will be informed that the data MAY be used for secondary analysis by the investigators.

If there are no plans to reanalyze the data for secondary purposes and, yet, you wish to keep the data indefinitely, please explain why.

SECTION G -- MONITORING ONGOING RESEARCH

24. **Annual Review and Serious Adverse Events (SAE):**

a) Minimum review requires the completion of a "Renewal/Project Completed" form at least annually.
Indicate whether any additional monitoring or review would be appropriate for this project.

It is the investigator's responsibility to notify the REB using the "Renewal/Project Completed" form, when the project is completed or if it is cancelled.
http://www.brocku.ca/researchservices/Forms/Forms.html

No additional monitoring is necessary.

* **Serious adverse events** (unanticipated negative consequences or results affecting participants) **must be reported** to the Research Ethics Officer and the REB Chair,

as soon as possible and, in any event, no more than 3 days subsequent to their occurrence.

25. **COMMENTS**

If you experience any problems or have any questions about the Ethics Review Process at Brock University, please feel free to contact the Research Ethics Office at (905) 688-5550 ext 3035, or reb@brocku.ca

Invitation Letter

Socio-behavioural determinants of bone health in adolescent females

Principal Investigators: Dr. Nota Klentrou and Dr. Kimberley Gammage, Department of Physical Education and Kinesiology, Brock University

We would like to invite your daughter to participate in the present study, which investigates socio-behavioural determinants of bone health as assessed by a new ultrasound technique, in adolescent females.

The **purpose** of this research project is to examine young females' specific socio-behavioural factors related to osteoporosis, and will evaluate lifestyle risk factors and preventative behaviours.

Tests and measurements will be completed during two visits in your school of approximately 1 hour each. Briefly, measurements include bone strength (using ultrasound), physical characteristics, and filling out several questionnaires.

Participation in this project will allow you to have personal information on your bone strength, as well as other information, such as height, weight and percent body fat.

This research is being performed only by Brock University researchers in the Applied Physiology Laboratory.

If you have any pertinent questions about your rights as a research participant, please contact the Brock University Research Ethics Officer (905 688-5550 ext 3035, reb@brocku.ca)

If you have any questions, please feel free to contact us.

Thank you

Nota Klentrou, PhD

Department of Physical Education and Kinesiology
Faculty of Applied Health Sciences
Brock University
Tel: 905-688-5550 ext 4538
email: <nota.klentrou@brocku.ca>

This study has been reviewed and received ethics clearance through Brock University's Research Ethics Board (file # 06-351)

CONSENT/ASSENT TO PARTICIPATE IN RESEARCH

Socio-behavioural determinants of bone health in adolescent females

You are being invited to participate in a research study being conducted by the investigators listed below. Prior to participating in this study please read this form to find out about the purpose and the tests of this study. This study is part of the Department of Physical Education and Kinesiology (PEKN) in the Faculty of Applied Health Sciences of Brock University.

INVESTIGATOR:	DEPARTMENT:	CONTACT:
Dr. Nota Klentrou	PEKN, Brock University	(905) 688-5550 ex. 4538
Dr. Kimberley Gammage	PEKN, Brock University	(905) 688-5550 ex. 3772

PURPOSE:

The purpose of this project is application will examine young females' specific socio-behavioural factors related to osteoporosis, and will evaluate lifestyle risk factors and preventative behaviours.

DESCRIPTION OF TESTING PROCEDURES:

The questionnaires and tests described below will be completed during two visits in your school of approximately 1 hour each. At the end of the study, a summary of your personal results and the summarized findings will be available, upon request. The procedures include:

1. Completion of several questionnaires, outlining your medical history, perceived stress, fatigue levels, osteoporosis knowledge, self-efficacy, health beliefs, physical activities and nutritional habits. In all questionnaires, you may chose not to answer any question without penalty. ***Parents will also be asked to return a questionnaire on: parent education and household income, family history of osteoporosis, family physical activity and leisure, and family/parental smoking. A SELF-ADDRESSED ENVELOPE WILL BE PROVIDED.***
2. Determination of your physical characteristics, including height and weight, arm and leg length and circumference. This procedure is quick and causes no discomfort.
3. Estimation of relative body fat using bioelectrical impedance analysis. The BIA device creates a mild electrical current (50kHz, 800 μA) that passes from electrodes situated on the back of your hand, through the body, to electrodes on the top of your feet. This current is very low and one cannot feel it. The measurement is quick, and no discomfort is associated with this measurement.
4. Bone strength will be determined from the speed of sound (SOS) measured by Quantitative Ultrasound (Sunlight Omnisense^{TM} 7000S, Sunlight Medical, Ltd., Israel). This ultrasound system consists of a main unit and a hand-held probe that measures the

SOS (m/s) of the mid-shaft tibia and the distal 1/3 of the radius. The measurement quick and no discomfort is associated with this measurement.

CONFIDENTIALITY

All data collected during this study will remain confidential and will be stored in offices and on secured computers to which only the principal and co-investigators have access. You should be aware that the results of this study may be made available to scientists, through publication in a scientific journal but your name and any personal data of you will not appear in the compiling or publishing these results. Additionally, you will have access to your own data, as well as the group data when it becomes available and if you are interested.

PARTICIPATION & WITHDRAWL

You can choose whether to participate in this study or not. You may remove your data from the study if you wish. You may also refuse to answer any questions posed to you during the study and still remain as a subject in the study. The investigators reserve the right to withdraw you from the study if they believe that it is necessary.

RISKS AND BENEFITS

Participation will allow you to gain personal and general knowledge about the human body and your bone health status. Additionally, if any unusually low or high result is attained for any of the measurements, reflecting a possible health-related problem, you and/or your parents will be alerted and advised to consult your physician. All results will be provided to you and/or your parents upon request. There are no foreseeable risks in your participation in this research study.

RIGHTS OF RESEARCH PARTICIPANTS

You will receive a signed copy of this ethics form. You may withdraw your consent to participate in this study at any time, and you may also discontinue participation at any time without penalty. In signing this consent form or in participating in this study, you are not waiving any legal claims or remedies. This study has been reviewed and received clearance from the Brock University Ethics Board (file # 06-351). If you have any pertinent questions about your rights as a research participant, please contact the Brock University research Ethics Office (905-688-5550 ext. 3035, reb@brocku.ca)

INFORMATION:

Please contact Dr. Nota Klentrou at 905-688-5550 ex 4538 or Dr. Kimberley Gammage at 905-688-5550 ex 3772, if you have any questions about the study.

I HAVE READ AND UNDERSTAND THE ABOVE EXPLANATION OF THE PURPOSE AND PROCEDURES OF THE PROJECT. I HAVE ALSO RECEIVED A SIGNED COPY OF THE INFORMATION

AND CONSENT FORM. MY QUESTIONS HAVE BEEN ANSWERED TO MY SATISIFACTION AND I AGREE TO PARTICIPATE IN THIS STUDY.

SIGNATURE of PARENT/GUARDIAN	DATE
PRINTED NAME OF PARTICIPANT	DATE
WITNESS	DATE
PRINTED NAME OF WITNESS	

INVESTIGATOR

In my judgment, the participant is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent and participate in this research study.

SIGNATURE OF INVESTIGATOR	DATE

Example Letter to the Principal

Name of High School

Dear Principal,

We have received permission from the **Name of School Board** to conduct our study entitled "Socio-Behavioural Determinants of Bone Health in Adolescent Females", and we have randomly selected your school to participate. This novel research program aims to examine the socio-behavioural determinants of optimal bone health and osteoporosis risk factors in adolescent females, and to develop, implement and evaluate potential population specific interventions sensitive to the pathways that connect socio-behavioural determinants to this chronic health program. The first stage of this research will examine young females' specific socio-behavioural factors related to osteoporosis, and will evaluate lifestyle risk factors and preventative behaviours, such as menstrual history, smoking, caffeine intake, and dietary and exercise habits.

Participation will allow students to gain personal and general knowledge about the human body and their bone health status. Additionally, if any unusually low or high result is attained for any of the measurements, reflecting a possible health-related problem, the student and/or parents will be alerted and advised to consult their physician. Personal data will be kept confidential and will be available to the students and/or parents only upon request. There are no foreseeable risks in participating in this research study.

The number of students required from **Name of High School** will be approximately 100 from grades 9, 10 and 11. The participants will be required for two visits, the first being dedicated to the in-class completion of a number of questionnaires. This will take approximately one period and preferably done during their Physical Education or Exercise Science class. The second visit will consist of anthropometric measurements including height, weight and percent body fat (using a non-invasive and touch free bioelectrical impedance device), as well as a bone ultrasound at the tibia and radius. This visit will take about twenty minutes of their Physical Education or Exercise Science class.

The research team would like to schedule a meeting with you to discuss this project in more detail and to confirm a start date. We are willing to make a presentation relating to bone health and supply additional material for the teachers and students for better incorporation of this research into the PE curriculum. Visits to the University laboratories

can also be arranged upon request by teachers. Please contact the project coordinator Brianna Holmes (by email: bh03iv@brocku.ca or by phone: (905) 688-5550 ext 5623) to set up a meeting at your earliest convenience.

Sincerely,

Panagiota (Nota) Klentrou

Professor and Chair

Department of Physical Education & Kinesiology

Faculty of Applied Health Sciences

Physical Education & Kinesiology

Dr. Nota Klentrou Dr. Kimberley Gammage

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nklentrou@brocku.ca kgammage@brocku.ca

Socio-behavioural determinants of bone health in adolescent females

Questionnaire Package A

(Adolescent Participants)

Name: _____	ID: _____
Date of Birth: _____	Date of Testing: _____
Grade: _____	School: _____
Phone: _____	Email: _____
Dominant Hand: _____	Dominant Leg: _____

DEMOGRAPHIC QUESTIONNAIRE

Your responses to this questionnaire are confidential. You may refuse to answer any of the following questions.

Father's name:———————— Mother's name: ————————

Father's Occupation: ———————— Mother's Occupation: ————————

Father's Education Level: ———————— Mother's Education Level: ————————

Father's Address: ———————— Mother's Address:————————

———————— ————————

———————— ————————

Number of siblings: ———————— Number of people living at home: —

Household Yearly Income:

Less than $ 20,000	**$ 20,000–40,000**	**$ 40,000–70,000**	**more than $70,000**
☐	☐	☐	☐

I do not know

☐

SUBJECT SCREENING AND MEDICAL HISTORY QUESTIONNAIRE

Your responses to this questionnaire are confidential. If you answer "YES" to any of the following questions, please give additional details in the space provided and discuss the matter with one of the investigators. You may refuse to answer any of the following questions.

1. Have you ever had any major joint instability or ongoing chronic pain such as in the knee, back or elbow?

   YES NO

2. Are you currently taking any medication (including aspirin) or have you taken any medication in the last two days?

   YES NO

3. Have you taken any medication in the past six months?

   YES NO

4. Is there any medical condition with which you have been diagnosed and are under the care of a physician (e.g. asthma, diabetes, anorexia)?

   YES NO

5. Do you, or have you in the past, consumed any alcohol on a regular basis?

   YES NO

6. Do you, or have you in the past, smoked on a regular basis?

YES NO

7. Are you, or have you in the past, engaged in any extreme diet?

YES NO

8. Do you, or have you in the past, consumed any nutritional supplements (e.g. calcium, multi-vitamin) on a regular basis?

YES NO

9. Do you, or have you in the past, taken oral contraceptives (birth control pills)
YES NO

10. Have you ever sustained a fracture? (arm, leg)

YES NO

11. Are you, or have you in the past, had your period?

YES NO

If yes, what was your age when you first had your period? _____

12. Are your periods regular

YES NO

If yes, every how many days do you usually have your period? _____

13. Does anybody in your house smokes or has smoked on a regular basis?

YES NO

14. Is anybody in your house engaged in physical activity on a regular basis?

YES NO

If yes, who? _____ How many hours per week? _____

15. Has anybody in your family ever been diagnosed with Osteoporosis?

YES NO

If yes, who? _____

Perceived Stress Scale

INSTRUCTIONS--PLEASE READ CAREFULLY

The questions in this scale asked you about your feelings and thoughts during the last month. In each case, you will be asked to indicate *how often* you felt or thought a certain way. Although some of the questions are similar, there are differences between them and you should treat each one as a separate question. The best approach is to answer each question fairly quickly. That is, don't try to count up the number of times you felt a particular way, but rather indicate the alternative that seems like a reasonable estimate. For each question, choose from the following alternatives:

0. never
1. almost never
2. sometimes
3. fairly often
4. very often

		NEVER 0	ALMOST NEVER 1	SOMETIMES 2	FAIRLY OFTEN 3	VERY OFTEN 4
1	In the last month, how often have you been upset because of something that happened unexpectedly?					
2	In the last month, how often have you felt that you were unable to control the important things in your life?					
3	In the last month, how often have you felt nervous and "stressed"?					
4	In the last month, how often have you dealt successfully with irritating life hassles?					
5	In the last month, how often have you felt that you were effectively coping with important changes that were occurring in your life?					
6	In the past month, how often have you felt confident about your ability to handle your personal problems?					
7	In the past month, how often have you felt that things were going your way?					
8	In the past month, how often have you found that you could not cope with all the things that you had to do?					
9	In the last month, how often have you been able to control irritations in your life?					
10	In the last month, how often have you felt that you were on top of things?					
11	In the last month, how often have you been angered because of things that happened that were outside of your control?					
12	In the last month, how often have you found yourself thinking about things that you have to accomplish?					

13	In the last month, how often have you been able to control the way you spend your time?					
14	In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?					

ID# _____

Date: _____

PedsQL™

Multidimensional Fatigue Scale

Standard Version

TEEN REPORT (ages **13-18**)

DIRECTIONS

On the following page is a list of things that might be a problem for you. Please tell us **how much of a problem** each one has been for you during the **past ONE month** by circling:

0 if it is **never** a problem
1 if it is **almost never** a problem
2 if it is **sometimes** a problem
3 if it is **often** a problem
4 if it is **almost always** a problem

There are no right or wrong answers.
If you do not understand a question, please ask for help.

*In the past **ONE month,** how much of a **problem** has this been for you ...*

GENERAL FATIGUE *(problems with...)*	Never	Almost Never	Some-times	Often	Almost Always
1. I feel tired	0	1	2	3	4
2. I feel physically weak (not strong)	0	1	2	3	4
3. I feel too tired to do things that I like to do	0	1	2	3	4
4. I feel too tired to spend time with my friends	0	1	2	3	4
5. I have trouble finishing things	0	1	2	3	4
6. I have trouble starting things	0	1	2	3	4

SLEEP/REST FATIGUE *(problems with...)*	Never	Almost Never	Some-times	Often	Almost Always
1. I sleep a lot	0	1	2	3	4
2. It is hard for me to sleep through the night	0	1	2	3	4
3. I feel tired when I wake up in the morning	0	1	2	3	4
4. I rest a lot	0	1	2	3	4
5. I take a lot of naps	0	1	2	3	4
6. I spend a lot of time in bed	0	1	2	3	4

COGNITIVE FATIGUE *(problems with...)*	Never	Almost Never	Some-times	Often	Almost Always
1. It is hard for me to keep my attention on things	0	1	2	3	4
2. It is hard for me to remember what people tell me	0	1	2	3	4
3. It is hard for me to remember what I just heard	0	1	2	3	4
4. It is hard for me to think quickly	0	1	2	3	4
5. I have trouble remembering what I was just thinking	0	1	2	3	4
6. I have trouble remembering more than one thing at a time	0	1	2	3	4

OSTEOPOROSIS KNOWLEDGE and BELIEFS

Osteoporosis is a condition in which the bones become very brittle and weak so that they break easily. Below is a list of things that may affect a person's chance of getting osteoporosis. After each one, you are asked to circle the letters that indicate if you think the person is:

ML – MORE LIKELY TO GET OSTEOPOROSIS

LL – LESS LIKELY TO GET OSTEOPOROSIS

NT – IT HAS NOTHING TO DO WITH GETTING OSTEOPOROSIS

DK – YOU DON'T KNOW

1. Eating a diet LOW in milk products.	ML	LL	NT	DK
2. Being menopausal; female "change of life".	ML	LL	NT	DK
3. Having big bones.	ML	LL	NT	DK
4. Eating a diet high in dark-green, leafy vegetables.	ML	LL	NT	DK
5. Having a parent or grandparent who had osteoporosis.	ML	LL	NT	DK
6. Being White with fair skin.	ML	LL	NT	DK
7. Having ovaries surgically removed.	ML	LL	NT	DK
8. Taking cortisone (steroids, e.g., Prednisone).	ML	LL	NT	DK
9. Exercising regularly.	ML	LL	NT	DK

For the next group of questions, you will be asked to choose one answer from several choices. Be sure to choose only one answer. If you think there is more than one answer, choose the best answer. If you are not sure, choose "don't know".

10. Which of the following exercises is the best way to reduce a person's chances of getting osteoporosis?
    A. SWIMMING
    B. WALKING BRISKLY
    C. DOING KITCHEN CHORES, SUCH AS WASHING DISHES OR COOKING
    D. DON'T KNOW

11. Which of the following exercises is the best way to reduce a person's chance of getting osteoporosis?
    A. BICYCLING
    B. YOGA
    C. HOUSE CLEANING
    D. DON'T KNOW

12. How many days a week do you think a person should exercise to strengthen the bones?
    A. 1 DAY A WEEK
    B. 2 DAYS A WEEK
    C. 3 OR MORE DAYS A WEEK
    D. DON'T KNOW

13. What is the least amount of time a person should exercise on each occasion to strengthen the bones?
    A. LESS THAN 15 MINUTES
    B. 20 T0 30 MINUTES
    C. MORE THAN 45 MINUTES
    D. DON'T KNOW

14. Exercise makes bones strong, but it must be hard enough to make breathing:
    A. JUST A LITTLE FASTER
    B. MUCH FASTER, BUT TALKING IS POSSIBLE
    C. SO FAST THAT TALKING IS NOT POSSIBLE
    D. DON'T KNOW

15. Which of the following exercises is the best way to reduce a person's chance of getting osteoporosis?
    A. JOGGING OR RUNNING FOR EXERCISE
    B. GOLFING USING A GOLF CART
    C. GARDENING
    D. DON'T KNOW

16. Which of the following exercises is the best way to reduce a person's chance of getting osteoporosis?
    A. BOWLING
    B. DOING LAUNDRY
    C. AEROBIC DANCING
    D. DON'T KNOW

Calcium is one of the nutrients our body needs to keep bones strong.

17. Which of these is a good source of calcium?
    A. APPLE
    B. CHEESE
    C. CUCUMBER
    D. DON'T KNOW

18. Which of these is a good source of calcium?
    A. WATERMELON
    B. CORN
    C. CANNED SARDINES
    D. DON'T KNOW

19. Which of these is a good source of calcium?
    A. CHICKEN
    B. BROCCOLI
    C. GRAPES
    D. DON'T KNOW

20. Which of these is a good source of calcium?
    A. YOGURT
    B. STRAWBERRIES
    C. CABBAGE
    D. DON'T KNOW

21. Which of these is a good source of calcium?
    A. ICE CREAM
    B. GRAPEFRUIT
    C. RADISHES
    D. DON'T KNOW

22. Which one of the following is the recommended amount of calcium intake for an adult?
    A. 100 MG – 300 MG DAILY
    B. 400 MG – 600 MG DAILY
    C. 800 MG OR MORE DAILY
    D. DON'T KNOW

23. How much milk must an adult drink to meet the recommended amount of calcium?
    A. ½ GLASS DAILY
    B. 1 GLASS DAILY

C. 2 OR MORE GLASSES DAILY
D. DON'T KNOW

24. Which of the following is the best reason for taking a calcium supplement?
A. IF A PERSON SKIPS BREAKFAST
B. IF A PERSON DOES NOT GET ENOUGH CALCIUM FROM DIET
C. IF A PERSON IS OVER 45 YEARS OLD
D. DON'T KNOW

OSTEOPOROSIS HEALTH BELIEFS

For the following questions, please indicate how strongly you agree or disagree by circling the appropriate number (1-5).

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1. You feel your chances of getting osteoporosis in the future are good.	1	2	3	4	5
2. There is a good possibility that you will get osteoporosis.	1	2	3	4	5
3. Your physical health makes it more likely that you will get osteoporosis.	1	2	3	4	5
4. Your chances of getting osteoporosis are great.	1	2	3	4	5
5. Your family history makes it more likely that you will get osteoporosis.	1	2	3	4	5
6. Eating calcium rich foods requires changing your dietary habits which is difficult.	1	2	3	4	5
7. You are afraid you would not be able to always eat calcium rich foods.	1	2	3	4	5
8. Calcium rich foods do not agree with you.	1	2	3	4	5
9. Calcium rich foods are too expensive.	1	2	3	4	5

10. You dislike calcium rich foods.	1	2	3	4	5
11. You would not be so anxious about osteoporosis if you ate calcium rich foods.	1	2	3	4	5
12. Eating calcium rich foods reduces risks of broken bones.	1	2	3	4	5
13. Eating calcium rich foods helps to build bones.	1	2	3	4	5
14. Eating calcium rich foods prevents future problems from osteoporosis.	1	2	3	4	5
15. Eating calcium rich foods prevents future pain.	1	2	3	4	5
16. Exercising regularly reduces risks of broken bones.	1	2	3	4	5
17. You would not be so anxious about osteoporosis if you exercised regularly.	1	2	3	4	5
18. Exercising regularly prevents future pain.	1	2	3	4	5
19. Exercising regularly helps to build bones.	1	2	3	4	5
20. Exercising regularly prevents future problems from osteoporosis.	1	2	3	4	5
21. Exercising regularly interferes with your daily activities.	1	2	3	4	5
22. Exercising regularly can be time consuming.	1	2	3	4	5

23. Exercising regularly can be painful.	1	2	3	4	5
24. Exercising regularly would require starting a new habit which is difficult.	1	2	3	4	5
25. You are not strong enough to exercise regularly.	1	2	3	4	5
26. If you had osteoporosis, your whole life would change.	1	2	3	4	5
27. Your feelings about yourself would change if you got osteoporosis.	1	2	3	4	5
28. The thought of osteoporosis scares you.	1	2	3	4	5
29. Osteoporosis would endanger your marriage (or relationship with a significant other.	1	2	3	4	5
30. Having osteoporosis would make daily activities more difficult.	1	2	3	4	5
31. You frequently do things to improve your health.	1	2	3	4	5
32. You eat a well-balanced diet.	1	2	3	4	5
33. You search for new information related to your health.	1	2	3	4	5
34. You exercise regularly – at least 3 times/week.	1	2	3	4	5
35. Maintaining good health is extremely important to you.	1	2	3	4	5

OSTEOPOROSIS SELF-EFFICACY SCALE

For the following questions, indicate how confident you are with an (X) on the line.

1. **Begin a new or different exercise program.**

Not at all confident Very confident

2. **Change your exercise habits.**

Not at all confident Very confident

3. **Put forth the effort required to exercise.**

Not at all confident Very confident

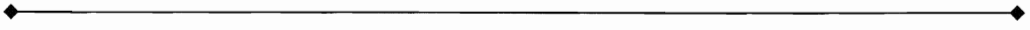
4. **Do exercises even though they are difficult.**

Not at all confident Very confident

5. **Maintain a regular exercise program.**

Not at all confident Very confident

6. **Exercise for the appropriate length of time.**



Not at all confident Very confident

7. **Do exercises even though they are tiring.**

Not at all confident Very confident

8. **Stick to your exercise program.**

Not at all confident Very confident

9. **Exercise at least three times a week.**

Not at all confident Very confident

10. **Do the type of exercises you are supposed to do.**

Not at all confident Very confident

11. **Begin to eat more calcium-rich foods.**

Not at all confident Very confident

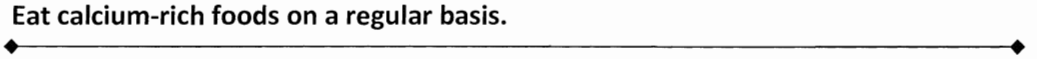
12. **Increase your calcium intake.**

Not at all confident Very confident

13. **Consume adequate amounts of calcium-rich foods.**

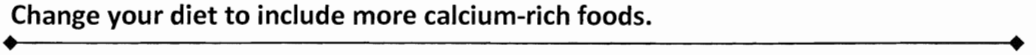
Not at all confident Very confident

14. **Eat calcium-rich foods on a regular basis.**



Not at all confident Very confident

15. **Change your diet to include more calcium-rich foods.**



Not at all confident Very confident

16. Eat calcium-rich foods as often as you are supposed to.

Not at all confident Very confident

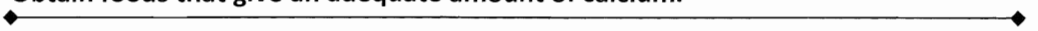
17. Select appropriate foods to increase your calcium intake.

Not at all confident Very confident

18. Stick to a diet which gives an adequate amount of calcium.

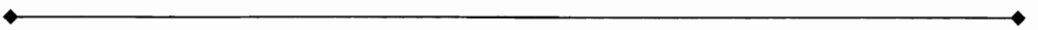
Not at all confident Very confident

19. Obtain foods that give an adequate amount of calcium.



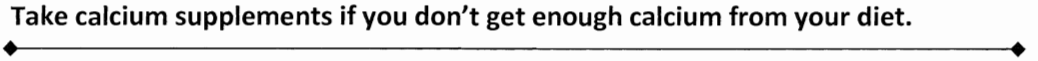
Not at all confident Very confident

20. Remember to eat calcium-rich foods.



Not at all confident Very confident

21. Take calcium supplements if you don't get enough calcium from your diet.



Not at all confident Very confident

DEBQ

Please respond to the following questions by circling the appropriate number according to the following scale:

Never = 1

Seldom = 2

Sometimes = 3

Often = 4

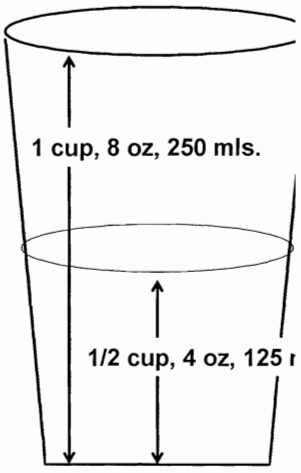
Very Often = 5

1. If you have put on weight, do you eat less than you usually do?	1	2	3	4	5
2. Do you try to eat less at meal times than you would like to eat?	1	2	3	4	5
3. How often do you refuse food or drink offered because you are concerned about your weight?	1	2	3	4	5
4. Do you watch exactly what you eat?	1	2	3	4	5
5. Do you deliberately eat foods that are slimming?	1	2	3	4	5
6. When you have eaten too much, do you eat less than usual the following day?	1	2	3	4	5
7. Do you deliberately eat less in order not to become heavier?	1	2	3	4	5
8. How often do you try not to eat between meals because you are watching your weight?	1	2	3	4	5
9. How often in the evenings do you try not to eat because you are watching your weight?	1	2	3	4	5
10. Do you take into account your weight with what you eat?	1	2	3	4	5

Rapid Assessment Method for Daily Calcium Intake

Record the number of servings you ate on a <u>typical day</u> in the previous 7 days.
(Use the pictures to estimate serving sizes)

MILK -YOGURT-CHEESE	# SERVINGS DAILY
Cheese, 1oz or 6 tbsp.	
Cottage cheese, ½ cup	
Custard, pudding, or cream pie, ½ cup	
Ice cream, frozen yogurt, or milk shake, 1 cup	
Milk or cocoa, 1 cup	
Soy milk, 1 cup	
Yogurt, 1 cup	
Cream soups/sauce, 1 cup	
Macaroni and cheese, 1 cup	
Pizza, 1/8 of 15" (8 slice pizza)	
Quiche, 1/8 of 8"	



FRUITS and VEGETABLES	# SERVINGS DAILY
Broccoli or cooked greens (beet/turnip greens, kale, collards, spinach), ½ cup	
Other vegetables, ½ cup	
Orange juice, 1 cup (enriched with calcium)	
Fruits, ½ cup or 1 small	
MEAL REPLACEMENT PRODUCTS	**# SERVINGS DAILY**
Slim fast, 1 can	
Jenny Craig bar, 1 bar	
Other:_____	

- Fist = 1 cup or 1 medium whole fruit
- Thumb (tip to base) = 1 oz. of meat or cheese
- Thumb tip (tip to 1st joint) = tbsp.
- Index finger (1st to 2nd joint) = 1"
- Palm (minus fingers = 3 oz. of meat, fish, or poultry

BREADS-CEREALS-RICE-PASTA	# SERVINGS DAILY
Bread, 1 slice	
Bread, 1 slice (enriched with calcium)	
Cereal, 1 oz	
Cereal, 1 oz (enriched with calcium)	
2" biscuit/roll	
6" corn tortilla	
3" muffin, cornbread, or doughnut	
Rice, noodles, or pasta, 1 cup	
Pancake, waffle, or French toast, 1 serving	
FAT-SUGAR-ALCOHOL	**# SERVINGS DAILY**
Cake, 1/16 of 9"	
Beer, 12oz	
Colas, 12oz	
Chocolate, 1oz	
MEAT-FISH-POULTRY-DRY BEANS-NUTS	**# SERVINGS DAILY**
Dry beans, cooked (navy, pinto, kidney), 1 cup	
Meat, fish, poultry, 3 oz	
Peanuts, ½ cup	
Almonds, ½ cup	
1 egg	
Salmon (with bones), 3oz	
Sardine (with bones), 3 oz	
3oz shrimp	
7 to 9 oysters	
Tofu, 2 ½"x 2 ½"x 1"	

GODIN-SHEPHARD LEISURE-TIME EXERCISE QUESTIONNAIRE

1. Considering a **7-day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your **free-time** (write on each line the appropriate number)?

Times Per Week

(a) STRENUOUS EXERCISE

(HEART BEATS RAPIDLY) _____

(i.e. running, jogging, hockey, football, soccer, squash, basketball,

cross country skiing, judo, roller skating, vigorous swimming,

vigorous long distance bicycling)

(b) MODERATE EXERCISE

(NOT EXHAUSTING) _____

(i.e. fast walking, baseball, tennis, easy bicycling, volleyball,

badminton, easy swimming, alpine skiing, popular and folk dancing)

(c) MILD EXERCISE

(MINIMAL EFFORT) _____

(i.e. yoga, archery, fishing from river bank, bowling, horseshoes,

golf, snow-mobiling, easy walking)

2. Considering a **7-day period** (a week), during your leisure-time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

1. OFTEN	**2. SOMETIMES**	**3. NEVER/RARELY**
☐	☐	☐

Physical Activity Questionnaire (High School)

We are trying to find out about your level of physical activity from ***the last 7 days*** (in the last week). These include sports or dance that make you sweat or make your legs feel tired, or games that make you breathe hard, like tag, skipping, running, climbing, and others.

Remember:

1. There are no right and wrong answers — this is not a test.
2. Please answer all the questions as honestly and accurately as you can — this is very important.

1. Physical activity in your spare time: Have you done any of the following activities in the past 7 days (last week)? If yes, how many times? (Mark only one circle per row.)

	No	1-2	3-4	5-6	7 times or more
Skipping	❍	❍	❍	❍	❍
Rowing/Canoeing	❍	❍	❍	❍	❍
In-line skating	❍	❍	❍	❍	❍
Tag	❍	❍	❍	❍	❍
Walking for exercise	❍	❍	❍	❍	❍
Bicycling	❍	❍	❍	❍	❍
Jogging or running	❍	❍	❍	❍	❍
Aerobics	❍	❍	❍	❍	❍
Swimming	❍	❍	❍	❍	❍
Baseball, softball	❍	❍	❍	❍	❍
Dance	❍	❍	❍	❍	❍
Football	❍	❍	❍	❍	❍
Badminton	❍	❍	❍	❍	❍
Skateboarding	❍	❍	❍	❍	❍
Soccer	❍	❍	❍	❍	❍

Street hockey	❍	❍	❍	❍	❍
Volleyball	❍	(	(	(	(
Floor hockey	(	(	(	(	(
Basketball	(	(	(	(	(
Ice skating	(	(	(	(	(
Cross-country skiing	(	(	(	(	(
Ice hockey/ringette	❍	❍	❍	❍	❍
Other:					
_____	❍	❍	❍	❍	❍
_____	❍	❍	❍	❍	❍

2. In the last 7 days, during your physical education (PE) classes, how often were you very active (playing hard, running, jumping, throwing)? (Check one only.)

I don't do PE ..... ❍
Hardly ever ..... ❍
Sometimes ..... ❍
Quite often ..... ❍
Always ..... ❍

3. In the last 7 days, what did you normally do *at lunch* (besides eating lunch)? (Check one only.)

Sat down (talking, reading, doing schoolwork..... ❍
Stood around or walked around ..... ❍
Ran or played a little bit ..... ❍
Ran around and played quite a bit ..... ❍
Ran and played hard most of the time ..... ❍

4. In the last 7 days, on how many days *right after school*, did you do sports, dance, or play games in which you were very active? (Check one only.)

None ..... ❍
1 time last week ..... ❍
2 or 3 times last week ..... ❍
4 times last week ..... ❍
5 times last week ..... ❍

5. In the last 7 days, on how many *evenings* did you do sports, dance, or play games in which you were very active? (Check one only.)

None ..... ❍
1 time last week ..... ❍
2 or 3 times last week ..... ❍
4 or 5 last week ..... ❍
6 or 7 times last week ..... ❍

6. *On the last weekend*, how many times did you do sports, dance, or play games in which you were very active? (Check one only.)

None ..... ❍
1 time ..... ❍
2 — 3 times ..... ❍
4 — 5 times ..... ❍
6 or more times ..... ❍

7. Which *one* of the following describes you best for the last 7 days? Read *all five* statements before deciding on the *one* answer that describes you.

F. All or most of my free time was spent doing things that involve little physical effort..... ❍

G. I sometimes (1 — 2 times last week) did physical things in my free time (e.g. played sports, went running, swimming, bike riding, did aerobics) ..... ❍

H. I often (3 — 4 times last week) did physical things in my free time..... ❍

I. I quite often (5 — 6 times last week) did physical things in my free time.....❍

J. I very often (7 or more times last week) did physical things in my free time...❍

8. Mark how often you did physical activity (like playing sports, games, doing dance, or any other physical activity) for each day last week.

	None	Little bit	Medium	Often	Very often
Monday	❍	❍	❍	❍	❍
Tuesday	❍	❍	❍	❍	❍
Wednesday	❍	❍	❍	❍	❍
Thursday	❍	❍	❍	❍	❍
Friday	❍	❍	❍	❍	❍
Saturday	❍	❍	❍	❍	❍
Sunday	❍	❍	❍	❍	❍

9. Were you sick last week, or did anything prevent you from doing your normal physical activities? (Check one.)

Yes ..... ❍
No .....❍

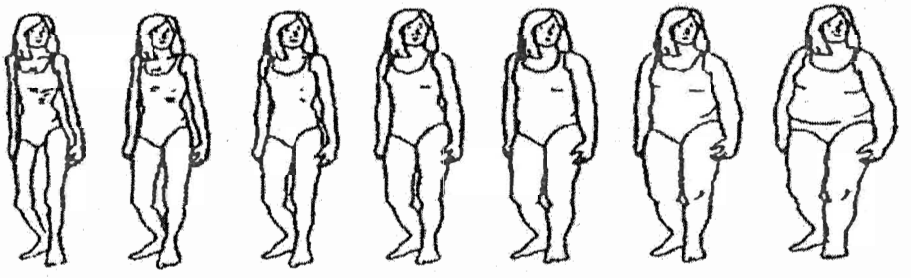
If Yes, what prevented you? _____

Child

Girls Body Image Scale

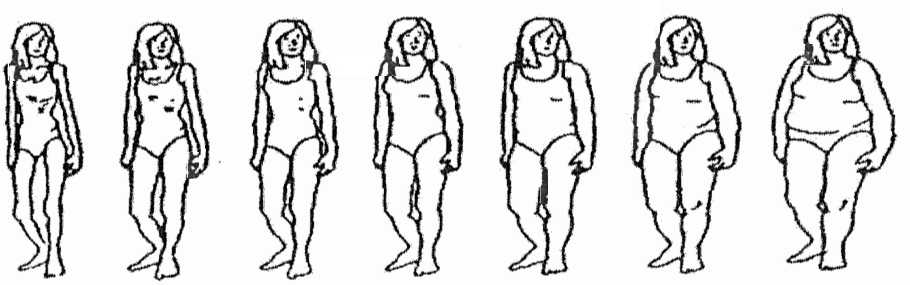
Answer the questions by placing an x in the box of the picture you choose.

Which girl do you look most like?



☐ ☐ ☐ ☐ ☐ ☐ ☐

Which girl would you like to look like most?



☐ ☐ ☐ ☐ ☐ ☐ ☐

Parental Questionnaire

Thank you for agreeing to allow your adolescent daughter to participate in this important study and agreeing to complete this questionnaire. We want to remind you that all of the information you provide will be kept strictly confidential and will be coded anonymously so that your name and your child's name are not associated with answers to any questions. Once you are done, place the completed questionnaire into the envelope provided. Seal the envelope and send it back to school with your daughter and the consent form. If you have any questions or difficulties understanding any of the items on this questionnaire or if you need any help, please call Dr. Nota Klentrou at 905-688-5550 (ext 4538) or the Project Coordinator, Brianna Holmes, at 905-688-5550 (ext 5623).

Are you male or female?

MALE ↓	FEMALE ↓
What is your relationship to this child?	**What is your relationship to this child?**
☐ BIRTH Father	☐ BIRTH Mother
☐ STEP Father	☐ STEP Mother
☐ ADOPTIVE Father	☐ ADOPTIVE Mother
☐ FOSTER Father	☐ FOSTER mother
☐ Brother	☐ Sister
☐ Grandfather	☐ Grandmother
☐ Other relative	☐ Other relative
☐ Other, not related	☐ Other, not related

Are you currently married, widowed, divorced, separated, or have you never been married?

☐ married and living with spouse (including common-law)

☐ separated

☐ divorced

☐ widowed

☐ never married

☐ Other - Specify: _____

In your opinion, how physically active you are compared to others the same age and sex?

- much more
- moderately more
- equally
- moderately less
- much less

Y O U:	Spouse/Commonlaw Partner: (If applicable)
When were you born? _____/___/_____ (mm / dd / yyyy)	**When was your spouse/partner born?** _____/___/_____ (mm / dd / yyyy)
In what country were you born?	**In what country was your spouse/partner bo**
Canada	**Canada**
China	**China**
France	**France**
Germany	**Germany**
Greece	**Greece**
Guyana	**Guyana**
Hong Kong	**Hong Kong**
Hungary	**Hungary**
India	**India**

☐ **Italy** ☐ **Jamaica** ☐ **Netherlands / Holland** ☐ **Philippines** ☐ **Poland** ☐ **Portugal** ☐ **United Kingdom** ☐ **United States** ☐ **Viet Nam** ☐ **Other – Specify:** _____	☐ **Italy** ☐ **Jamaica** ☐ **Netherlands / Holland** ☐ **Philippines** ☐ **Poland** ☐ **Portugal** ☐ **United Kingdom** ☐ **United States** ☐ **Viet Nam** ☐ **Other – Specify:** _____
What is your current: Height _____ cm/inches Weight _____ kg/lbs	**What is your current:** Height _____ cm/inches Weight _____ kg/lbs

Household Yearly Income:

Less than $ 20,000	**$ 20,000–40,000**	**$ 40,000–70,000**	**< $70,000**
☐	☐	☐	☐

What is the highest grade in school that you have had the opportunity to complete?	What is the highest grade in school that you spouse had the opportunity to complete?
☐ Less than grade 6 ☐ grade 6 ☐ grade 7 ☐ grade 8 ☐ grade 9 ☐ grade 10 ☐ grade 11 ☐ grade 12 ☐ high school graduate/GED ☐ partial college (at least one year) or training ☐ standard college or university (undergraduate degree) ☐ graduate or professional training (graduate degree)	☐ Less than grade 6 ☐ grade 6 ☐ grade 7 ☐ grade 8 ☐ grade 9 ☐ grade 10 ☐ grade 11 ☐ grade 12 ☐ high school graduate/GED ☐ partial college (at least one year) or training ☐ standard college or university (undergraduate degree) ☐ graduate or professional training (grad degree)
Are you currently:	**Is your spouse/partner currently:**
☐ Working full-time ☐ Working part-time ☐ With a job but not at work because of temporary illness, vacation, strike ☐ Unemployed, laid off, looking for work	☐ Working full-time ☐ Working part-time ☐ With a job but not at work because of temporary illness, vacation, strike ☐ Unemployed, laid off, looking for work

☐ **Disable, too ill to work (permanent)**	☐ **Disable, too ill to work (permanent)**
☐ **Retired**	☐ **Retired**
☐ **In school**	☐ **In school**
☐ **Staying at home (by choice)**	☐ **Staying at home (by choice)**
☐ **Other – Specify: _____**	☐ **Other – Specify: _____**

How many adults 18 years of age or older live in your home (including yourself)?

Number of adults (at least 18 years of age): _____

How many children under the age of 18 live in your home (including the child that brought home this survey)?

Number of children (under 18 years of age): _____

Thinking about where you live now, do you rent the living space, or own it?

☐ Rent ☐ Own

What type of place is it?

☐ House

☐ Apartment

☐ Townhouse/Condominium

☐ Other - Specify: _____

How long have you lived at this address? _____(# years) or _____ (# of months)

Now we want to ask you some questions about the neighborhood in which you live.
What do you usually do for transportation? (check only one)

- ☐ Drive a car that you own
- ☐ Drive a car that you borrow
- ☐ Have a relative, friend, or neighbor drive you
- ☐ Take public transit
- ☐ Take a taxi
- ☐ Ride a bike
- ☐ Walk

How do you feel about your neighborhood as a place to bring up children?

- ☐ excellent
- ☐ good
- ☐ average
- ☐ poor
- ☐ very poor

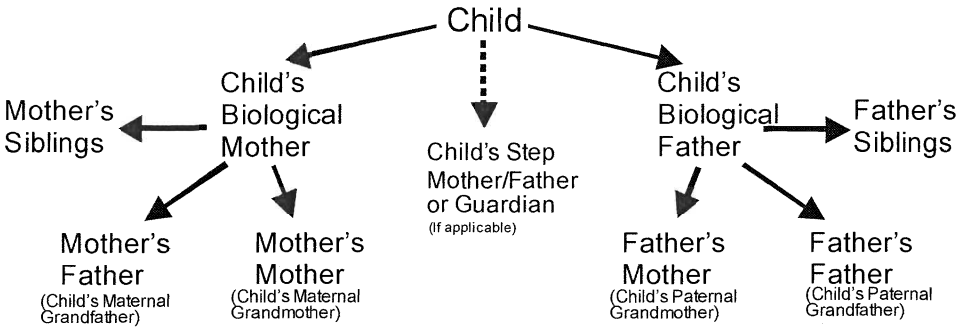
Including all household members and regular visitors, does anyone smoke <u>inside</u> your home, every day or almost every day? (including cigarettes, cigars, and pipes)

- ☐ Yes → If yes, how many people smoke inside the home? _____
- ☐ No

In the past month, was your daughter exposed to second-hand smoke, every day or almost every day, in a car or other private vehicle?

☐ Yes ☐ No

Please circle all family members that have been diagnosed by a health professional as having OSTEOPOROSIS or low Bone Mineral Density.



LEISURE-TIME EXERCISE QUESTIONNAIRE

3. Considering a **7-day period** (a week), how many times on the average do **YOU** do the following kinds of exercise for **more than 15 minutes** during your **free-time** (write on each line the appropriate number)?

Times Per Week

(a) STRENUOUS EXERCISE

(HEART BEATS RAPIDLY) _____

(i.e. running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

(b) MODERATE EXERCISE

(NOT EXHAUSTING) _____

(i.e. fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

(c) MILD EXERCISE

(MINIMAL EFFORT) _____

(i.e. yoga, archery, fishing from river bank, bowling, horseshoes,

golf, snow-mobiling, easy walking)

4. Considering a **7-day period** (a week), during your leisure-time, how often do you engage in any regular activity long enough to work up a sweat (heart beats rapidly)?

1. OFTEN	**2. SOMETIMES**	**3.**
NEVER/RARELY		
☐	☐	☐

OSTEOPOROSIS KNOWLEDGE and BELIEFS

Osteoporosis is a condition in which the bones become very brittle and weak so that they break easily. Below is a list of things that may affect a person's chance of getting osteoporosis. After each one, you are asked to circle the letters that indicate if you think the person is:

ML – MORE LIKELY TO GET OSTEOPOROSIS

LL – LESS LIKELY TO GET OSTEOPOROSIS

NT – IT HAS NOTHING TO DO WITH GETTING OSTEOPOROSIS

DK – YOU DON'T KNOW

1. Eating a diet LOW in milk products.	ML	LL	NT	DK
2. Being menopausal; female "change of life".	ML	LL	NT	DK
3. Having big bones.	ML	LL	NT	DK
4. Eating a diet high in dark-green, leafy vegetables.	ML	LL	NT	DK
5. Having a parent or grandparent who had osteoporosis.	ML	LL	NT	DK
6. Being White with fair skin.	ML	LL	NT	DK
7. Having ovaries surgically removed.	ML	LL	NT	DK
8. Taking cortisone (steroids, e.g., Prednisone).	ML	LL	NT	DK
9. Exercising regularly.	ML	LL	NT	DK

For the next group of questions, you will be asked to choose one answer from several choices. Be sure to choose only one answer. If you think there is more than one answer, choose the best answer. If you are not sure, choose "don't know".

10.Which of the following exercises is the best way to reduce a person's chances of getting osteoporosis?

E. SWIMMING
F. WALKING BRISKLY
G. DOING KITCHEN CHORES, SUCH AS WASHING DISHES OR COOKING
H. DON'T KNOW

11.Which of the following exercises is the best way to reduce a person's chance of getting osteoporosis?

I. BICYCLING
J. YOGA
K. HOUSE CLEANING
L. DON'T KNOW

12. How many days a week do you think a person should exercise to strengthen the bones?

A. 1 DAY A WEEK
B. 2 DAYS A WEEK
C. 3 OR MORE DAYS A WEEK
D. DON'T KNOW

13. What is the least amount of time a person should exercise on each occasion to strengthen the bones?

A. LESS THAN 15 MINUTES
B. 20 T0 30 MINUTES
C. MORE THAN 45 MINUTES
D. DON'T KNOW

14. Exercise makes bones strong, but it must be hard enough to make breathing:

A. JUST A LITTLE FASTER
B. MUCH FASTER, BUT TALKING IS POSSIBLE
C. SO FAST THAT TALKING IS NOT POSSIBLE
D. DON'T KNOW

15. Which of the following exercises is the best way to reduce a person's chance of getting osteoporosis?

A. JOGGING OR RUNNING FOR EXERCISE
B. GOLFING USING A GOLF CART
C. GARDENING
D. DON'T KNOW

16. Which of the following exercises is the best way to reduce a person's chance of getting osteoporosis?

A. BOWLING
B. DOING LAUNDRY
C. AEROBIC DANCING
D. DON'T KNOW

Calcium is one of the nutrients our body needs to keep bones strong.

17. Which of these is a good source of calcium?
    A. APPLE
    B. CHEESE
    C. CUCUMBER
    D. DON'T KNOW
18. Which of these is a good source of calcium?
    A. WATERMELON
    B. CORN
    C. CANNED SARDINES
    D. DON'T KNOW
20. Which of these is a good source of calcium?
    E. CHICKEN
    F. BROCCOLI
    G. GRAPES
    H. DON'T KNOW
21. Which of these is a good source of calcium?
    E. YOGURT
    F. STRAWBERRIES
    G. CABBAGE
    H. DON'T KNOW
22. Which of these is a good source of calcium?
    E. ICE CREAM
    F. GRAPEFRUIT
    G. RADISHES
    H. DON'T KNOW
23. Which one of the following is the recommended amount of calcium intake for an adult?
    E. 100 MG – 300 MG DAILY
    F. 400 MG – 600 MG DAILY
    G. 800 MG OR MORE DAILY
    H. DON'T KNOW
24. How much milk must an adult drink to meet the recommended amount of calcium?
    E. ½ GLASS DAILY
    F. 1 GLASS DAILY
    G. 2 OR MORE GLASSES DAILY
    H. DON'T KNOW
25. Which of the following is the <u>best reason</u> for taking a calcium supplement?
    E. IF A PERSON SKIPS BREAKFAST
    F. IF A PERSON DOES NOT GET ENOUGH CALCIUM FROM DIET
    G. IF A PERSON IS OVER 45 YEARS OLD
    H. DON'T KNOW

OSTEOPOROSIS HEALTH BELIEFS

For the following questions, please indicate how strongly you agree or disagree by circling the appropriate number (1-5).

	Strongly Disagree	Disagree	Undecided	Agree	Strongly Agree
1. You feel your chances of getting osteoporosis in the future are good.	1	2	3	4	5
2. There is a good possibility that you will get osteoporosis.	1	2	3	4	5
3. Your physical health makes it more likely that you will get osteoporosis.	1	2	3	4	5
4. Your chances of getting osteoporosis are great.	1	2	3	4	5
5. Your family history makes it more likely that you will get osteoporosis.	1	2	3	4	5
6. Eating calcium rich foods requires changing your dietary habits which is difficult.	1	2	3	4	5
7. You are afraid you would not be able to always eat calcium rich foods.	1	2	3	4	5
8. Calcium rich foods do not agree with you.	1	2	3	4	5

9. Calcium rich foods are too expensive.	1	2	3	4	5
10. You dislike calcium rich foods.	1	2	3	4	5
11. You would not be so anxious about osteoporosis if you ate calcium rich foods.	1	2	3	4	5
12. Eating calcium rich foods reduces risks of broken bones.	1	2	3	4	5
13. Eating calcium rich foods helps to build bones.	1	2	3	4	5
14. Eating calcium rich foods prevents future problems from osteoporosis.	1	2	3	4	5
15. Eating calcium rich foods prevents future pain.	1	2	3	4	5
16. Exercising regularly reduces risks of broken bones.	1	2	3	4	5
17. You would not be so anxious about osteoporosis if you exercised regularly.	1	2	3	4	5
18. Exercising regularly prevents future pain.	1	2	3	4	5
19. Exercising regularly helps to build bones.	1	2	3	4	5
20. Exercising regularly prevents future problems from osteoporosis.					

	1	2	3	4	5
21. Exercising regularly interferes with your daily activities.	1	2	3	4	5
22. Exercising regularly can be time consuming.	1	2	3	4	5
23. Exercising regularly can be painful.	1	2	3	4	5
24. Exercising regularly would require starting a new habit which is difficult.	1	2	3	4	5
25. You are not strong enough to exercise regularly.	1	2	3	4	5
26. If you had osteoporosis, your whole life would change.	1	2	3	4	5
27. Your feelings about yourself would change if you got osteoporosis.	1	2	3	4	5
28. The thought of osteoporosis scares you.	1	2	3	4	5
29. Osteoporosis would endanger your marriage (or relationship with a significant other).	1	2	3	4	5
30. Having osteoporosis would make daily activities more difficult.	1	2	3	4	5
31. You frequently do things to improve your health.	1	2	3	4	5

32. You eat a well-balanced diet.	1	2	3	4	5
33. You search for new information related to your health.	1	2	3	4	5
34. You exercise regularly – at least 3 times/week.	1	2	3	4	5
35. Maintaining good health is extremely important to you.	1	2	3	4	5

OSTEOPOROSIS SELF-EFFICACY SCALE

For the following questions, indicate how confident you are with an (X) on the line.

1. **Begin a new or different exercise program.**

Not at all confident Very confident

2. **Change your exercise habits.**

Not at all confident Very confident

3. **Put forth the effort required to exercise.**

Not at all confident Very confident

4. **Do exercises even though they are difficult.**

Not at all confident Very confident

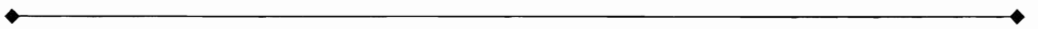
5. **Maintain a regular exercise program.**

Not at all confident Very confident

6. **Exercise for the appropriate length of time.**

Not at all confident Very confident

7. Do exercises even though they are tiring.



Not at all confident Very confident

8. Stick to your exercise program.

Not at all confident Very confident

9. Exercise at least three times a week.

Not at all confident Very confident

10. Do the type of exercises you are supposed to do.

Not at all confident Very confident

11. Begin to eat more calcium-rich foods.

Not at all confident Very confident

12. Increase your calcium intake.

Not at all confident Very confident

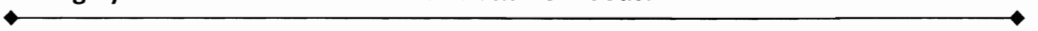
13. Consume adequate amounts of calcium-rich foods.

Not at all confident Very confident

14. Eat calcium-rich foods on a regular basis.

Not at all confident Very confident

15. Change your diet to include more calcium-rich foods.



Not at all confident Very confident

16. Eat calcium-rich foods as often as you are supposed to.

Not at all confident Very confident

17. Select appropriate foods to increase your calcium intake.

Not at all confident Very confident

18. Stick to a diet which gives an adequate amount of calcium.

Not at all confident Very confident

19. Obtain foods that give an adequate amount of calcium.

Not at all confident Very confident

20. Remember to eat calcium-rich foods.

Not at all confident Very confident

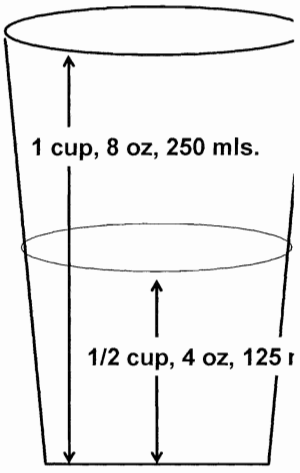
21. Take calcium supplements if you don't get enough calcium from your diet.

Not at all confident Very confident

Rapid Assessment Method for Daily Calcium Intake

Record the number of servings you ate on a <u>typical day</u> in the previous 7 days.
(Use the pictures to estimate serving sizes)

MILK -YOGURT-CHEESE	# SERVINGS DAILY
Cheese, 1oz or 6 tbsp.	
Cottage cheese, ½ cup	
Custard, pudding, or cream pie, ½ cup	
Ice cream, frozen yogurt, or milk shake, 1 cup	
Milk or cocoa, 1 cup	
Soy milk, 1 cup	
Yogurt, 1 cup	
Cream soups/sauce, 1 cup	
Macaroni and cheese, 1 cup	
Pizza, 1/8 of 15" (8 slice pizza)	
Quiche, 1/8 of 8"	



FRUITS and VEGETABLES	# SERVINGS DAILY
Broccoli or cooked greens (beet/turnip greens, kale, collards, spinach), ½ cup	
Other vegetables, ½ cup	
Orange juice, 1 cup (enriched with calcium)	
Fruits, ½ cup or 1 small	
MEAL REPLACEMENT PRODUCTS	**# SERVINGS DAILY**
Slim fast, 1 can	
Jenny Craig bar, 1 bar	
Other:_____	

- Fist = 1 cup or 1 medium whole fruit
- Thumb (tip to base) = 1 oz. of meat or cheese
- Thumb tip (tip to 1st joint) = tbsp.
- Index finger (1st to 2nd joint) = 1"
- Palm (minus fingers = 3 oz. of meat, fish, or poultry

BREADS-CEREALS-RICE-PASTA	# SERVINGS DAILY
Bread, 1 slice	
Bread, 1 slice (enriched with calcium)	
Cereal, 1 oz	
Cereal, 1 oz (enriched with calcium)	
2" biscuit/roll	
6" corn tortilla	
3" muffin, cornbread, or doughnut	
Rice, noodles, or pasta, 1 cup	
Pancake, waffle, or French toast, 1 serving	

FAT-SUGAR-ALCOHOL	# SERVINGS DAILY
Cake, 1/16 of 9"	
Beer, 12oz	
Colas, 12oz	
Chocolate, 1oz	

MEAT-FISH-POULTRY-DRY BEANS-NUTS	# SERVINGS DAILY
Dry beans, cooked (navy, pinto, kidney), 1 cup	
Meat, fish, poultry, 3 oz	
Peanuts, ½ cup	
Almonds, ½ cup	
1 egg	
Salmon (with bones), 3oz	
Sardine (with bones), 3 oz	
3oz shrimp	
7 to 9 oysters	
Tofu, 2 ½"x 2 ½"x 1"	

We have finished asking you questions about yourself, your home and your family. Now we would like to ask you some questions about your daughter.

Once again, we want to remind you that all of your private information will be kept strictly confidential and anonymously so that your name and your child's name are not associated with any answers to any questions.

We would like to ask you some questions about your grade 9, 10 or 11 daughter. Thinking back to around the time when she was born.

On what date was this child born? ____/____/_____

mm/ dd / yyyy

Was this child born on her due date, before the due date or after the due date?

☐ ON the due date

☐ BEFORE due date→ (how many days or weeks before the due date?) _____ (# of days) or _____ (# of weeks)

☐ AFTER due date → (how many days or weeks after the due date?) _____ (# of days) or _____ (# of weeks)

☐ Don't remember or don't know

Was this the mother's first child, second child, etc.?

☐ 1st child ☐ 2nd child ☐ 3rd child ☐ 4th child or more

Was this child a single birth, a twin or triplet?

☐ Single ☐ Twin ☐ Triplet or more

Approximately how much weight did the mother gain during this pregnancy?

_____._____ or _____,_____

(kgs) (grams) (lbs) (ounces)

Approximately how much did this baby weigh at birth?

_____._____ or _____,_____

(kgs) (grams) (lbs) (ounces)

During pregnancy, was the birth mother diagnosed or treated for:

(check all that apply):

- ☐ High blood pressure
- ☐ Diabetes
- ☐ Anaemia
- ☐ Depression/anxiety

How long was this child breast fed for?

- ☐ Not breast fed
- ☐ Less than 1 month
- ☐ 1 – 3 months
- ☐ 3 – 6 months
- ☐ 6 or more months

Did the mother smoke regularly (one or more cigarettes a day) in the year before the pregnancy?

- ☐ Yes → If yes, did the mother stop smoking when she learned she was pregnant?
  - ☐ No
  - ☐ No
    - ☐ Yes, right away
    - ☐ Within 1 month
    - ☐ Within 2 months
    - ☐ After 3 or more months
- ☐ No

Did the mother smoke within the first year after giving birth to this child?

- ☐ No
- ☐ Yes, right away
- ☐ Within 1 month
- ☐ Within 2 months
- ☐ After 3 or more months

Did the mother drink regularly (one or more drinks a day) in the year before the pregnancy?

- ☐ Yes → If yes, did the mother stop smoking when she learned she was pregnant?
  - ☐ No
  - ☐ No
    - ☐ Yes, right away
    - ☐ Within 1 month
    - ☐ Within 2 months
    - ☐ After 3 or more months
- ☐ No

Did the mother take any over-the-counter drugs during her pregnancy with this child?

☐ Yes → What over-the-counter drugs did she take?

_____

☐ No

☐ Don't remember

Did the mother take any prescription medications during her pregnancy with this child?

☐ Yes → What prescription medications did she take?

_____

☐ No

☐ Don't remember

Now we would like you to answer some questions about your daughter's current health.

In general, how is her health? Would you say it is...

☐ excellent ☐ very good ☐ good ☐ fair ☐ poor

Over the past few months, how often has she been in good health?

☐ almost all of the time ☐ often ☐ about half of the time ☐ sometimes ☐ almost never

In the past month, about how many days has she missed school for any reason?

☐ none

☐ 1 to 3 days

☐ 4 to 6 days

☐ 7 to 10 days

☐ 11 to 20 days

☐ more than 20 days

Has your daughter been diagnosed by a medical professional of a chronic condition or disease?

☐ Yes → List all diagnoses: _____

☐ No

If you indicated any conditions above, did it prevent or limit her participation in school, at play, or in any other activities?

☐ Yes ☐ No

Within the past month, has she taken any over-the-counter medications every day or most days?

☐ Yes → List all: _____

☐ No

Within the past month, has she taken any prescribed medications?

☐ Yes → List all: _____

☐ No

How many times has this child changed schools since Kindergarten? _____

Aside from school changes, how many times in her life has she moved homes, that is changed her usual place of residence? _____

We would like to know if your daughter has ever experienced any of the following events or situations that may have caused her a great amount of worry or unhappiness?
(check all that may apply)

- ☐ Death of a parent
- ☐ Death of a family member (other than a parent)
- ☐ Divorce or separation of parents
- ☐ A stay in the hospital (at least one night)
- ☐ A stay in a foster home
- ☐ Separation from parents
- ☐ A serious illness or injury
- ☐ A serious illness or injury of a family member
- ☐ A conflict or serious argument between parents
- ☐ Other (Specify: _____)

****Please check the appropriate Body Image Scale on the next page.**

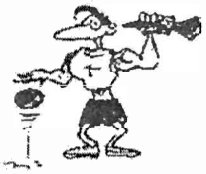
After doing so, place in the envelope provided and seal it shut.

Please send the sealed envelope to school with the signed consent form.

☺ Thank you for completing the BONES Parent/Guardian questionnaire ☺

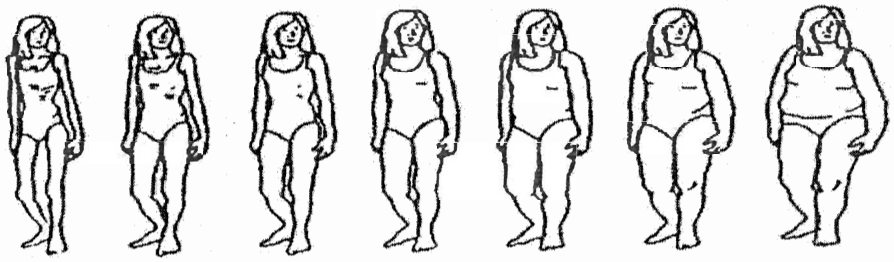
Parent

Girls Body Image Scale



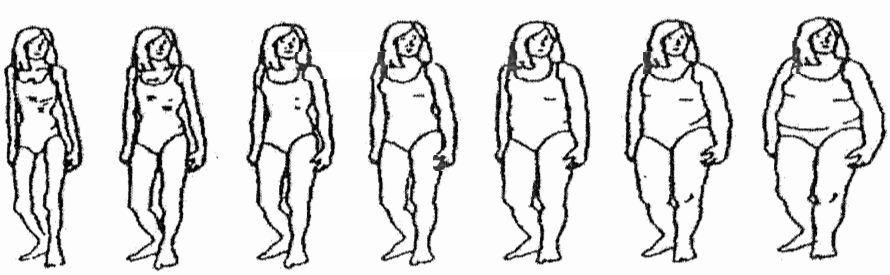
Answer the questions by placing an x in the box of the picture you choose.

Which girl does your child look most like?



☐ ☐ ☐ ☐ ☐ ☐ ☐

Which girl would you like your child to look like most?



☐ ☐ ☐ ☐ ☐ ☐ ☐

ID	CalciumIntake	Age	AgeGroup	Grade	School	SOStech	ParentIncome	IncomeGroup	Income	TotalDEBQ	Screening5	Screening6
999		14.86027397	1	9	BT		1					
1001	1521	14.29863014	1	9	SF		1			0	20	0	0
1002		14.26027397	1	9	SF		1			0		0	0
1003	2030	14.74794521	1	9	SF		1			0	20	0	0
1004		14.42465753	1	9	SF		1			0	12	0	0
1005		14.81917808	1	9	SF		1	4	1	0	13	0	0
1006	1979	14.39452055	1	9	SF		1			0	31	0	0
1007	2175	14.33972603	1	9	SF		1			0	21	0	0
1008		14.53972603	1	9	SF		1			4	22	0	0
1009	2125	14.56164384	1	9	SF		1			0	20	0	0
1010	1270	14.05479452	1	9	SF		1	3	0	0	12	0	0
1011	1670	15.35068493	2	9	SF		1			0	18	0	0
1012		14.44931507	1	9	SF		1			0	23	1	0
1013		14.78356164	1	9	SF		1			0	14	0	0
1014		14.56164384	1	9	SF		1			0	13	0	0
1016	790	14.41917808	1	9	SF		1			0	18	0	0
1017	1783	14.56712329	1	9	SF		1			4	10	0	0
1018	1331	16.42739726	3	11	SF		1			0	40	0	0
1019		16.32876712	3	11	SF		1	4	1	0	37	0	0
1020	1320			11	SF		1			0	29	0	0
1021		16.30410959	3	11	SF		1			0	29	0	0
1022		16.51780822	3	11	SF		1			0	13	0	0
1023	1371	16.58356164	3	11	SF		1			0	30	0	0
1024		16.79726027	3	11	SF		1	4	1	4	29	0	0
1025	1700			11	SF		1	4	1	4	16	0	0
1026	1587	16.09863014	3	11	SF		1	4	1	0	18	0	0
1027	1270	16.56986301	3	11	SF		1			0	22	0	0
1028		16.71232877	3	11	SF		1			0	14	0	0
1029	1681	16.20821918	3	11	SF		1			4	21	0	0
1030	1400	16.23835616	3	11	SF		1			0	20	0	0
1031		16.56438356	3	11	SF		1			0	35	0	0
1032	1534	16.79726027	3	11	SF		1	2	0	0	10	0	0
1033	1525	16.86575342	3	11	SF		1	4	1	0	17	0	0
1034		16.65479452	3	11	SF		1			4	18	0	0
1035	1265	16.71506849	3	11	SF		1	3	0	0	22	0	0
1036		15.6	2	10	SF		1			0	22	0	0
1037		15.04931507	2	10	SF		1	4	1	0	15	0	0
1038		15.31780822	2	10	SF		1			0	23	0	0
1039	1693	15.03013699	2	10	SF		1			0	23	0	0
1040		15.67945205	2	10	SF		1			0	19	0	0
1041		15.46849315	2	10	SF		1	4	1	0	24	0	0
1042	1321	15.04383562	2	10	SF		1	3	0	0	24	0	0
1043	1101	15.23561644	2	10	SF		1			0	26	0	0
1044	1727	15.49041096	2	10	SF		1			0	11	0	0
1045		15.20273973	2	10	SF		1			0	40	1	0

1047		15.81369863	2	10 SF	1	2	0	0	29	0	0
1048		16.98630137	3	10 SF	1			0	11	0	0
1049		15.07671233	2	10 SF	1	3	0	0	36	0	0
1051	620	15.24109589	2	10 SF	1			0	32		
1052	1832	15.34520548	2	10 SF	1			0	16	0	0
1053	1192	15.79178082	2	10 SF	1			0	24	0	0
1054	1471	17.52876712	4	12 SF	1			0	41	0	0
1055		17.56986301	4	12 SF	1				15	1	0
1056		14.24931507	1	9 SF	1			0	10	0	
1057	533	16.55616438	3	11 BT	1	4	1	3	20	0	0
1058	1361	15.04657534	2	10 SF	1			0	14	0	0
1060	1998	14.81917808	1	9 SF	1	0		0	27	0	0
1061	1345	16.66027397	3	11 BT	1	4	1	0	15	0	0
1062		14.14794521	1	9 SF	1			0	29	0	0
1063		16.31780822	3	11 BT	1			0	11	0	0
1064	750	16.15068493	3	11 BT	1	0		0	26	0	0
1065	1567	14.23561644	1	9 SF	1	3	0	0	21	0	0
1066	645	14.12876712	1	9 SF	1	3	0	0	29	0	0
1067		14.68493151	1	9 SF	1			0	11	0	0
1068		13.97534247	1	9 SF	1			0	31	0	0
1070		14.63835616	1	9 SF	1	2	0	0	13	0	0
1071		14.30684932	1	9 SF	1			0	12	0	0
1072	930	16.15068493	3	11 BT	1			0	27	0	0
1075		15.64657534	2	10 BT	1				15	0	0
1076		15.81917808	2	10 BT	1	4	1	0	22	0	0
1077	1580	15.49315068	2	10 BT	1			3	33	0	0
1078	845	15.4739726	2	10 BT	1	4	1		22	0	0
1079	1373	15.09863014	2	10 BT	1	0			27	0	0
1080		15.85479452	2	10 BT	1			0	14	0	0
1081	1610	15.05479452	2	10 BT	1			0	27	0	0
1082	1593	15.44657534	2	10 BT	1	3	0	0	14	0	0
1083	720	14.92876712	1	10 BT	1	2	0	0	21	0	0
1084	1850	15.82739726	2	10 BT	1	4	1	0	26	0	0
1085		15.9260274	2	10 BT	1			0	20	0	0
1086	1657	14.08219178	1	9 BT	1			0	12	0	0
1087	1621	14.10136986	1	9 BT	1	4	1	0	23	0	0
1088	1870	14.06575342	1	9 BT	1			0	11	0	0
1089		14.25205479	1	9 BT	1			3	17	1	0
1090		15.18630137	2	9 BT	1				24	0	0
1091		15.75890411	2	10 BT	1	2	0	0	24	0	0
1092		14.16712329	1	9 BT	1	4	1	0	16	0	0
1093		14.38356164	1	9 BT	1	4	1	0	17	0	0
1094		15.50958904	2	10 ND	1			0	14	0	0
1095	1252	15.09041096	2	10 ND	1			0	26	0	0
1096		15.39726027	2	10 ND	1			4	38	1	0
1097		15.26027397	2	10 ND	1			0	16	0	0

1098		15.52876712	2	10	ND	1			2	23	0	0
1099	1263	15.33424658	2	10	ND	1			0	28	0	0
1100		15.53150685	2	10	ND	1			0	23	0	0
1102	1151	15.11232877	2	10	ND	1			0	26	1	0
1103	1970	15.81917808	2	10	ND	1	4	1	0	25	1	0
1104		15.36164384	2	10	ND	1	4	1	0	27	1	0
1105	1541	15.72328767	2	10	ND	1			0	10	0	0
1106		15.86849315	2	10	ND	1			4	10	1	0
1107	770	15.75890411	2	10	ND	1	3	0	0	14	1	0
1108	1530	15.43835616	2	10	ND	1			0	31	0	0
1109		15.06027397	2	10	ND	1			0	33	0	0
1110	1980	15.08767123	2	10	ND	1			0	16	0	0
1111		16.14794521	3	11	ND	1	3	0	0	10	0	0
1112	1510	16.94520548	3	11	ND	1			0	10	0	0
1113		16.18630137	3	11	ND	1	3	0	0	21	0	0
1114		16.07123288	3	11	ND	1			0	23	0	0
1115		16.38630137	3	11	ND	1			4	41	1	0
1116	1780	16.69589041	3	11	ND	1			4	17	0	0
1117	1280	16.02465753	3	11	ND	1	4	1	3	32	0	0
1118		17.60547945	4	12	ND	1			4	15	1	0
1119		16.60273973	3	11	ND	1	0		0	19	1	0
1120	1730	16.82191781	3	11	ND	1	4	1	0	22	0	0
1121		16.93424658	3	11	ND	1			0	22	0	0
1122		16.36438356	3	11	ND	1	4	1	0	26	0	0
1123		16.77808219	3	11	ND	1	4	1	0	21	0	0
1124		16.62739726	3	11	ND	1	3	0	0	28	0	0
1125	1690	15.95890411	2	11	ND	1			0	13	0	0
1126	1082	16.74520548	3	11	ND	1			0	16	0	0
1127	1700	16.73972603	3	11	ND	1			0	47		0
1128	1183	16.09863014	3	11	ND	1			0	49	0	0
1129	1460	14.26575342	1	9	ND	1			4	30	0	0
1130		14.03835616	1	9	ND	1			0	10	0	0
1131		14.09589041	1	9	ND	1			0	16	0	0
1132		14.33972603	1	9	ND	1			0	13	0	0
1133		14.29041096	1	9	ND	1			0	10	0	0
1134		14.19452055	1	9	ND	1			0	23	0	0
1135	1160	14.55890411	1	9	ND	1			0	20	0	0
1136	1540	14.10410959	1	9	ND	1	4	1	0	26	0	0
1137		16.02739726	3	10	ND	1			0	24	0	0
1138		14.82465753	1	9	ND	1			0	34	0	0
1139		14.87671233	1	9	ND	1			0	12	0	0
1140		14.24931507	1	9	ND	1			0	10	0	0
1141		14.51506849	1	9	ND	1			4	33	0	0
1142		14.79178082	1	9	ND	1	3	0	4	33	0	0
1143	2040	14.51780822	1	9	ND	1			0	18	0	0
1144		14.49589041	1	9	ND	1			0	12	0	0

1145		14.25205479	1	9	ND	1	3	0	0	11	0	0
1146		14.91780822	1	9	ND	1			0	31	0	0
1147	1420	14.67945205	1	9	ND	1	4	1	0	15	0	0
1148		14.63013699	1	9	ND	1			0	16	0	0
1149		14.02191781	1	9	ND	1	4	1	0	10	0	0
1151	1480	15.83835616	2	10	ND	1			0	37	0	0
1152		15.8739726	2	10	ND	1			0	32	0	0
1153		16.9369863	3	11	SM	1			3	27	1	0
1155		16.79452055	3	11	SM	1			0	26	0	0
1156	1870	16.5369863	3	11	SM	1			0	34	0	0
1157		15.02739726	2	9	SM	1			0	19	0	0
1158	840	16.59178082	3	11	SM	1			0	35	0	0
1159	1140	16.50684932	3	11	SM	1			0	28	0	0
1160	1460	16.50410959	3	11	SM	1			0	29	0	0
1161	1480	16.60547945	3	11	SM	1	4	1	0	32	0	0
1162	1194	16.23287671	3	11	SM	1			0	25	0	0
1163		16.71780822	3	11	SM	1			0	26	0	0
1164	1180	16.65753425	3	11	SM	1			0	11	0	0
1165		16.89315068	3	11	SM	1			0	13	0	0
1166	950	16.28219178	3	11	SM	1			1	15	0	0
1167		16.56438356	3	11	SM	1	3	0	0	22	0	0
1168		14.06027397	1	9	SM	1			0	31	0	0
1169		14.72054795	1	9	SM	1			0		0	0
1170		14.51232877	1	9	SM	1			0	10	0	0
1172		14.44931507	1	9	SM	1			0	31	1	0
1175		14.5890411	1	9	SM	1			0		0	0
1176		14.73424658	1	9	SM	1			0		0	0
1177		14.96438356	1	9	SM	1			0	13	0	0
1178		14.07945205	1	9	SM	1			4	25	0	0
1179		14.1260274	1	9	SM	1			0	25	0	0
1180	1580	14.4	1	9	SM	1			0	15	0	0
1181		14.40821918	1	9	SM	1			0		0	0
1183		14.09315068	1	9	SM	1			0	11	0	0
1184		14.73424658	1	9	SM	1			0	33	0	0
1185		14.07945205	1	9	SM	1			0	38	0	0
1187		14.81917808	1	9	SM	1			0	42	1	0
1189		14.63287671	1	9	SM	1			4	29	0	0
1190		14.22191781	1	9	SM	1	4	1	0	10	0	0
1191		14.21643836	1	9	SM	1				16	0	0
1192				9	SM	1			0	26	0	0
1193		14.76164384	1	9	SM	1	0		0	24	0	0
1194		14.57534247	1	9	SM	1				26	0	0
1195		14.43835616	1	9	SM	1			0	37	0	0
1196	2210	14.74246575	1	9	SM	1			0	20	0	0
1197	1180	14.14520548	1	9	SM	1			0	12	0	
1199		14.63561644	1	9	SM	1			0	39	0	0

1200		14.55068493	1	9	SM	1			0	17	0	0
1201	1060	15	2	9	SM	1			0	20	0	0
1203		14.66027397	1	9	SM	1			0	34	0	0
1204		14.60821918	1	9	SM	1			0	10	0	0
1205	590	14.73424658	1	9	SM	1			0	15	0	0
1206	1690	15.03835616	2	9	SM	1			0	32	0	0
1209	1520	17.05205479	4	11	ND	1			4	16	0	0
1210	1330	16.69589041	3	11	ND	1	4	1	4	29	1	0
1211	1470	18.12328767	5	12	ND	1	1	0	1	41	1	0
1212	1670	16.50410959	3	11	ND	1	4	1	0	24	0	0
1213	1830	17.06027397	4	11	ND	1	0		0	30		0
1214	1210	16.4109589	3	11	ND	1				12	0	0
1215	1410	16.71506849	3	11	ND	1				16	0	0
1216		16.63561644	3	11	ND	1	4	1	0	14	0	0
1217		16.44109589	3	11	ND	1	4	1	4	20	1	0
1218	620	16.43835616	3	11	ND	1	4	1	0	28	1	0
1219	1250	16.71232877	3	11	ND	1	4	1	0	28	0	0
1220	1180	17.12328767	4	11	ND	1	3	0	3	20	0	0
1221	2055	17.03013699	4	11	ND	1	4	1	0	39	1	0
1223	1190	16.6	3	11	ND	1			0	35	0	0
1224	2090	16.78082192	3	11	ND	1			0	28	1	0
1225	1595	16.83287671	3	11	ND	1	0		0	10	1	0
1226	1583.3	16.89589041	3	11	ND	1	4	1	0	33	1	0
1227	480	16.85205479	3	11	ND	1			4	13	0	0
1228	1880	17.1369863	4	11	ND	1			4	23	0	0
1229		16.64383562	3	11	ND	1			0	14	0	0
1230	1875	16.24931507	3	11	ND	1			0	27	0	0
1231	1880	16.80273973	3	11	ND	1			0	24	0	0
1236	940	14.76986301	1	9	ND	1	4	1	0	20	0	0
1237	2055	14.49315068	1	9	ND	1			0	23	0	0
1238		14.65753425	1	9	ND	1			0	32	0	0
1239		14.63013699	1	9	ND	1			0	30	0	0
1240	560	15.12876712	2	9	ND	1	3	0	0	33	0	0
1242		14.57534247	1	9	ND	1			0	10	0	0
1243		14.61369863	1	9	ND	1	2	0	0	23	0	0
1244		14.33424658	1	9	ND	1	4	1	0	16	0	0
1245	980	14.97808219	1	9	ND	1			0	29	0	0
1246	2260	15.14246575	2	9	ND	1			4	27	0	0
1247	1395	14.22191781	1	9	ND	1	4	1	4	30	0	0
1248		14.71506849	1	9	ND	1			4	11	0	0
1249		14.92054795	1	9	ND	1			0	14	0	0
1250	1760	14.69863014	1	9	ND	1			0	10	0	0
1251	1455	15.07123288	2	9	ND	1	3	0	0	36	0	0
1252	1230	14.84109589	1	9	ND	1			0	40	1	0
1253	2210	15.03287671	2	9	ND	1	4	1	0	41	1	0
1256	130	16.23287671	3	10	ND	1			0	23	0	0

1257	1970	16.02739726	3	10	ND	1			0	31	1	0
1258	1630	15.51232877	2	10	ND	1			0	14	1	0
1259	1605	17.77534247	4	12	ND	1			0	19	0	0
1264	2210	16.01643836	3	10	ND	1			4	13	1	0
1265	1860	15.73972603	2	10	ND	1	4	1	0	34	0	0
1266		15.18082192	2	10	ND	1			4	18	0	0
1267	1110	16.0109589	3	10	ND	1			4	16	1	0
1268		15.53972603	2	10	ND	1	3	0	2	19	0	0
1269		15.31780822	2	10	ND	1			0	28	0	0
1271	2070	15.70410959	2	10	ND	1			0	10	0	0
1272		15.13424658	2	10	ND	1			4	27	0	0
1273	650	15.61917808	2	10	ND	1			0	14	0	0
1274	1040	15.24931507	2	10	ND	1			0	40	0	0
1275	1055	15.45479452	2	10	ND	1	4	1	0	22	0	0
1276	1510	16.0739726	3	10	ND	1			0	27	0	0
1278		15.23835616	2	10	ND	1			0	15	0	0
1279	1820	16.48219178	3	11	ND	1	2	0	0	24	1	0
1280		15.07123288	2	9	ND	1			0	21	1	0
1281		17.27945205	4	11	LS	1				35	0	0
1282		16.44383562	3	11	LS	1			0	20	1	0
1283	1860	16.72876712	3	11	LS	1	3	0	3	43	1	0
1284		16.61643836	3	11	LS	1	4	1	0	25	0	0
1285	1130	17.14246575	4	11	LS	1	4	1	0	20	0	0
1286		17.44109589	4	11	LS	1			0	20	0	0
1287	1580	16.20273973	3	11	LS	1			0	31	0	0
1288	780	17.08767123	4	11	LS	1	4	1	0	40	0	0
1289	1060	15.29315068	2	10	LS	1	2	0	0	25	1	0
1290	1615	16.67123288	3	11	LS	1			0	26	1	0
1291	630	17.79452055	4	11	LS	1			0	32	0	0
1292	810	16.24109589	3	11	LS	1			0	38	1	0
1293	1700	16.49041096	3	11	LS	1			0	12	1	0
1295		16.7369863	3	11	LS	1	3	0	0	10	0	0
1296		17.03287671	4	11	LS	1			0	24	0	0
1297		16.91232877	3	11	LS	1			0	26	0	0
1298	390	15.20821918	2	10	LS	1			0	33	0	0
1299	1931.5	15.6	2	10	LS	1			0	27	0	0
1300	1860	15.69863014	2	10	LS	1			0	28	0	0
1301		17.42465753	4	12	LS	1	4	1	4	23	0	0
1303	1250	17.57808219	4	12	LS	1			4	12	0	0
1304	1790	17.67945205	4	12	LS	1			4	32	1	0
1305	1890	18.14794521	5	12	LS	1	4	1	4	11	0	0
1307		17.57534247	4	12	LS	1	0		0	29	0	0
1309	2115	17.83013699	4	12	LS	1			4	31	0	0
1310	1950	17.90410959	4	12	LS	1			0	14	0	0
1311	1560	16.14246575	3	10	LS	1			0	17	1	0
1312	1440	15.66849315	2	10	LS	1			4	22	0	0

1313	1550	15.43287671	2	10	LS	1			4	39	0	0
1314		15.69041096	2	10	LS	1			4	17	0	0
1315		15.68767123	2	10	LS	1	0		0	30	0	0
1316	1190	15.42191781	2	10	LS	1	4	1	0	46	1	0
1319	970	15.70684932	2	10	LS	1	4	1	0	18	0	0
1320		15.93972603	2	10	LS	1				10	0	0
1321		15.30958904	2	10	LS	1	4	1	4		0	0
1323		15.21917808	2	10	LS	1			3	27	0	0
1324	1570	16.14246575	3	10	LS	1			4	18	0	0
1325		16.10410959	3	10	LS	1	0		0	32	0	0
1326	1650	15.70410959	2	10	LS	1			4	14	0	0
1327	1530	15.84383562	2	10	LS	1			0	28	1	0
1328	1940	15.83287671	2	10	LS	1	3	0	0	10	0	0
1329	1040	14.46575342	1	9	LS	1			4	29	1	0
1330	1670	15.18356164	2	10	LS	1			0	28	0	0
1331		15.40273973	2	10	LS	1			3	29	0	0
1332	1935	15.57808219	2	10	LS	1			0	16	0	0
1333	925	15.31506849	2	10	LS	1	3	0	0	44	0	0
1335		16.16164384	3	10	LS	1			0	19	0	0
1336		15.22739726	2	10	LS	1	2	0	2	23	0	0
1337	1960	15.69315068	2	10	LS	1				26	0	0
1338		15.50136986	2	10	LS	1			0	13	1	0
1339	1830	16.14794521	3	10	LS	1			0	15	0	0
1341		15.66849315	2	10	LS	1			4	29	0	0
1342	790	16.81643836	3	11	LS	1			0	31	1	0
1344	1335	16.60273973	3	11	LS	1			4	10	0	0
1345		16.87123288	3	11	LS	1	4	1	0	20	1	0
1347	1960	16.94246575	3	11	LS	1			0	18	0	0
1348		17.02465753	4	11	LS	1	2	0	2	43	0	0
1349	1400	16.96712329	3	11	LS	1	2	0		25	1	0
1350	1440	16.36712329	3	11	LS	1			0	40	1	0
1351	1710	16.81643836	3	11	LS	1			0	29	0	0
1352		16.74520548	3	11	LS	1	4	1	0	10	0	0
1354	180	16.66849315	3	11	LS	1	3	0	0	45	1	0
1355		16.24109589	3	11	LS	1			0	44	1	0
1357		15.36164384	2		LS	1						
1358		16.84383562	3	11	LS	1			0	30	1	0
1359		15.50136986	2		SWIM	1	4	1	4	17	0	0
1360		16.37808219	3		SWIM	1			0	20	0	0
1361	1760	14.33972603	1		SWIM	1	4	1	4	18	0	0
1362	1120	14.62465753	1	9	WC	1	2	0	0	10	0	0
1364		14.76164384	1	9	SWIM	2			0	14	0	0
1365	1885	15.57534247	2	10	SWIM	2	4	1	4	33	0	0
1366		14.83835616	1	9	SWIM	2	4	1	0	11	0	0
1367		16.74794521	3	11	SWIM	2	4	1	4	13	0	0
1368		15.7369863	2	10	SWIM	2			0		0	0

1369	817	14.09863014	1		SWIM	2			0	14	0	0
1370		14.52328767	1	9	WC	2			0	17	0	0
1372	1192	14.55342466	1	9	WC	2			0	12	0	0
1373		14.42465753	1	9	WC	2			0		0	0
1374	1090	15.00547945	2	9	WC	2			0	18	0	0
1375	1625	14.75616438	1	9	WC	2			0	18	0	0
1376	1575	15.26027397	2	9	WC	2			0	10	1	0
1377	720	14.5260274	1	9	WC	2			0	27	0	0
1378	1870	14.7369863	1	9	WC	2			0	28	0	0
1379	1180	14.9260274	1	9	WC	2			0	24	0	0
1380		14.5369863	1	9	WC	2			0	19	0	0
1381	1790	14.54520548	1	9	WC	2			0	32	0	0
1382	430	16.1260274	3	9	WC	2	0		0	18	0	0
1383		15.08493151	2	9	WC	2			0	22	0	0
1384	1745	14.54794521	1	9	WC	2			0	13	0	0
1386	675	16.52328767	3	9	WC	2	0		0	14	0	0
1387	1165	16.85753425	3	11	WC	2	4	1	0	10	0	0
1388	1115	18.20547945	5	11	WC	2			0	21	1	0
1389		17.00821918	4	11	WC	2			0	24	0	0
1390	1080	17.21643836	4	11	WC	2			0	30	0	0
1391	1920	16.7260274	3	11	WC	2			0	46	1	0
1392	850	16.82739726	3	11	WC	2	4	1	0	24	0	0
1393	405	17.88219178	4	12	WC	2	2	0	0	26	0	0
1394	930	17.24383562	4	11	WC	2	4	1	0	33	0	0
1395	1530	16.7260274	3	11	WC	2	3	0	0	11	0	0
1396	1890	16.98356164	3	11	WC	2	0		4	34	1	0
1397	1220	17.37808219	4	12	WC	2			3	27	0	0
1398	985	16.83013699	3	11	WC	2			0	38	0	0
1399	1840	16.62465753	3	11	WC	2	4	1	4	27	1	0
1400	2065	16.91780822	3	11	WC	2	3	0	0	24	1	0
1401	1670	17.0109589	4	11	WC	2	4	1	0	25	0	0
1403	1280	17.50958904	4	11	WC	2			0	11	0	0
1404	1197	17.15616438	4	11	WC	2			0	16	0	0
1408	680	15.30684932	2	9	WC	2			0	37	0	0
1410	1020	14.83013699	1	9	WC	2			0	21	0	0
1411	1160	15.34246575	2	9	WC	2			0	21	0	0
1412	935	14.65205479	1	9	WC	2			0	39	0	0
1413	790	15.24931507	2	9	WC	2	4	1	0	11	0	0
1414	897.5	15.35068493	2	9	WC	2			0	29	0	0
1415	1030	15.09863014	2	9	WC	2			0	13	1	0
1416	1295	15.34794521	2	9	WC	2			0	16	0	0
1417	1780	16.19726027	3	10	SWIM	2	4	1	4	15	0	0
1418	530	16.01369863	3	10	WC	2			0	13	0	0
1419	1645	15.81643836	2	10	WC	2			0		0	0
1421	1167.5	15.97534247	2	10	WC	2			0	15	0	0
1422	545	16.28767123	3	10	WC	2			0	40	1	0

1423	1500	15.58356164	2	10	WC	2			0	26	0	0
1424	1180	15.76712329	2	10	WC	2			4	41	0	0
1426	1410	14.81369863	1	9	WC	2			0	30	0	0
1427	1320	14.6	1	9	WC	2			0	10	0	0
1428	1035	14.53150685	1	9	WC	2			0	23	0	0
1430	460	14.67671233	1	9	WC	2			0	14	0	0
1431	460	15.32328767	2	9	WC	2	2	0	0	29	0	0
1432	1570	14.91780822	1	9	WC	2			0	12	0	0
1433	795	14.98082192	1	9	WC	2			0	24	0	0
1436	580	15.20547945	2	9	WC	2			0	23	0	0
1437	450	15.18630137	2	9	WC	2			0	10	0	0
1438	690	14.39726027	1	9	WC	2	2	0	0	30	0	0
1439	1160	15.09315068	2	9	WC	2			0	37	1	0
1440	1205	14.53150685	1	9	WC	2	4	1	0	15	1	0
1442	775	15.31232877	2	9	WC	2			0	11	0	0
1443	270	15.22191781	2	9	WC	2	3	0	0	13	0	0
1444	1115	14.46849315	1	9	WC	2			0	22	0	0
1445	1020	15.22191781	2	9	WC	2			0	29	0	0
1446	790	14.4109589	1	9	WC	2			0	37	0	0
1447	640	15.10410959	2	9	WC	2			0	16	0	0
1448	677.5	14.51506849	1	9	WC	2			0	29	0	0
1449	790	15.16986301	2	9	WC	2			0	16	0	0
1450	1760	15.47945205	2	9	WC	2				30	0	0
1452	1215	15.23561644	2	9	WC	2			0	25	0	0
1453	755	16.08767123	3	10	WC	2			0	12	0	0
1454	630	15.89041096	2	10	WC	2			0	22	1	0
1455	1020	15.68493151	2	10	WC	2			0	36	1	0
1456	1567.5	17.17534247	4	10	WC	2	0		0	14	0	0
1457	1040	16.29041096	3	10	WC	2			2	37	0	0
1458	520	15.75342466	2	10	WC	2			1	16	0	0
1459	915	15.92328767	2	10	WC	2			0	30	0	0
1460	710	15.42191781	2	10	WC	2			4	18	0	0
1462	775	16.24383562	3	10	WC	2			3	39	0	0
1463	660	14.74794521	1	9	WC	2			0	31	1	0
1465	1860	14.78356164	1	9	WC	2			0	37	0	0
1466	1225	14.36438356	1	9	WC	2			0	30	1	0
1467	1155	18.20821918	5	12	WC	2			2	32	0	0
1468	1275	18.14520548	5	11	WC	2			1	34	1	0
1469	1017.5	16.70958904	3	11	WC	2			0	35	1	0
1470	640	15.59726027	2	9	WC	2			0	26	0	0
1472	1005	18.2	5	12	WC	2			0	25	0	0
1473	2110	14.93972603	1	9	WC	2			0	10	0	0
1474	1415	14.9369863	1	9	WC	2			0	39	0	0
1475	830	16.15068493	3	10	WC	2				12	0	0
1476	910	15.57534247	2	10	WC	2			4	40	0	0
1477	400	17.71780822	4	12	WC	2			0	29	1	0

1479	800	15.59452055	2	10	WC	2			0	11	0	0
1481	1250	15.90410959	2	10	WC	2			0	28	0	0
1482	1680	16.23013699	3	10	WC	2			0	11	0	0
1483	1175	15.61369863	2	10	WC	2			0	14	0	0
1485	800	15.36986301	2	10	WC	2			0	30	0	0
1486	1010	16.32054795	3	10	WC	2			0	27	0	0
1487	353	15.99178082	2	10	WC	2			0	12	0	0
1488	1710	15.54246575	2	10	WC	2			0	27	0	0
1491	810	16.30958904	3	10	WC	2			0	10	0	0
1492	505	16.10684932	3	10	WC	2			1	15	0	0
1493	550	15.99726027	3	10	WC	2			0	36	1	0
1494	940	15.57534247	2	10	WC	2			0		0	0
1495	1255	15.63013699	2	10	WC	2			0	11	0	0
1496	1415	17.17534247	4	11	ROW	2			4	12	0	0
1497		15.1890411	2	9	ROW	2						
1498		15.19452055	2	9	ROW	2						
1499		15.4	2	9	ROW	2						
1500		15.01917808	2	9	ROW	2						
1501	1510	16.70410959	3	11	ROW	2	4	1	4	33	0	0
1502	1595	17.25205479	4	11	ROW	2	4	1	4	18	0	0
1503	2345	16.49315068	3	11	ROW	2	4	1	4	41	0	0
1504	1630	18.51232877	5	12	ROW	2	4	1	4	12	0	0
1505	1360	16.51506849	3	11	ROW	2				16	0	0
1506	1840	18.38082192	5	12	ROW	2			0	17	0	0
1507		17.48219178	4	12	ROW	2						
1508	2310	17.34520548	4	11	ROW	2	4	1	4	30	0	0
1509	2187	16.0630137	3	10	ROW	2	4	1	4	25	0	0
1510	780	17.58630137	4	12	ROW	2	4	1	4	16	0	0
1511	1350	16.95616438	3	11	ROW	2				32	1	0
1512		16.4630137	3	11	ROW	2						
1513	1030	15.3369863	2	9	ROW	2	4	1	4	17	1	0
1514	970	15.18356164	2	9	ROW	2	4	1	4	11	1	0

Screening9	Screening11	PeriodAge	Screening12	PeriodLength	Screening13	Notes	StrenEx	ModEx	MildEx	Sweat	TotalEXScore	PAQ1
0	1	12	1		1		3	1	0	1	32	1.55
0	1	13	1	30	1							
0	1	11	0		0		7	5	7	1	109	1.55
0	1	13	1	28	1		2	2	0	2	28	1.45
0	0				0		4	2	1	1	49	1.43
0	1	12	1	30	1		5	0	2	1	51	1.27
0	1	12	1	30	1		1.5	4	1.5	2	38	1.36
1	1	11	1	30	0		4	5	2	2	67	1.55
0	1	12	1	30	0		5	3	1	2	63	1.82
0	1	12	1	30	0		4.5	2.5	1.5	1	57.5	1.59
0	1	12	1	28	0		5	7	7	2	101	1.36
1	1	12	1	30	0		3	2	4.5	2	50.5	1.27
0	1	12	1	30	1		5	5	3	1	79	1.68
0	1	13	1	30	0		3	2	3	1	46	1.48
0	1	12	1	30	1		6	0	8	1	78	1.41
0	0				1		7	1	0	1	68	1.61
0	1	9	1		1		8	3	2	1	93	1.59
0	1	11	1	30	0		5	4	4	1	77	1.9
0	1	11	1	30	1		5	3	2	2	66	1.14
0	1	13	1	30	0		2	2	2	2	34	1.77
0	1	12	1	28	0		0	0	1	2	3	1.41
0	1	13	1	28	1		14	7	10	1	191	0
0	1	13	0		0		4	2	3	1	55	1.41
0	1	13	1	30	0		3	4	2	2	53	1.32
0	1	12	0		1		0	3	3	3	24	1.18
0	1	13	0		1		0	0	1	3	3	1.18
0	1	14	0	30	0		2	5	3	2	52	1.23
0	1	10	1	30	0		3	5	5	1	67	1.59
1	1	11	1	30	0		5	7	5	2	95	1.41
0	1	12	0		0		1	5	5	1	49	1.17
0	1	13	1	38	0		0	2	5	2	25	1.36
0	1	12	0		0		0	0	4	2	12	1.43
0	1	14	0		0		2	3	2	1	39	1.43
	1	12	0		1		1	2	4	2	31	1.18
0	1	12	1	30	1		3.5	2	4	2	53.5	1.45
0	1	12	1	29	0		3	4	2	2	53	1.27
0	1	13	0		0		3	2	1	2	40	1.73
0	1	12	1	26	1		3.5	7	7	1	87.5	1.36
0	1	12	1	28	0		1	2	4	2	31	1.86
0	1	13	1	30	0		0	2	3	2	19	1.18
0	1	13	0		1		5	5	7	1	91	1.27
0	1	13	1	30	0		5	5	7	1	91	1.32
0	1	13	1	24	1		3	3	1	2	45	1.36
0	1	13	1	7	1							

0	1	14	1	7	1						1.32
0	1	12	1	21	0						2.18
0	1	12	1	21	1						1.86
0	1	10.5	1	30	1	0	0	0	3	0	1.09
0	1	13	1	28	0	3	3	6	1	60	1.43
0	1	14	0		0	3	3	3	2	51	1.23
0	1	14	1	28	0	5	3	3	1	69	1.73
	1	14	1	26	1	6	2	3	1	73	1.64
0	1	14			1	2	7	0	2	53	1.68
1	1	14	1	28	0	6	3	5	1	84	1.23
0	1	13	1	28	1	2	5	7	1	64	1.32
0	1	12	0		1	4	2	3	1	55	1.59
0	1	14	1	28	0	0	3	2	3	21	1.09
0	1	13	1	30	1	3	5	4	2	64	1.41
0	1	12	1	28	0	0	2	3	3	19	1.09
0	1	13	1	31	1	2	2	1	2	31	1.32
0	1	12	1		1	5	4	4	1	77	1.32
0	1	13	0		1	5	5	7	2	91	1.7
0	1	13	0		1	1	1	1	2	17	2.54
0	1	12	1	28	1	4	2	2.5	2	53.5	1.32
0	1	14	1	28	0	1	2	2	1	25	1.83
0	0		0		0	2	3	4	1	45	2.64
0	1	13	1	28	0	2	3	4	2	45	1.22
0	1	13.5	1	28	0	3	5	6	2	70	1.57
0	1	12	1	28	1	3	4	5	2	62	1.57
1	1	13	1	28	0	6	1	1	2	62	1.13
0	1	12	1	28	0	1	1	1	2	17	1.14
0	1	12	1	26	1	2	2	3	2	37	1.27
0	0				0	3	3	5	2	57	1.35
0	1	14	1	30	0	2	1	0	1	23	1.39
0	1	13	1		1	2.5	5	3.5	3	58	1.18
0	1	11	0		1	5	5	5	2	85	1.41
1	1	12	1	28	0	0	3	3	2	24	1.41
0	1	12	1	25	1	2	5	8	2	67	1.78
0	1	13	0		0	0	2.5	1.5	2	17	1.33
0					0	6	5	3	1	88	1.67
0	1	13	1		0	3.5	7	3.5	2	77	1.64
0	0		0		0	1	3.5	4	3	38.5	1.86
0	0		0		0	1	1	1	2	17	2.48
1	1	11	0		1	1	1	1	2	17	2.09
0	0		0		0	3	2	2	2	43	1.18
0	1	13	0		0	1	3	1	2	27	1.17
0	1	13	0		1	0	5	4	3	37	1.23
0	1	13	0		1	0	1	5	3	20	1.18
0	1	12	1		0	2	2	3	1	37	1.35
0	1	13	1		0	4	2	2	1	52	1.54

0	1	13	1		0		4	2	2	1	52	1.46
0	1	11	0		0		0	0	2.5	3	7.5	1.14
1	1	12	1		1		1	5	3	2	43	
0	1	12	1	30	1		3	7	7	1	83	1.23
1	1		1	28	1							1.41
0	1	12	1	28	0		2	5	5	2	58	1.45
0	1	13	1		0		10	3	2	1	111	1.36
0	1	14	1	21	0	scoliosis	7	3	1	1	81	1.77
1	1	12	1	28	0		0	1	1	3	8	1.27
0	1	10	1	30	1		0	0	2	2	6	1.23
0	1	9	0		0		0	0	0.5	2	1.5	1.32
1	1	13	1	28	1		3	1	4	3	44	1.36
0	1	14	1	28	1		5	5	5	3	85	1.27
0	1	12	0		0		0	0	2	2	6	1.09
0	1	11	1	29	0		1	2	5	2	34	1.41
0	1	12	1	28	0		1	2	1	2	22	1.23
1	1	13	1	20	0		3	0	5	1	42	1.39
0	1	14	1	28	0		7	0	0	1	63	1.58
0	1	13	1	33	1		3	0	0	1	27	1.23
0	1	14	1	29	0		2	1	3	2	32	1.32
0	1	11	0		1		6	4	1	2	77	1.27
0	1	12	1	28	0		2	1	0	2	23	1.18
0	1	14	0		0		2	1	4	1	35	1.36
0	1	15	0		1		5	3	5	1	75	1
0	1	13	1	21	0		1	5	0	2	34	1.18
0	1	13	1	30	0		3	6	7	2	78	1.32
0	1	11	1	30	1		2	1	5	2	38	1
1	1	11	0		1		2	1	5	2	38	1
0	1	12	0		1		0	8	0	2	40	1.56
1	1	12	0		1		4	7	4	1	83	1.57
0	1	12	1	0	1	.	2	2	1	2	31	1.91
0	0		0		0		4	7	7	2	92	1.64
0	1	12	1	28	0		3	4	5	1	62	1.83
0	1	13	1		0		1	5	1	2	37	1.22
0	1	12	1		0		3	1	1	2	35	1.22
1	1	12	0		0		2	1	1	1	26	1.36
0	1	10	1	28	1		1.5	4	7.5	2	56	1.77
0	1	11	1	30	0	native americai	3	5	7	1	73	1.27
0	1	12	1	30	1	Japanese	0	1	0	2	5	1.09
0	1	11	1	30	1		4	6	5	2	81	1.77
0	1	14	0		0		5	2	5	1	70	2.09
0	1	13	1	30	1		2.5	1.5	2	2	36	1.91
0	1	13	1	28	0	blue puffer	5	2	1	1	58	2.27
0	1	13	1	30	0		3	2	1	2	40	1.82
0	1	12	1	28	0		2	0	1	2	21	1.23
0	1	12	1	26	0		1	4	2	1	35	1.18

0	1	13	1	28	0	2.5	2	3	1	41.5	1.23
0	1		0		0	2	3	3	1	42	1.64
0	1	13	0		0	4	4	1	1	59	1.39
0	1	12	1	30	0	4	3	5	1	66	2.05
0	1	13	0		1	3	1	6	1	50	1.48
0	1	7	0		0	3.5	3.5	2.5	1	56.5	1.18
0	1		1		0 symbicort (asth	2	5	5	2	58	1.27
1	1	14	0		1	5	5	5	2	85	1.5
0	1	11	1	28	0	2	1.5	3	1	34.5	1.27
1	1	13	1	28	0	5	5	0.5	2	71.5	1.41
0	1	14	1	28	0	1	9	8	2	78	1.86
0	1	12	1	28	0	1	3	2	2	30	1.14
0	1	12	1	28	1	5	4	6	2	83	1.32
0	1	12	1	28	0	4	2	2	1	52	1.09
0	1	13	1	28	0	3	3	3	2	51	1.09
0	1	12	1	28	1	7	5	5	1	103	2.14
1	1	12	1	28	0	7	5	5	1	103	1.72
0	1	14	0		1			5	2		1.27
0	1	12	1	29	0	3	0	0	2	27	1.14
0	1	12	0		1 vegan/diabetic	2	4	5	2	53	1.23
0	1	14	1	28	0	3	3	3	2	51	1.64
0	1	13			0	1					1.82
0	1	12	1		0						
0	1	12	1	30	1	4.5	3	2	2	61.5	1.32
1	1	13	1	30	1	5	0	1	2	48	1.32
0	1	13	1	28	1						
0	0		0		0 starting growth hormon						
0	1	12	1	30	1	2	7	7	1	74	1.91
0	1	12	1	28	1	4	7	0	2	71	1.23
0	1	11	1	28	0	5	4	3	2	74	
0	1	13	1	28	1	3	3	0	2	42	1.61
0	1	10	0		1						
0	0				0	4	4	3	1	65	3.36
1	1	12	0		1	5	2	1	1	58	1.59
0	1	12	1	30	0	3	0	0	2	27	1.18
0	1	12	1	30	1	5	2	7	1	76	1.41
0	1	12	0		0	5	5	1	1	73	1.35
0	1	12	0		0	2	7	7	3	74	1.36
0	1	13			1	7	7	7	2	119	1.32
0	1	13	1		0	0	5	0	2	25	1.36
0	1	14	0		0	2	2	3	2	37	1.18
0	1	12	1	28	0	4	3	4	1	63	1.32
0	1	10	0		1	1	3	2	2	30	1.14
0	1	12	1	28	0	5	5	3	1	79	1.64
0	1	11	0		1	4	7	7	2	92	1.3
0	1	12	1	28	1	4	7	10	2	101	1.82

0	1	13	1	30	0	2	4	1	2	41	1.3
0	1		0		0	3	2	2	1	43	1.35
0	1	12	1	30	0	2	5	3	3	52	1.41
0	1	12	1	30	0	0	0	0	2	0	1.09
0	0				0	2	1	2	2	29	1.05
0	1	13	0		0 calcium supple	2.5	0	0	1	22.5	2.13
0	1	12	1	28	0	3	2.5	1	1	42.5	1.41
1	1	15	1	28	0	2.5	7	2	1	63.5	1.32
1	1	13	1	28	1	2	10	2	2	74	1.45
0	1	14	0		1	2	3	3	2	42	1.14
1	1	12	1	25	0	3	1	1	1	35	1.27
0	1	12	1	28	1	1	4	7	2	50	1.36
0	1	14	1	28	0	2.5	3.5	5.5	2	56.5	1.27
0	1	14	1	28	1			5	2		1.18
0	1	14	1	28	0	1	1	2	2	20	1.18
0	1	14	1	28	1	5	5	1	2	73	1.32
1	1	12	1	28	1	9	3	3	1	105	1.63
0	1	12	1	31	0	2	2	7	2	49	1.27
0	1	13	1	28	0 swim+row	4.5	1		1		1.23
0	1	10	1	28	0	6	1.5	1.5	1	66	1.78
0	1	12	0		0	3	4	3	2	56	1.45
1	1	12	1	28	0	0	0	0	2	0	1.09
0	1	12	0		1	4			2		1.14
0	1	12	0	28	0	6	1	1	1	62	1.27
0	1	12	1	32	0	3	2	1	2	40	1.33
0	1	12	1	32	0	3	3	5	1	57	1.41
1	1	13	1	28	0	2	3	4	2	45	1.5
0	1	12	1	28	0	5	7	1	1	83	1.41
0	1		1	28	1 whole house sr	7	2	1	3	76	1.59
0	1	14	1		0	1	3	2	2	30	1.27
0	1	12	1	28	1 mother smoke	5	0	0	2	45	1.39
0	1	11	1	28	1	3	5	2	1	58	1.68
0	1	12	0		1	2	2	3	2	37	1.39
0	1	13	1	28	0	5	5	5	2	85	2.36
0	0				1	3	2	4	2	49	2.14
0	1	13	1	28	0	3	1	0	2	32	1.48
0	1	14	1	28	0	4	1	2	1	47	1.5
0	1	12	0	28	1	7	2	3	2	82	1.9
0	1	14	1	28	0	7	1	1	1	71	1.93
0	1	12	0		0	6	4	3	1	83	1.27
0	1	12	0		0	5	3	3	1	69	1.86
0	1	13	0		1	3	6	0	1	57	2
0	1	11	1	28	1	5	2	5	2	70	1.32
0	1	12	1	28	0	6	6	6	1	102	1.45
0	1	13	0		0	4	2	3	1	55	1.45
0	1	12	1	28	1		4.5	5	2		1.36

0	1	13	1	28	0	1	0	5	3	24	1.3
0	1	12	1	28	0	2.5	3.5	2.5	1	47.5	1.36
0	1	11	1	28	0	1	5	5	1	49	1.27
0	1	12	1	28	0	0	1	5	2	20	1.18
0	1	11	1	28	0	5.5	1	1	1	57.5	1.52
0	1	13	1	28	0	3	6.5	5	1	74.5	1.5
0	1	13	1	28	0	3.5	1.5	4.5	1	52.5	1.45
0	1	12	1	30	0	1		2	3		1.18
0	1	12	1	26	1	2	1	1	2	26	1.45
0	1	13	1	28	1	0	4	4	3	32	1.14
0	1	12	1	21	1	0	3	5	1	30	1.32
1	1	13	1	28	0	5	2	4	2	67	1.48
1	1	13	1	28	1	0	0	2	3	6	1.14
0	1	10	1	28	0	3	1	2	1	38	1.18
0	1	12	1	28	0	2	5	3	2	52	1.3
0	1	12	1	28	0	5	2	1	1	58	1.73
0	1	11	1	28	0 latinamerican	0	1	1	2	8	1.23
0	1	13	1	28	0	2	7	1	2	56	1.59
1	1	15	0		1	4	1	1	3	44	1.22
1	1	12	1	28	1	2	2	0	2	28	1.18
1	1	9	1	28	1 on the pill	3	2	2	1	43	1.32
0	1	12	0		1	3	1	1	2	35	1.36
0	1	14	1	30	0	4	0	1	1	39	1.5
0	1	15	1	30	0	1	0	1	2	12	1.86
0	1	12	1	27	1	0	0	4	3	12	1.18
0	1	12	1	30	0	2.5	2.5	0	2	35	1.41
0	1	13	1	30	0	1	1	1	2	17	1.64
1	1	11	0		1	5	2	1	1	58	1.26
0	1	15	1	30	1	3	3	3	1	51	1.41
1	1	13	1	30	1 on the patch	4	4	2	2	62	1.23
1	1	10	1	21	1	2	3	1	1	36	1.43
0	1	13	1	30	1	2	4	2	2	44	1.36
0	1	11	1	30	1	1	1	1	2	17	1.64
1	1	10	0		1	14	7	7	1	182	1.36
0	1	14	1	29	1 blue&orange p	1	2	2	2	25	1.27
0	1	14	0		0	4	4	2	1	62	1.73
0	1	14	1	28	0	4	3	4	1	63	2.27
0	1	14	0		0	4.5	2	5	1	65.5	1.26
1	1	14	0		0 blue&orange p	5	1	2	2	56	1.13
1	1	11	1	28	1	5	1	2	1	56	1.44
1	1	12	1	30	1	4	2	1	2	49	1.23
0	1	12	1	28	0	1	1	2	3	20	1.17
0	1	14	0		0	4	6	4	1	78	2.08
1	1	11	1	30	1	0	5	0	2	25	1.27
1	1	10	1	25	0	3.5	6	4	1	73.5	1.45
1	1	12	1	30	0 anorexia nervo	3	1	2	1	38	1.39

0	1	11	1	30	1	3	6	7	3	78	1.41
0	1	13	0		0	5	1	1	2	53	1.41
0	1	11	1	30	1	0	1	3	2	14	1.54
1	1	13	1	28	0	3	3	3	2	51	1.21
0	1	12	1	28	0	2	3	3	1	42	1.43
0	1	13	1	30	0	3	2	2	1	43	1.27
0	1	13	1	30	1	4	1	4	1	53	1.41
0	1	14	1	28	0	4	5	2	1	67	1.32
0	1	14	1		1	5.5	0	5.5	1	66	1.41
0	1	14	1	30	0	5	4	3	1	74	1.78
1	1	10	1	30	1	0	1	1	3	8	1.09
1	1	14	1	28	1	2	3	5	1	48	1.18
0	1	10	1	30	1	3.5	2	3.5	2	52	1.55
0	1	12	1	30	0	5	3	3	2	69	1.26
0	1	12	1	25	1	3	2	3	1	46	1.17
0	1	11	0		1	0	2	5	3	25	1.27
0	1	14	1	28	0	4	2	2	1	52	1.5
0	1	12	1	28	0 orange puffer,c	6	6	7	1	105	1.68
1	1	9	1	28	0	3	3	3	1	51	1.95
1	1	11	1	28	1 multi-vitamin	0	0	3	3	9	1.05
0	1	14	1	30	1	5	3	7	2	81	1.68
0	1	13	1	28	1	3	2	2	2	43	2.61
0	1	9	1	14	1	3	2	5	2	52	1.26
1	1	13	1	28	1	6	8	1	1	97	2.36
1	1	10	1	28	0 purple puffer	4	0	3	2	45	1.18
0	1	11	1	28	1	3	2	1	1	40	2.27
0	1	12	1	28	1	7	1	3	1	77	1.77
0	1	14	1	28	0	3.5	1	2	1	42.5	1.41
0	0	11	0		0	6	0	0	1	54	1.36
1	1	11	1	28	1	1	5	4	2	46	2.27
1	1	13	1	28	1	1.5	3.5	7	1	52	1.63
1	1	11	1	28	1	2	4	4	2	50	1.18
1	1	13	1	28	1	5	5	5	1	85	1.59
1	1	11	1	28	0	5	2		1		1.23
1	1	14	1	28	1	2	3	3	1	42	1.41
1	1	13	0		1	7	3	1	1	81	1.32
0	1	12	1	30	0	8	4	7	1	113	1.91
1	1	13	1	21	0 asthma-symbic	7	2	5	1	88	1.36
0	1	12	0		0	9	4	0	1	101	1.32
0	1	12	0		1	8	8	0	2	112	1.23
0	1	13	1	28	0	10	0	1	1	93	1.86
0	1	12	0		0	10	10	5	1	155	1.46
0	1		1		0	8	2	1	1	85	1.27
0	1	12	0		0	7	3	5	1	93	1.3
0	1	14	1	25	0						

0	1	12	1	30	0	5	1	0	1	50	1.26
0	0				1	3	2	0	2	37	1.5
0	1	12	1	30	0	0	5	0	2	25	1.32
0	1	13	0		1						2.41
0	1	11	0		1	3	2	1	2	40	1.14
0	1	10	1	28	1	1	3	5	2	39	1.23
0	1	13	1	30	1	2	5	6	2	61	1.32
0	1	12	1	28	1	1	1	1	2	17	1.36
0	1	12	1		0	2	3	5	2	48	1.36
0	1	12	1	30	0	2	5	1	2	46	1.32
0	1	13	1		1	4	4	7	1	77	1.64
0	1	12	1		1						1.18
0	1	11	1	28	1	0	0	10	3	30	1.22
0	1	14	1	30	0	3	2	0	2	37	1.32
0	1	13	1	28	1	7	5	3	1	97	1.36
0	1		1		0	7	7	0	1	98	1.95
0	1	15	0		1	5	5	5	2	85	1.32
1	1	10	0		1 depoprovera n	5	6	7	1	96	3.26
0	1	11	1	25	0	2	5	0	1	43	1.54
1	1	11	1	30	1	6	5	5	2	94	1.3
1	1	9	1	28	1	7	5	5	2	103	2.05
1	1	10	1	30	1 on celebrex, lyr	0	0	7	3	21	1
1	1	13	0	1	0 on NuvaRing	4	4	7	2	77	1.64
0	1	11	1	30	0	4	5	1	2	64	1.27
1	1	13	1	24	1	0	2	4	3	22	1.32
1	1	14	1	30	1	2	5	7	2	64	1.41
1	1	11	1	22	1	5	5	7	2	91	1.36
0	1	10	1	30	1	5	5	1	2	73	1.45
0	1	11	1	30	0	0	6	4	3	42	1.32
0	1	13	1	30	1	5	2	10	1	85	1.73
0	1	11	1	30	0	3	2	3	1	46	1.35
0	1	15	1	30	1	5	10	1	1	98	1.68
0	1	13	0	0	1	6	6	7	2	105	1.64
0	0		0		1	1	7	7	2	65	1.45
0	1	12	1	30	1	1.5	2.5	10	2	56	1.45
0	1	10	0		0	4	5	2	2	67	1.18
1	1	11	1	24	1	5	2	0	2	55	1.5
0	1	13	1	28	0	4	0	0	1	36	1.09
0	1	15	0		0	1.5	2	0	2	23.5	1.68
0	1	12	1	30	1	2	1	0	2	23	1.73
0	1	12	1	30	0	3	7	7	2	83	1.59
0	1	15	0		1	8	4	4	1	104	1.59
1	1	14	1	25	0 asian	4	2	3	1	55	1.77
0	1	15	1	28	0	5	5	3	1	79	2.5
0	1	11	0		0	3	7	4	2	74	2.82
0	1	11	1	30	1	7	5	5	1	103	2.91

1	1	11	0		0		2	1.5	2	2	31.5	1.41
1	1	10	1	30	1		3	2	7	2	58	2
0	1	11	1	28	0		2	4	3	2	47	1.36
0	1	13	0		1		4	0	5	1	51	1.59
0	1	11	1	30	1		3	14	7	2	118	
0	0		0		1		1	1	7	2	35	1.14
0	1	12	1	28	0	uses a walker	0	0	0	3	0	1.09
0	1	12	1	28	1		1	3.5	7	2	47.5	1.91
0	1	12	0		1		0	0	7	2	21	1.32
0	1		1	30	1							
0	1	13	1	30	0		2	5	0	3	43	1.23
0	1	12	0		1		2	2	1	2	31	1.27
1	1	12	1	30	1	smokes weed	3	3	3	2	51	2.05
0	1	12	1	30	1	smokes weed	7	7	7	1	119	1.77
1	1	11	1	30	1		1	2	1	2	22	1.45
0	1	13	0		0		2	1	3	2	32	1.09
0	1	13	1	30	1		0	7	7	2	56	1.09
0	1	12	0		0	asian	1	5	5	2	49	1.18
0	1	11	1	30	0		0	0	5	3	15	1.59
0	1	12	1	30	1		5	5	6	1	88	1.41
0	1	14	0		0		3	2	3	1	46	2.45
1	1	11	1	30	1		0	0	7	2	21	1.18
0	1	14	1	28	0		5	3	1	2	63	
0	1	13	1	30	1	ritalin						1.91
0	1	14	1	30	1		5	7	7	2	101	1.41
0	1	13	1	30	1		6	6	6	1	102	2.45
1	1	13	1	28	1		3	7	1	2	65	1.74
1	1	13	1	28	1		3	2	4	1	49	2
1	1	11	0		1		3	6	5	1	72	1.7
0	1	11	0	25	0	vietnamese	2	1	2	3	29	1.09
0	1	11	1	30	0		2	5	1	2	46	1.45
0	1	10	1	30	0		3	2	0	2	37	1.27
1	1	13	0		1		2	2	3	2	37	1
0	1	12	1	30	1		3	5	7	2	73	1.41
0	1	11	1		0		3	7	0	2	62	1.23
0	1	10	1	30	1		4	7	1	1	74	2.36
0	1	11	1	30	1		3	1	1	2	35	1.59
1	1	16	1	28	0		2	2	1	2	31	1.45
1	1	13	1	28	1		1.5	5	7	2	59.5	1.23
0	1	12	1	30	1		3.5	0	10	1	61.5	1.59
1	1	12	1	30	0		5	3	4	1	72	1.36
0	1	13	1	28	1		2	3.5	7	2	56.5	1.09
1	1	11	1	30	0		3	5	8	2	76	1.55
0	1	13	0		0		5	4	3	1	74	2.36
0	1	11	1	28	1		2	5	7	2	64	1.41
0	1	12	1	28	1		1	2	7	2	40	1.18

1	1	8	1	30	0	2	5	2	2	49	1.36
0	1	12	1	30	1	3	1	0	2	32	1.27
0	1	14	1	28	1	3	5	0	2	52	1.23
0	1	14	1	30	1	3	4	7	2	68	1.41
0	1	11	1	30	0	0	2.5	1	2	15.5	
1	1	10	1	28	1	2	5	7	2	64	1.86
0	1	12	1	28	1	3	3	0	1	42	1.41
0	1	11	1	30	1	0	0	7	2	21	1.41
0	1	15	0		1	3	3	2	2	48	1.45
1	1	13	1	28	1	3	5	3	1	61	1.77
1	1	13	1	30	1	3	7	0	1	62	1.64
1	1	14	0		1	7	7	7	1	119	2.36
0	1	13	1	30	1	2	4	0	1	38	1.77
0	1	12	1	40	1	1	1	1	2	17	1.09
0	1	12	0		0	11	0	2	1	105	1.23
1	1	14	1	21	0	14	2	7	1	157	1.77
0	1	12	1	25	1	7	7	7	1	119	1.41
0	1	14	0		0	10	2	3	1	109	1.36
0	1	13	1	30	1	11	7	7	1	155	1.41
0	1	12	1	30	0	7	6	3	1	102	1.48
0	1	10	1	30	1	7	4	3	1	92	1.45
1	1	13	1	28	1	10	0	0	1	90	1.73
0	1	14	1	30	1	0	1	1	3	8	1.05
0	1	14	0		0	10	3	3	1	114	1.64
0	1	12	1	28	0	14	7	14	1	203	2.09
0	1	13	1	28	0	14	7	4	1	173	1.27

PAQ2	PAQ3	PAQ4	PAQ5	PAQ6	PAQ7	PAQ8	PAQ9	Reason	TotalPAQ	Height	SittingHeight	Weight	
										168.3	90		
	5	2	3	3	2	3	2.29	0	21.84	173	92.3	64.8	
										156	69	49.5	
	5	3	3	3	4	2	3.57	1 Flu	25.12	152	79.5	49.7	
	3	2	3	3	2	2	3	0	19.45	131.5	71.2	33.6	
	5	2	3	4	3	5	4	0	27.43	156.2	81	40.2	
	4	1	5	4	3	3	3.57	0	24.84	161.4	85.4	56.2	
	4	2	3	3	2	0	1.86	1 coughing	17.22	162.8	89	65	
	4	2	3	2	1	2	2.57	1 tired	18.12	165	85.2	59.4	
	4	3	2	3	4	3	2.71	0	23.53	162	83.1	58.2	
	4	2	3	3	4	3	3.43	0	24.02	159.5	83	49.2	
	4	2	2	3	2	3	3	0	20.36	151.8	84	53	
	3	2	2	2	2	3	3.43	0	18.7	167	88.4	88.1	
	5	2	4	3	4	4	4	0	27.68	160.5	85.1	48.2	
	4	2	3	3	2	2	3.14	0	20.62	165	83.1	47	
	5	2	4	3	3	3	3.71	1 business	25.12	159.5	85.7	72.2	
	5	2	4	4	3	4	4	0	27.61	156	83.8	41.9	
	4	1	4	5	3	4	3.57	0	26.16	161.3	85.5	55.3	
	5	2	4	4	5	3	4	1 flu	28.9	164	85	65.5	
	3	1	1	1	3	2	2	0	14.14	164.6	85.2	64.2	
	4	2	3	3	2	2	1.86	0	19.63	173.9	89	73.6	
	4	2	1	2	3	2	1.57	0	16.98	166.8	84.8	57.2	
	5	2	5	3	3	3	3.57	0	24.57	163.3	87	80.3	
	4	2	4	3	3	3	3	0	23.41	153	82.7	50.4	
	4	2	2	2	2	2	3	0	18.32	155.4	83.4	62.8	
	4	2	1	1	2	2	1.71	0	14.89	156	84	57.3	
	2	1	1	1	1	1	1.86	1 strepthroat	10.043	170.3	89.7	63.9	
	3	1	1	2	2	3	1.71	0	14.94	168	88.5	80.2	
	4	2	4	4	3	4	3.14	1 hurt knee	25.73	159.8	84.3	59	
	4	2	3	3	3	3	3.14	0	22.55	160.1	83.7	56.7	
	2	1	1	3	1	2	1.43	1 friend/foot/tes	12.6	160.4	82	52.8	
	3	1	1	1	2	1	1	0	11.36	163.4	85.1	55.3	
	4	2	2	3	4	3	1.71	0	21.14	160	81.8	51	
	3	1	4	4	3	3	2.86	0	22.29	161.7	82	55.3	
	3	1	1	2	3	1	1.57	1	13.75	156.2	79.8	61.6	
	4	2	2	1	4	3	3	0	20.45	168.2	82.2	58.6	
	5	2	2	2	2	2	3	0	19.27	161.1	84	50.8	
	4	2	2	4	2	2	3.29	1 cold	21.02	158.3	80	52.3	
	4	2	3	2	3	3	3.43	0	21.79	168.3	80.3	57.4	
	3	1	3	3	3	2	3.29	0	20.15	153.5	82.5	49.6	
	4	1	3	3	4	3	3.29	0	23.47	162	85.6	52.9	
	3	3	3	3	3	2	3	0	21.27	154.4	83.4	45.4	
	4	2	3	3	2	2	2.29	0	19.61	168.5	87.5	75.4	
	4	2	1	1	3	2	2.43	0	16.79	160.3	84	47.3	
										161.2	82.4	60.4	

5	2	2	1	1	2	3.14	0	17.46	167.2	87.8	73.7
4	1	4	3	3		0.57	0	17.75	152.5	82	45.3
5	1	3	2	4	2	2.14	0	21	168.8	88	78.8
3	2	1	1	1	1	1.43	0	11.52	152.4		44
5	1	5	3	2	3	3.29	0	23.72	150.2	80.3	48
3	1	1	3	2	3	1.29	0	15.52	159	83.5	46.8
4	1	5	5	5	5	4.29	0	31.02	169.4	85.6	64
4	1	4	4	2	4	3.29	0	23.93	165.2	84.3	67.7
4	2	3	3	3	2	0.43	0	19.11	176.2	89.2	63.6
4	2	1	1	1	4	3.71	0	17.94	159.5	88.3	52
4	2	3	3	1	2	2.57	1 cold	18.89	152.6	80.4	44.49
5	4	4	3	5	4	3.71	0	30.3	163.3	85.2	81.2
4	2	1	2	1	1	1.14	1 homework	13.23	158.6	81	51
5	1	5	3	2	5	2.86	0	25.27	165	82.1	50.3
4	1	1	1	1	1	1.57	0	11.66	176.3	90.4	74.1
4	2	3	3	2	2	2.57	1 tonsillitis	19.89	155.2	83	52.9
3	2	4	5	2	3	3.29	0	23.61	158.6	80.5	49.4
4	1	3	3	3	3	3.57	1 cold	22.27	169.2	81	59.8
4	2	4	3	5	5	4.29	1 knee injury	29.83	164.2	84.7	50
4	2	4	3	4	3	3.28	0	24.6	166	85	52.6
2	1	3	3	2	1	2.83	0	13.66	164.7	80.5	47
5	3	4	3	1	3	3.29	0	24.93	157	81.4	41.4
2	2	2	1	1	1	1.57	1 tired	9.79	171	91	71.1
4	2	3	2	2	3	2.57	0	20.14	155.4	84.5	38.6
5	2	2	2	2	2	2.57	0	19.14	157.3	83.6	52.9
4	2	4	3	3	4	3.29	0	24.42	160.5	85	50.3
4	2	3	2	2	2	2.14	0	18.28	162.5	88.6	55.3
4	1	3	3	3	2	2.14	0	19.41	165.4	86.1	60.3
4	2	3	3	3	2	2.14	1 sick	20.49	155	82.6	40.1
5	4	3	3	3					147.2	79.5	57
4	2	1	4	1	2	2.29	0	17.47	160.7	87.5	43.7
4	1	2	1	2	3	2.29	1 tendonitis	16.7	159.7	82.7	54.3
3	2	1	3	3	3	2.89	0	16.3	160.6	83.6	50.3
4	4	3	2	1	2	3.14	1 stomach flu	20.92	171.5	89.8	77.1
5	2	2	3	3	2	3.43	0	21.76	150	77.5	39.9
4	2	5	4	3	4	4.14	0	27.81	154.9	83.5	47.7
5	2	1	1	4	3	3.23	0	20.87	161	85.7	48.9
4	2	3	2	3	2	2.14	1 sick	20	159.4	79.7	45.5
1	2	2	2	1	2	1.71	0	14.19	168	87.3	59.1
5	2	3	1	3	4	3.29	0	23.38	157	84.9	60.7
4	2	3	3	2	1	2.57	0	18.75	163.2	83.3	53
3	2	1	1	2	1	2	0	13.17	157.9	83.7	62.2
3	2	1	1	1	1	1.71	0	11.94	157	84	59.9
3	2	1	1	2	1	2.71	0	14.89	165.1	87.6	58.7
4	2	4	3	3	3	3.43	0	23.78	158.5	84.5	57.2
4	2	3	3	2	5	4.43	1	24.96	168.6	86.9	55.2

4	2	3	3	2	5	4.43	0	24.89	170	89	68.1
2	1	1	1	3	2	1.29	1 sick	12.43	150	79.4	47.1
3	2	1	2	1		1.57	0	10.752	157.6	83.6	52
4	2	4	4	2	3	2.86	0	23.09	165.1	89.3	56.9
4	2	3	3	3	3	4	0	23.41	163.9	87.3	61.8
4	1	1	1	2	3	2	1 cold	15.45	158.5	82.4	46.5
5	2	4	4	3	4	3.43	0	26.79	156.5	85.7	50.9
4	2	5	5	3	4	2.71	0	27.48	155.2	82.1	42.6
3	2	1	1	2	2	3.14	0	15.41	166	87.5	49.5
3	2	1	1	1	1	1.86	1 sick	12.09	161.3	85	67
3	2	1	1	3	2	1.86	0	15.18	162.1	84.7	70.7
2	2	2	1	2	2	2.86	0	15.22	178.4	90.3	69.7
4	1	2	2	1	2	1.57	0	14.84	162	84.5	48.7
3	2	1	1	1	1	1.57	0	11.66	162.5	88.6	52
4	1	2	2	1	2	2	1	15.41	159.3	87.5	55.1
4	1	2	1	2	2	1.29	0	14.52	164	86.9	55.1
2	1	3	3	3	3	4.14	0	20.53	159.3	82.5	48.3
4	2	5	5	5	5	5		32.58	161.3	86.1	60.2
3	2	2	3	2	3	3.43	0	19.66	159.6	86.5	77.2
3		2	3	4	3	3.57	0	19.89	167.4	89.2	59.5
4	2	4	4	4	1	3.57	0	23.84	161.8	86.4	62.2
4	2	3	3	3	2	2.43	0	20.61	166.6	88.9	70.5
4	1	3	3	4	3	2.86	0	22.22	158	85.8	56.9
4	2	1	1	1	1	1	0	12	164	85.7	56.5
4	1	1	2	2	1	1.14	0	13.32	162	86.4	56.1
5	4	1	1	3	3	2.57	1	20.89	159.7	84.8	64.6
3	2	1	1	1	1	1	0	11	161.6	87.4	50.5
3	2	1	1	1	1	1	0	11	165.7	88.4	56.4
3	3	1	1	1	2	2.86	1 injured back	15.42	172.5	94.1	68.6
2	1	4	1	1	3	4.43	1 sick	18	163.4	84	57.1
4	2	4	4	3		2.14	1 flu	21.05	157.7	85	58.9
5	3	3	4	3	3	3.71	0	26.35	158.1	80.3	41
4	2	4	4	3		3.14	0	21.97	165.5	89.7	63.6
4		2	3	3	3	2.29	0	18.51	160.5	81.5	47.7
4	2	3	1	2	1	2.86	0	17.08	160	85.5	46.2
2	2	1	3	3	1	2.43	1 head cold	15.79	163.7	86.8	53.3
3	2	1	1	1	1	3	0	13.77	164.2	91.4	72.2
3	2	3	3	1	3	2.71	1	18.98	159	87.5	53.7
3	2	2	1	1	1	2.57	1 head hurt	13.66	160.3	86	52
4	2	3	4	2	3	3.29	1 ankle	23.06	159.5	85.5	71.3
5	4	2	2	2	2	1.43	1 upset stomach,	20.52	167.5	86.5	53.2
4	3	3	3	3	1	3.57	0	22.48	156.7	84.7	49.3
5	3	5	5	5	5	4.57	0	34.84	166.4	88.5	68.7
1	1	3	4	2	3	2.86	0	18.68	153.7	83.6	65.9
5	2	2	2	2	4	2.43	0	20.66	155.3	83.4	53.7
5	3	1	4	1	3	2.71	1	20.89	155.3	81.7	43.9

5	3	2	2	2	2	3.29	0	20.52	157.3	84.6	47.9
4	3	5	5	4	5	4.57	0	32.21	152.3	80.5	49.5
5	3	4	4	3	3	3.43	0	26.82	166	87.4	57.3
4	2	3	3	4	4	3.29	0	25.34	164.6	84.1	47.9
5	2	3	3	3	3	3.86	0	24.34	160.5	84.3	48.9
5	2	4	4	3	3	3.86	0	26.04	155.2	81.4	51.6
3	1	3	1	1	2	2.43	0	14.7	173.3	86	64.1
4	2	3	4	4	4	3.86	1 cold	26.36	157.3	83.3	45.8
4	1	1	3	3	3	2.57	1 sore muscles	18.84	165.8	86.5	63.7
4	2	3	3	2	3	4.14	1 low bp	22.55	165	87.5	53.3
5	2	2	3	3	2	3.14	0	22	165.3	83.6	50.2
3	1	1	1	1	2	1	0	11.14	160.5	87	75.3
4	1	3	3	3	3	3.29	1 sick	21.61	166.7	88.4	71.5
3	1	3	3	2	2	2.29	0	17.38	165.6	81.5	66.5
3	1	1	1	2	2	1.71	0	12.8	164.9	88.4	66.7
5	3	4	5	3	4	4.43	0	30.57	167.3	87.5	75.5
5	3	4	4	3	4	4	0	28.72	154.5	79.5	55.7
4	1	2	2	1		2	0	13.27	153.5	79.1	45.8
4	1	1	1	1	3	2.43	0	14.57	157.3	81.5	50.1
3	2	3	3	2	2	1.71	0	17.94	165.1	84.3	61.2
5	1	4	4	4	3	3	0	25.64	157.4	82.1	48.1
4	2	2	4	3		3	0	19.82	165.5	87.5	80.6
									153	79.5	54.5
4	2	3	2	3	3	3.14	0	21.46	166	86.6	52.6
4	1	4	2	2	4	2.14	0	20.46	161.7	82.1	55.4
									153.5		83
									143.6	78.8	38.2
4	2	3	3	4	3	3.43	1 school projects	24.34	168.1	85.1	53.9
5	2	3	1	3	2	2.29	1 cough/flu	19.52	166.5	88.5	81.8
									155	81.5	63.1
3	1	2	5	2	3	3.43	0	21.04	153.8	79	42.5
									156	85.1	121.8
5	2	4	4	3	4	3.57	0	28.93	162.6	83	48.3
4	2	5	4	3	4	3.43	1 threw-up/pain	27.02	152.3	81	59
5	2	1	1	3	1	3.43	0	17.61	170	89	75.1
5	2	1	3	3	2	2.43	0	19.84	160.5	83.8	57.2
5	2	5	4	2	5	3.43	0	27.78	170.2	89.6	66.1
2	1	2	2	1	3	2.29	0	14.65	157	84.5	51.2
4	2	2	2	2	2	2	0	17.32	163.7	85.7	47.7
4	2	1	2	2	2	2.86	0	17.22	160.5	86	80.1
3	2	2	3	3	2	1.57	1	17.75	167	89	54
3	2	4	4	3	3	3	0	23.32	163.2	84.8	55.7
5	2	1	1	1	1	2	1 cramps	14.14	154	84.4	51.1
3	1	3	3	2	3	3.71	1 flu	20.35	165.5	86.4	53.1
3	2	4	4	4	3	3	0	24.3	161.4	84	54.2
4	3	4	4	4	3	3	1 cold	26.82	161	84.8	68.4

5	2	3	3	2	3	2.29	0	21.59	155.7	78.6	44.7
4	2	3	3	3	3	2.86	0	22.21	163	86	
4	2	5	2	1	4	4.43	1 Bronchitis	23.84	162	87.1	57
3	2	3	1	1	2	1.71	0	14.8	149.5	77.5	47.1
4	2	1	2	2	2	1.86	0	15.91	158	81.3	42.3
4	1	3	3	3	3	3.57	0	22.7	165.8	85.6	61.3
5	1	3	3	3	3	2.29	0	21.7	161	84	76.6
4	1	3	3	3	5	4	0	24.32	167.1	85.5	67
4	2	2	3	2	2	2.86	1 flu	19.31	162.3	83.8	63.6
4	2	1	1	1	2	2.43	0	14.57	173.5	93.6	70.5
5	2	1	1	1	2	3.29	1 sick	16.56	155.6	79.9	48.6
4	1	1	1	2	2	2	0	14.36	152.3	84.3	57
4	1	2	1	1	2	2	0	14.27	154.4	81.5	53
4	2	1	1	2	1	1.43	0	13.6	155.2	82	45.3
4	2	2	1	1	2	1.43	0	14.61	174	88.1	54.8
4	2	1	1	1	1	1.43	0	12.75	167.3	91.3	60.4
3	1	5	3	3	5	5	0	26.63	170.5	89	67.6
4	1	1	3	1	3	2.57	0	16.84	162.5	86.5	57.2
4	1	5	2	2	4	3.71	0	22.94	178.4	90.3	61.9
4	1	5	3	5	5	3.57	1 cold	28.35	156.8	86.4	64.7
4	1	4	2	1	3	2.71	0	19.16	156.5	80.7	49.9
5	2	2	1	1	1	3.29	0	16.38	167.3	87.7	50.9
3	1	1	1	1	3	2.14	0	13.28	160	86	55.9
4	2	5	1	2		4.43	0	23.7	159.5	84.4	55.8
4	2	2	4	3	3	3.71	0	23.04	166	87.7	65.2
4	2	3	3	3	3	2.43	1 cold	21.84	173.5	88.1	55.5
4	2	3	2	3	3	2.71	0	21.21	162.7	86.6	51.8
3	2	5	4	4	4	3.71	0	27.12	174	91.3	79.5
4	1	4	4	4	2	4	0	24.59	158.8	81.5	49.1
3	2	2	2	2	3	2.14	1 sick	17.41	161.7	85.5	51.8
3	1	1	4	3	4	3	0	20.37	179.5	94.7	82.7
5	3	5	4	3	3	4.71	0	29.39	173	90.7	77.7
3	2	3	2	1	2	3	1 sick	17.39	156	82	57.2
5	2	5	5	5	5	4.29	0	32.65	167.7	86.4	49.2
3	2	1	1	3	3	2.14	0	17.28	162.4	83.1	52.7
3	2	3	3	2	2	2.57	0	19.05	167.1	86.5	53.6
4	2	4	3	2	3	3.29	0	22.79	170.4	88.8	68.1
5	3	5	5	4	5	4.71	1 fever	33.61	164.8	87	68.1
4	3	5	5	5	5	4.71	0	33.44	167	85.3	55.8
5	2	4	4	4	4	4	0	28.27	173.2	84.8	51.7
3	2	4	4	5	4	3	0	28.86	160.6	85.7	44.8
5	3	5	4	3	5	3.86	1 flu	30.86	165	84.6	49.9
4	2	1	3	2	2	3	0	18.32	157.5	80.9	48.5
3	2	3	5	3	4	5	0	26.45	164.5	85.2	54.9
4	2	3	3	2	3	3.29	1 away	21.74	164.5	86.4	56.1
4	1	1	2	2	2	1.71	0	15.07	156.6	82.3	63.5

2	1	3	2	1	4	1.29	0	15.59	167	87.1	60.3
4	1	2	4	1	3	2.71	0	19.07	163.5	86.3	56.1
4	2	3	1	1	3	2	0	17.27	154.5	83.4	59.9
3	2	1	1	2	2	2.29	0	14.47	161.3	87.6	50.1
2	2	3	5	4	5	4.29	0	26.81	158.6	84.3	62.3
2	2	5	3	3	3	2.57	0	22.07	174.5	89	58.4
5	1	2	3	3	3	2.71	0	21.16	167.6	88.5	62
3	1	1	2	2	2	2.14	1 sick	14.32	170.3	88.3	58
4	2	1	3	1	2	2.71	1 flu	17.16	161.5	88.6	53.4
4	2	1	1	1	1	2.43	0	13.57	154.5	82	
3	2	5	4	4	2	3	0	24.32	162.3	85.4	56.8
4	2	3	3	3	3	4.14	0	23.62	164.1	88.5	51.8
4	2	1	1	1	1	1.29	1 sore throat	12.43	166.2	87	62.3
2	1	2	3	3	2	2.29	1 cold	16.47	160.5	88.5	59.1
3	2	2	3	3	3	3	0	20.3	172	89	50.9
4	3	3	3	3	2	3	0	22.73	184	94.4	81.6
4	2	1	1	1	1	2.14	1 sick work	13.37	154.4	84.2	49.7
4	2	2	1	2	2	1.71	1 cold	16.3	166.4	83.6	51.4
5	1	2	1	2	5	3.14	0	20.36	166.2	85	55.3
4	1	1	1	1	1	1.43	1 sick	11.61	158.5	84.5	49.6
5	1	3	2	3	4	3	0	22.32	153.8	84.2	46.7
4	2	3	3	3	3	2.86	0	22.22	176	94	79.6
2	2	4	1	2	4	3.29	0	19.79	186	96.2	75.7
4	2	3	3	2	2	2	1 too weak	19.86	161.5	85.8	46.3
4	1	1	1	1	1	1.71	0	11.89	164.5	87.2	63.9
5	1	3	3	2	2	3.86	1 funeral/hw	21.27	167.5	86	85.5
4	2	3	2	4	3	3.86	1 pneumonia	23.5	162	82.6	64.7
4	1	3	3	2					154.5	82	53.2
4	1	3	3	2	2	2.29	0	18.7	153.3	82.5	53
3	2	1	1	1	3	1.43	1	13.66	158.4	85.4	54.5
5	2	1	3	1	3	2.43	0	18.86	165.5	88.4	49.2
4	2	3	4	3	2	2.71	0	22.07	166.6	89.6	45.4
3	2	3	3	2	2	2.29	0	18.93	157.8	84.5	60.7
5	2	5	5	3	5	5	1 sick	31.36	160.384	84.1	56
3	2	2	3	2	2	2.14	0	17.41	164	86.3	72.1
5	1	5	4	3	4	3.86	1 missed class	27.59	166	88	65.9
5	2	4	5	3	3	3.14	1 flu one day	27.41	157	83.5	55.6
4	1	4	3	4	3	2.85	0	23.11	166	86.5	58.8
5	5	1	1	2	2	2.86	0	19.99	165.5	90.3	49.5
4	2	3	2	3	5	4.43	0	24.87	160.2	87	74.5
4	1	3	1	1	2	2.57	1 NLS recert	15.8	159.2	86	56.2
5	1	2	2	3	2	2	0	18.17	165.2	89.3	65.5
5	5	5	5	5	5	4.57	0	36.65	166.5	89.5	62.4
3	2	2	1	3	3	3.57	0	18.84	159.6	88.4	53.3
4	2	3	3	1	3	3	1 headache/heac	20.45	170.5	93	61.5
4	2	4	3	3	3	3.71	1 stress	24.1	164.5	87.7	50.3

5	2	3	1	2	3	3	1	sinus infection	20.35	167.7	89.5	90.4
4	1	5	5	5	5	4.57	0		30.98	160	81.6	48.1
4	2	2	2	1	1	2.29	1	stomachace	15.83	159.8	87.2	99.2
4	2	3	2	2	2	2.57	0		18.78	170.4	91.2	65
5	2	3	3	3	3	3.86	0		24.29	165	89	79.3
4	1	1	1	1	2	2.71	0		14.98	170.3	88	43.9
4	2	1	3	2	2	3	0		18.41	155.7	83.5	42.8
4	2	4	4	4	3	3.14	1	stomachache	25.4	159.6	85.4	57.6
4	1	5	5	5	5	4.71	0		31.12	171.2	91	61.6
5	2	4	4	5	4	3.71	0		29.49	168.3	88.5	65.3
5	1	1	1	1	2	2.29	0		14.38	164.1	92.2	53.7
5	2	2	1	2	3	3	1	strep	18.18	159.1	85.5	51.4
5	2	1	1	3	1	3	0		17.55	169.6	92.8	52.6
4	1	2	4	2	3	4.57	0		21.83	173	92.8	64.5
5	1	3	3	2	2	3.14	0		19.81	156.2	83.2	61.7
5	1	3	1	1	2	1.71	0		15.98	151.1	80.3	55.1
5	2	4	4	3	4	4.14	0		27.64	154	82.5	40.6
5	2	5	5	2	4	4.57	0		29.25	154.2	84.5	59.7
3	2	1	2	3	3	2.29	1	sick	18.24	165.3	89.8	55.5
4	2	1	1	1	1	1.57	1	sick	12.62	165	85.7	94.8
4	2	2	1	3		1.71	0		15.39	160.1	82.4	53
5	2	4	4	4	1	4.57	0		27.18	162.5	85.1	47.9
4	1	3	2	1	3	2.29	0		17.55	167.6	90.7	68.8
4	2	5	5	3	4	3.57	0		28.93	166.6	86.7	62.4
4	1	1	1	1	1	3.57	1	sick	13.75	159.2	84.6	55.5
5	2	2	1	3	1	3.29	0		19.56	156.7	81.2	49.6
5	2	3	2	2	3	2.43	1	sick	21.2	160.3	85.5	62
4	2	3	3	2	4	3.86	0		23.27	170.2	88	58.4
4	1	3	3	3	4	3.29	0		22.65	160.4	89.2	84.4
4	2	2	2	2	1	1.71	0		16.98	156.6	82.8	51.9
3	2	3	2	1	3	3	0		18.63	172	89	82.5
4	1	2	1	2	2	2.57	1		15.75	157.6	84.5	58.7
4	2	2	2	3	3	2.29	0		19.88	174.3	93.2	56.7
5	1	5	4	3	4	3.86	1	cold	27.09	172.1	92.6	70
5	1	2	3	3	2	2.43	1	flu	19.84	171.4	85.36	73
										166.3	89.6	
5	1	4	4	1	3	2.86	0		22.18	170.7	88.3	
3	3	3	3	3	5	4.57	0		26.48	160.5	84.5	57.3
4	2	3	1	3	5	3.14	1	sick-virus	22.5	165.1	85.8	65.9
1	1	5	5	3	5	4.43	0		25.75	169.4	88.6	59.1
3	2	1	1	1	1	2	0		12.23	163.7	85.5	44.2
5	1	5	5	3	5	4.86	0		30.72	155.1	83.4	48.1
1	2	5	5	5	5	3.14	1	sick	27.6	177	94.2	64.6
3	2	5	5	5	4	2.86	0		28.13	169.2	87.5	58.3
1	1	5	5	4	5	4.86	0		27.16	165.5		58.5
										172	91.5	65.5

1	2	3	3	5	4	3.71	0	22.97	163.4	83.6	48.9
4	2	3	3	3	3	4	0	23.5	164.3	86.4	50.2
3	2	3	1	2	3	2	1 health class	17.32	160.1	84	48.2
3	2	1	2	1	3	3	0	17.41	165.7	85.2	53.3
2	2	2	3	3	1	1.71	0	15.85	163	86.3	56.1
3	2	2	1	3	2	1.43	0	15.66	159	85.4	47.9
4	2	1	2	3	2	1.29	0	16.61	168.2	88.7	49.7
1	1	2	2	3	1	2.14	1 cold	13.5	160.5	83.5	62.5
2	2	1	2	3	2	2.43	0	15.79	156.7	86.1	48.9
3	1	3	3	4	3	2.57	0	20.89	156	86.6	60.6
5	1	4	3	3	4	3	0	24.64	157.5	85.1	57.8
3	1	1	1	1	2	1.29	0	11.47	157.5	82.5	55
3	1	2	2	1	1	2.299	0	13.51	160	87.3	51.7
4	2	3	3	3	2	2.57	0	20.89	160.5	84.5	58
1	2	2	5	3	3	2.29	1 health class	19.65	167	86	58.2
5	2	4	4	3	4	3	0	26.96	168.4	88.4	67.7
5	2	3	4	4	5	4.43	1 twisted ankle	28.75	166.3	90.2	48.2
5	2	5	5	5	5	4.57	0	34.83	154.5	81.3	54.2
4	2	2	3	2	2	2.57	1 extra busy	19.11	162.5	86.2	52.1
5	1	3	3	2	3	3.14	0	21.44	155.4	88	76
4	1	4	3	3	4	2.57	0	23.62	171	90	56
2	2	1	1	1	1	1	1 disease in foot	10	160.2	86.6	50.1
3	2	2	2	3	2	2.29	0	17.93	166.8	90.5	63.1
4	2	3	3	2	2	3.29	0	20.56	164	85.5	76.4
4	1	5	4	2	2	2.57	0	21.89	168.3	90.8	63.3
4	1	3	3	3	3	2.14	0	20.55	157.7	85.3	53.4
4	2	2	3	2	3	3	0	20.36	156	85	58.6
4	1	3	2	2	2	2.14	1 sick	17.59	171.5	89	80.3
2	1	1	1	1	1	2.14	1 knee surgery	10.46	153.7	79.8	53.2
4	4	3	3	2	4	2.57	0	24.3	174	92.2	72.1
4	2	2	3	2	3	2.86	0	20.21	158.5	84.5	68.6
5	1	3	5	2	4	2.71	1 fever	24.39	151.5	79.2	49.8
4	2	3	3	3	3	2.71	0	22.35	170.4	87.4	58.1
2	2	3	3	3	3	2.71	1 health	20.16	164.1	86.5	77.4
2	1	3	2	3	2	2.86	1 health	17.31	176.8	91.1	65.1
2	4	4	4	2		3.71	0	20.89	166	87.6	76.2
1	1	1	1	1	2	2.14	1 flu	10.64	158.8	84	65.1
3	1	2	3	2	3	3.43	0	18.52	158.5	83.4	49.6
4	1	1	3	3	2	2.86	1 sore throat/cou	18.54	163.2	84.6	75.6
3	1	2	1	3	3	2.43	0	17.16	155.3	85.4	51.9
4	2	3	2	3	2	2.86	0	20.45	162	86.6	57.1
5	2	5	3	4	5	4.43	1 cold	30.02	163.8	87.8	61.2
4	2	3	3	2	2	3	0	20.77	163.9	87	51
5	2	5	4	4	4	3.86	0	30.36	164	84.5	49.5
4	2	1	3	3	3	3.43	0	22.25	167.4	87.6	72.9
5	2	5	4	3	5	4.43	0	31.34	176.5	86.5	79.4

3	1	1	3	2	2	2.71	1 cold	16.12	159.3	82.1	48.9
5	2	3	3	3	2	4	0	24	169	91	86.8
4	2	3	3	4	3	2.71	0 plugged nose?	23.07	163.5	85.5	101
4	2	1	3	4	3	2	0	20.59	163.5	85.5	46.4
									162	86.7	60.4
2	1	1	2	3	2	1.71	0	13.85	167	88.5	80.8
2	1	2	1	1	2	2	0	12.09			
2	1	2	1	1	1	3.14	0	13.05	159	82.5	53.4
4	2	3	3	3	3	2.71	0	22.03	164.5	85	72.5
									158	86.4	46.9
2	1	3	1	1	2	1.86	1 health/sick	13.09	153.5	77.5	49.1
	2	3	3	3	2	2.86	0	17.13	173.5	91.5	72.8
2	2	3	3	3	2	2.57	0	19.62	164.5	82	73.3
5	2	3	3	3	3	3.57	0	24.34	164	83.5	58.8
4	2	2	1	2	2	3	0	17.45	160.2	85	55.2
4	1	3	2	1	1	1.43	0	14.52	166.1	85.3	58.2
5	2	1	4	4	2	3.29	1 head cold	22.38	168.8	90.3	53.3
2	2	1	1	1	2	1.86	1 health	12.04	157.2	82.6	61.2
3	2	2	3	3	2	2.14	0	18.73	159.1	83	82.5
5	2	5	4	4	5	3.14	0	29.55	149	78.6	48.2
1	5	1	1	1		3.29	0	14.74	163	86.3	72.6
4	2	1	1	1	2	2.43	1 sinus infection	14.61	171	90.5	56.8
								22.95	166.2	84.5	51.4
5	1	3	3	2	3	3.43	0	22.34	156	83.4	69.5
5	2	3	4	3	1	2.57	0	21.98	162.6	84.5	50.4
5	4	5	5	5	1	5	0	32.45	176.4	90.5	69.2
4	2	5	4	3	4	3	0	26.74	174	92	68.4
5	1	3	2	3	4	4.71	0	24.71	153.5	80.9	48.3
4	2	5	3	3	4	3	0	25.7	171.1	90.5	65.1
4	2	1	1	1	1	2.71	0	13.8	156.5	84.3	52.6
5	2	3	3	3	2	3	1 sick	22.45	165.7	86.6	69.9
5	2	1	3	3	2	1.57	0	18.84	156.5	86.6	61.7
4	1	3	3	2	4	3.43	0	21.43	153.6	81.3	53.4
3	2	2	2	2	2	3.71	1 sick	18.12	159	78.7	57.5
3	1	3	1	1	2	1.71	0	13.94	162	87.2	75.6
4	1	3	3	3	3	3	1 sick	22.36	166.5	84.5	61.2
1	1	3	3	1	3	2.57	0	16.16	161	84	66.2
1	2	2	3	2	3	1.43	0	15.88	158.5	83.8	65.2
1	2	1	2	3	2	2.86	0	15.09	171	89.5	101
4	2	3	3	2	4	3	0	22.59	163.7	86	66.3
5	1	3	3	2	4	4.71	0	24.07	166.2	82	57.5
2	2	2	2	3	2	1.29	1 allergies/cold	15.38	158.5	90	48
3	3	4	3	4	4	3	0	25.55	158	84	57.3
5	3	4	3	5	4	4	0	30.36	148.3	74.8	48.6
3	2	2	1	2	3	3	1 cold	17.41	170	89.3	102.3
1	2	3	2	2	2	2.29	0	15.47	163.5	89.6	91.2

4	1	1	1	1	1	2	0	12.36	157.5	88	69
3	2	2	2	2	3	3.29	1 no energy	18.56	172.5	85	71.8
4	2	3	2	2	3	3	0	20.23	165.5	87	48.1
3	2	3	2	3	2	2.71	0	19.12	167.6	85.9	65.3
									143.5	71.7	56.8
5	2	5	3	3	3	3	0	25.86	160	86.1	65.7
2	2	3	3	1	3	3.14	0	18.55	161.9	86.5	72.5
1	2	3	3	3	2	3.43	0	18.84	165.1	83.2	65.2
5	1	5	4	5	4	3.29	0	28.74	156.3	81	37.9
3	3	3	4	3	3	3.14	0	23.91	160.5	85.8	55.3
3	2	2	2	2	4	3.71	0	20.35	158.2	84	50
5	5	5	5	3	5	4.43	0	34.79	172.5	91	66.4
5	4	5	4	4	4	4.43	0	32.2	172.7	91	55.1
1	1	1	2	2	2	1.29	0	11.38	156.5	83.7	39
									154	78.4	50.9
									170.5	90.5	52.6
									163.8	82.7	68.6
									171.5	89.5	59.1
1	2	1	4	3	5	4.14	0	21.37	165.5	86.5	63.1
1	2	5	5	4	5	5	0	28.77	163.2	79.6	64.7
1	1	5	5	4	5	4.71	1 tonsilitis	27.12	168.7	86.5	64.1
4	1	5	4	3	5	4.71	0	28.07	180.5	93.2	65.8
2	1	5	5	3	5	5	0	27.41	181.5	96	98.4
1	1	4	5	4	4	4	0	24.48	171.2	94.1	73.5
									176.5	95	66.2
1	2	1	5	3	5	4.71	0	23.16	171.4	92	85.3
1	1	5	5	4	5	5	0	27.73	176.5	92.5	83.5
1	1	1	1	2	1	1.57	0	9.62	163.8	84.1	49.4
3	2	3	5	3	5	5	0	27.64	164.4	83.5	70
									170.3	89.5	61.1
3	2	5	5	3	5	5	0	30.09	164.7	86.9	64.4
3	2	5	5	3	5	4.71	0	28.98	168.3	86.5	51.7

PHV	BMI	BodyFat	FM	LM	DomRadSOS	DomTibSOS	NDomRadSOS	NDomTibSOS
						3604	3872	3685
-0.160811618	21.7	25.7	16.6536	48.1464		3736	3880	3816
-1.621343029	20.3	23.3	11.5335	37.9665	3839	3582	3732	3617
-1.013704349	21.5	29.8	14.8106	34.8894			4082	3766
-1.92409176	19.4	29.3	9.8448	23.7552		3582	3958	3595
-0.330340987	16.5	12.1	4.8642	35.3358		3752	3716	3820
-0.69090844	21.6	19.6	11.0152	45.1848	3937	3925	3882	3778
-0.803933777	24.5	26.6	17.29	47.71		3737	3911	3762
-0.576012994	21.8	25.3	15.0282	44.3718	4012	3826	4068	3787
-0.771389968	22.2	28	16.296	41.904		3806	3832	3867
-0.816061579	19.3	14.1	6.9372	42.2628	3923	3852	3813	3814
-0.618386509	23	25.1	13.303	39.697		3965	4087	3842
-1.451951941	31.6	38.9	34.2709	53.8291				
-0.23856019	18.7	19.1	9.2062	38.9938		3962	3889	3885
-0.200594967	17.3	19.3	9.071	37.929		3818	3793	3785
-1.359066285	28.4	40.3	29.0966	43.1034		3884	3869	3907
-0.394906885	17.2					3624	3770	3639
0.398824915	21.3	22.4	12.3872	42.9128		3850	4068	3866
0.020593735	24.4	23.8	15.589	49.911				
	23.7	28.7	18.4254	45.7746	4089	3921	3950	3859
0.410020499	24.3	29.2	21.4912	52.1088	3792	3976	3792	3835
0.609081385	20.6	21.3	12.1836	45.0164		3952	3989	3943
-0.417497412	30.1	36.9	29.6307	50.6693		3870	4099	3792
0.205078559	21.5	25.1	12.6504	37.7496		3875	3955	3865
	26.1	28.3	17.7724	45.0276		3904	4045	3909
-0.212666226	23.5	31.8	18.2214	39.0786		3867	4022	3912
0.818933573	22	29.6	18.9144	44.9856		3778	3896	3846
-0.015675454	17.8	21	16.842	63.358			4083	3937
-0.018522418	23.1	28.4	16.756	42.244		3578	4145	3729
0.075604347	22.1	25.4	14.4018	42.2982	4059	3867	4050	3883
0.325273564	20.5	23.6	12.4608	40.3392		3861	3838	3838
0.677983866	20.7	25.8	14.2674	41.0326		3954	3938	3899
0.526040505	19.9	21.6	11.016	39.984		3779	4165	3845
0.329492094	21.1	23.8	13.1614	42.1386		3801	3913	3802
-0.334504296	25.2	32.8	20.2048	41.3952		3823	3922	3925
-0.00706071	20.7	21.5	12.599	46.001		3903	3942	3940
-0.228416894	19.6	16.6	8.4328	42.3672		3827	3688	3862
-0.504728188	20.9	26.8	14.0164	38.2836		3763	3993	3739
-0.353547691	20.3	22.8	13.0872	44.3128		3940	3982	3950
-0.311105156	21.1	30.6	15.1776	34.4224		3621	3881	3724
0.03895191	20.2	24.4	12.9076	39.9924		3900	3797	3919
-0.376067516	19	24.7	11.2138	34.1862		3805	3861	3829
-0.559406716	26.6	37.7	28.4258	46.9742			3945	3825
0.105901754	18.4	16.4	7.7572	39.5428		3915	3965	3853
-0.613265147	23.2	32.3	19.5092	40.8908			3887	3850

-0.25567489	26.4	40.5	29.8485	43.8515		3920	3937	3866
0.459928029	19.5	29.3	13.2729	32.0271	3968	3794	3963	3776
-0.730146194	27.7	34.4	27.1072	51.6928		3765	3943	3743
		24.8	10.912	33.088				
-0.695674203	21.3	27.4	13.152	34.848		3855	4031	3858
0.193731705	18.5	23.9	11.1852	35.6148		3941	4063	3939
1.017026895	22.3	28.8	18.432	45.568	3958	3997	3879	3860
0.555808579	24.8	28.7	19.4299	48.2701	4006	3903	4027	4012
-0.14509704	20.5	17.7	11.2572	52.3428		3928	3893	3898
0.676329581	20.4	16.3	8.476	43.524	3984	3942	4123	3985
-0.584300378	19.3	22.8	10.14372	34.34628		3800	4023	3731
-1.362816315	30.4	38.9	31.5868	49.6132		3653	3661	3974
0.29982185	20.3	32.5	16.575	34.425	4028	3874	3984	3913
-0.598291164	18.5	18.9	9.5067	40.7933		3633	3794	3608
0.603828235	23.8	35.1	26.0091	48.0909	3881	3836	4080	3846
-0.097614485	22	22	11.638	41.262	3901	3873	3909	3902
-0.898468267	19.6	24.4	12.0536	37.3464		3729	3956	3736
-0.823854877	20.9	26.8	16.0264	43.7736	3844	3686	3844	3671
-0.203418433	18.5	18.1	9.05	40.95		3705	3904	3648
-0.580816264	19.1	21.2	11.1512	41.4488	4096	3958	3924	3896
-0.31254807	17.3	13.4	6.298	40.702		3757	3750	3794
-0.590091623	16.8	15.1	6.2514	35.1486		3871	3862	3837
0.400975134	22.1	30.4	21.6144	49.4856		3779	3963	3793
0.328451452	16	19.7	7.6042	30.9958				
-0.12532775	21.4	31.2	16.5048	36.3952			3914	3829
0.050018309	19.5	23.5	11.8205	38.4795				
0.131682158	20.9	22.7	12.5531	42.7469			3984	3849
-0.255583363	22	20.2	12.1806	48.1194			3979	4054
0.254248223	16.7	12.6	5.0526	35.0474			3712	3719
-1.381083646	26.3	36.2	20.634	36.366			3975	3801
0.43821827	16.9	11.2	4.8944	38.8056			3925	3868
-0.565779498	21.3	24.3	13.1949	41.1051			4032	3960
0.153293158	19.5	21.9	11.0157	39.2843			3919	3901
-0.008312471	26.2	35.8	27.6018	49.4982			3966	3877
-1.170762495	17.7	18.8	7.5012	32.3988		3797	3818	3731
-0.925532647	19.9	13.8	6.5826	41.1174		3853	3858	3831
-0.595274415	18.9	27.1	13.2519	35.6481		3791	3946	3667
-0.748525024	17.9	16.4	7.462	38.038		3726	3778	3773
0.031334014	20.9	21.2	12.5292	46.5708	3657		3904	3680
-0.422249166	24.6	35.5	21.5485	39.1515		3910	4109	3875
-0.710812985	19.9	26.4	13.992	39.008		3847	3981	3836
-1.17489531	24.9	39.6	24.6312	37.5688		3837	3811	3837
-0.561426606	24.3	33.8	20.2462	39.6538		3836	4053	3783
-0.131183892	21.5	31.3	18.3731	40.3269		3894	3993	3951
-0.406170107	22.8	28.1	16.0732	41.1268		3748	3921	3783
0.23508018	19.4	19.3	10.6536	44.5464		3667	4120	3723

0.040532383	23.6	24.9	16.9569	51.1431				
-0.723222945	20.9	29.9	14.0829	33.0171		3905	3975	3803
-0.220357127	20.9	27.5	14.3	37.7		3875	4162	3807
0.041578284	20.9	19.1	10.8679	46.0321		3890	3964	3891
0.045358747	23	28.7	17.7366	44.0634		3933	3947	3865
-0.106568266	18.5	22.2	10.323	36.177		3764	3968	3819
-0.016579131	20.8	15.7	7.9913	42.9087		3918	3839	3914
0.139443175	17.7	16.1	6.8586	35.7414		3850	4075	3914
0.641965591	18	18.2	9.009	40.491		3831	3982	3880
-0.616434465	25.8	37.5	25.125	41.875		3800	3966	3782
-0.923511408	26.9	39.7	28.0679	42.6321		3835	4164	3834
0.238255352	21.9	23.3	16.2401	53.4599		3870	3916	3786
0.512614089	18.6	19.9	9.6913	39.0087		3704	3931	3793
1.06307496	19.7	23.7	12.324	39.676			3999	3839
0.291802434	21.7	24.3	13.3893	41.7107		3798	3831	3814
0.440544964	20.5	25.7	14.1607	40.9393			4027	3935
0.400965531	19	20.8	10.0464	38.2536		3936	4044	3858
0.358417822	23.1	30.6	18.4212	41.7788			3994	3884
-0.763505125	30.3	45	34.74	42.46			3798	3699
1.381401619	21.2	20	11.9	47.6		3874	3993	3961
0.267563854	23.8	32.4	20.1528	42.0472		3877	4058	3897
0.4148793	25.4	37.9	26.7195	43.7805			4061	3877
0.432985015	22.8	23.5	13.3715	43.5285			4061	3932
0.466338375	21	27.6	15.594	40.906		3799	3875	3649
0.635887126	23.1	21.4	12.0054	44.0946			4039	3864
-0.028870553	25.3	34.7	22.4162	42.1838			4212	3785
0.478591256	19.3	23	11.615	38.885		3953	4111	3942
0.919904681	20.5	20.3	11.4492	44.9508		3858	3985	3918
1.078785417	23.1	27.4	18.7964	49.8036			3983	3987
0.173588771	21.4	21.7	12.3907	44.7093				
-1.053280163	23.7	24.4	14.3716	44.5284		3762	3930	3772
-0.722924848	16.4	10.4	4.264	36.736			3752	3774
-0.713710109	23.2	22.2	14.1192	49.4808			3857	3915
-0.640947028	18.5	16.5	7.8705	39.8295			3871	3763
-0.430948076	18	17.6	8.1312	38.0688		3904	4088	3880
-0.507655714	19.9	19.9	10.6067	42.6933		3755	3882	3709
-0.779591525	26.8	36.8	26.5696	45.6304	3946	3821	3935	3787
-0.758725624	21.2	22.9	12.2973	41.4027		3870	4014	3903
0.307089791	20.2	32.9	17.108	34.892			4044	3963
-1.14340035	28	37.4	26.6662	44.6338				
0.030843726	19	20.3	10.7996	42.4004			3901	3924
-0.764605945	20.1	13.9	6.8527	42.4473			3893	3869
-0.70643286	24.8	28.5	19.5795	49.1205				
-1.326929387	27.9	39.7	26.1623	39.7377			3910	3857
-0.924435451	22.3	24.4	13.1028	40.5972			3907	3927
-0.649300623	18.2	11.7	5.1363	38.7637			3868	3815

-0.687504115	19.4	20.6	9.8674	38.0326		3866	3886
-0.855192383	21.3	23.2	11.484	38.016		3874	3821
-0.260028424	20.8	19	10.887	46.413		3941	3890
-0.164440358	17.7	13.9	6.6581	41.2419		3928	3905
-0.711169546	19	18.7	9.1443	39.7557		3787	3720
-0.29014088	21.4	22.5	11.61	39.99		3953	3899
0.383514548	21.3	22.5	14.4225	49.6775		3870	3749
0.742775721	18.6	15.7	7.1906	38.6094	3933	3978	3904
0.516292081	23.2	26.7	17.0079	46.6921		4039	3759
0.853667121	19.6	19.9	10.6067	42.6933		4011	3907
-0.033321511	18.4	20.8	10.4416	39.7584		3990	3851
-0.342978057	29.2	35.8	26.9574	48.3426		3760	3690
0.189275951	25.7	30.7	21.9505	49.5495	3927	3964	3894
-0.062141644	24.2	39.5	26.2675	40.2325			
0.35272486	24.5	32.9	21.9443	44.7557		3862	3838
-0.138509389	27	31.5	23.7825	51.7175		4020	3864
-0.179692981	23.3	27.3	15.2061	40.4939		4177	3851
0.149360799	19.4	24.5	11.221	34.579		3938	3760
0.420497995	20.2	14.7	7.3647	42.7353		3959	3909
0.197425537	31.8	22.5	13.77	47.43	3794	3885	3730
0.380674161	19.4	22.3	10.7263	37.3737		4012	3800
-1.467496088	29.4	41.3	33.2878	47.3122	3661	3756	3691
-1.16539159	36	54.4	29.648	24.852		4077	3720
-0.210739396	19.1	21.8	11.4668	41.1332	3726	3843	3730
-0.787957056	21.2	25.5	14.127	41.273		3921	3854
-1.008333882	18.5					3735	3769
0.004918825	19.1	24.6	13.2594	40.6406	3827	3934	3850
-1.406172772	29.5	41.4	33.8652	47.9348		3845	3727
-1.577777584	26.3	33.7	21.2647	41.8353		3942	3799
-0.85494067	18	20.9	8.8825	33.6175	3811	3857	3882
-3.435719491	50	53.7	65.4066	56.3934			
-0.618652476	18.3	12.2	5.8926	42.4074		3884	3800
-1.287644998	25.4	34.4	20.296	38.704		3767	3612
-0.967614899	26	26.8	20.1268	54.9732		4034	3730
-0.637790343	22.2	29.5	16.874	40.326		3945	3740
-0.305023033	22.8	23.6	15.5996	50.5004		3961	3863
-0.845577213	20.8	21.1	10.8032	40.3968		3988	3930
-0.342079815	17.8	18.3	8.7291	38.9709	3859	3768	3855
	31.1	44.3	35.4843	44.6157	3763	3949	3647
0.043515574	19.4	19.3	10.422	43.578	3892	4024	3817
-0.523051182	20.9	24.8	13.8136	41.8864		3866	3822
-0.877385966	21.5	25	12.775	38.325	3823	3994	3884
-0.140409984	19.4	22.8	12.1068	40.9932	3839	4010	3917
-0.815468328	20.8	22.4	12.1408	42.0592	3745		3743
-1.085292469	26.4	36.5	24.966	43.434	3743	3813	3783

-0.793871078	18.4	16.1	7.1967	37.5033		3794	3906	3955
1.9461504								
-0.468123772	21.7	25.2	14.364	42.636			3990	3866
-1.20368239	25.1	25.5	12.0105	35.0895			4017	3898
-0.355307939	16.9	18.5	7.8255	34.4745			3925	3757
-0.333432992	22.3	30.3	18.5739	42.7261		3843	3978	3750
-0.338860569	29.5	36.9	28.2654	48.3346			3974	3782
0.329840827	24	26.5	17.755	49.245		3886	4097	3803
0.829264861	24.1	29.8	18.9528	44.6472	3981	3850	4027	3853
0.894230765	23.4	32.7	23.0535	47.4465			4019	3853
0.385695015	20.1	28.4	13.8024	34.7976			4026	3830
-0.21895424	24.6	37.5	21.375	35.625			4001	3853
0.051679793	21.9	25.3	13.409	39.591			4069	3914
0.419882588	18.8	20.8	9.4224	35.8776			4069	3816
1.245199247	18.1	21.5	11.782	43.018			3988	3875
0.833383722	21.6	30.9	18.6636	41.7364		3850	3887	3823
0.701133321	23.3	26	17.576	50.024			4031	3775
0.799417461	21.7	25.2	14.4144	42.7856			4016	4019
1.629128494	19.4	19	11.761	50.139			3894	3926
-0.10586009	26.3	34.7	22.4509	42.2491			4055	3966
0.282372995	20.4	22.3	11.1277	38.7723		3854	4101	3926
1.254368116	18.2	19.1	9.7219	41.1781			4081	3918
0.576049656	21.8	25.8	14.4222	41.4778		3919	4012	3954
0.436400957	21.9	18.8	10.4904	45.3096			4138	3811
0.70723737	23.7	32.2	20.9944	44.2056				
1.301124771	18.4	22.8	12.654	42.846			3908	3853
0.591363628	19.6	27.3	14.1414	37.6586				
0.547262255	26.3	30.8	24.486	55.014			4018	3919
-0.551314799	19.5	20.2	9.9182	39.1818	3820	3711		3602
-0.453103749	19.8	26.1	13.5198	38.2802			3826	3781
-0.208956778	25.7	28.5	23.5695	59.1305		3722	4079	3755
-0.558453493	26	26	20.202	57.498		3831	4090	3768
-0.796868331	23.5	27.9	15.9588	41.2412		3857	4045	3831
0.025049885	17.5	16.3	8.0196	41.1804			3858	3767
-0.515060197	20	22.7	11.9629	40.7371		3835	3974	3835
-0.297318284	19.2	20.9	11.2024	42.3976			3877	3737
-0.235013525	23.5	22.8	15.5268	52.5732			4840	3734
-0.524608703	25.1	27.2	18.5232	49.5768			4091	3776
-0.505933777	20	17.3	9.6534	46.1466		3855	3869	3891
0.186053987	17.2	12.2	6.3074	45.3926		3841	3988	3833
0.004229356	17.4	16.6	7.4368	37.3632			3964	3913
-0.158968062	18.3	13.4	6.6866	43.2134		3822	3929	3800
-0.467406353	19.6	20.3	9.8455	38.6545		3836	3944	3843
-0.269557132	20.3	22.3	12.2427	42.6573			3946	3888
-0.151953664	20.7	28.7	16.1007	39.9993		3851	3935	3885
-0.477014863	25.9	34.5	21.9075	41.5925		3913	4091	3973

0.363938412	21.7	23.7	14.2911	46.0089			4008	3797
0.04519226	19.9	20	11.22	44.88			3929	3886
0.379204805	25.1	38.4	23.0016	36.8984		3726	4255	3908
0.522156475	19.3	21.5	10.7715	39.3285			3889	3734
-0.450388419	24.8	36.2	22.5526	39.7474			3998	3876
0.472625316	19.2	20	11.68	46.72		3839	3987	3936
0.394130517	22.1	29.3	18.166	43.834			4028	3917
0.4353554	20.5	22.1	12.818	45.182		3895	4009	3857
0.074671456	20.5	19.4	10.3596	43.0404			3997	3772
							4016	3913
-0.288304434	21.6	29.4	16.6992	40.1008			3999	3834
0.428717568	19.2	24.6	12.7428	39.0572			4084	3802
-0.169336124	22.6	31.2	19.4376	42.8624			3889	3900
-0.139158574	22.9	24	14.184	44.916			4066	3789
1.153462177	17.2	16.7	8.5003	42.3997	4037		4083	
0.350935883	24.1	29.5	24.072	57.528			4008	3932
0.235495489	20.8	23.6	11.7292	37.9708		3932	4066	4006
-0.003777896	18.6	23.8	12.2332	39.1668		3871	4014	3809
1.074481783	20	23.8	13.1614	42.1386		3810	3937	3778
0.450135869	19.7	29.4	14.5824	35.0176		3858	4073	3855
0.462673475	19.7	29.7	13.8699	32.8301		3932	3970	3844
0.714713511	25.7	37	29.452	50.148		3787	4043	3954
1.850967535	21.9	24.3	18.3951	57.3049		3949	3968	3894
1.36741106	17.8	15.8	7.3154	38.9846		3766	3915	3811
0.178546663	23	31.5	20.1285	43.7715			3985	3801
-0.253563539	30.5	47	40.185	45.315		3992	4058	3859
-0.7187251	24.7	30.7	19.8629	44.8371			3962	3800
0.05588181	22.3	31.6	16.8112	36.3888		3743	4106	3721
0.589630284	22.6	21.5	11.395	41.605		3976	3993	3967
0.180770209	21.7	29.9	16.2955	38.2045		3989	4066	4011
1.084897725	18	21.8	10.7256	38.4744		4005	3966	3951
1.518295376	16.4	18.2	8.2628	37.1372		3849	3918	3859
0.22472521	24.4	27.6	16.7532	43.9468		3854	3909	3867
0.482567362	21.8	29	16.24	39.76		3925	4169	3964
-0.728906206	26.8	34.8	25.0908	47.0092		3843	3840	3689
-0.090700437	23.9	27.7	18.2543	47.6457		3647	3949	3639
-0.318685136	22.6	24.1	13.3996	42.2004		3727	3857	3721
1.073467393	21.3	28.4	16.6992	42.1008	3992	3764	3867	3848
1.791768833	18.1	19.8	9.801	39.699				
0.188618987	29	38.2	28.459	46.041	4058	3549	4059	3645
1.163711113	22.2	30.8	17.3096	38.8904	4049	3966	4040	3996
0.972299656	24	31.7	20.7635	44.7365	4108	3911	4135	3910
1.33399647	22.5	21.8	13.6032	48.7968	3980	3882	3913	3848
1.346923569	20.9	24.4	13.0052	40.2948	4106	3810	4106	3886
0.890527655	21.2	28.6	17.589	43.911		3832	4069	3790
0.493904762	18.6	19.6	9.8588	40.4412		3970	4184	3967

-1.00268895	32.1	49	44.296	46.104				
0.029843006	18.8	21.6	10.3896	37.7104		3785	3948	3853
-1.777308936	38.8	50.4	49.9968	49.2032				
0.25063499	22.4	31.5	20.475	44.525		3801	3899	3798
-0.585347335	29.1	41.7	33.0681	46.2319		3903	3988	3747
1.226098156	15.1	15.4	6.7606	37.1394		3874	3856	3864
-0.063285675	17.7	20.2	8.6456	34.1544		3779	3823	3910
-0.409710605	22.5	28.8	16.5888	41.0112	3763		3943	3768
0.810548166	21	15.5	9.548	52.052		3915	4038	3959
0.33973578	23.1	24.6	16.0638	49.2362		3913	3929	3938
0.596636783	19.9	21.6	11.5992	42.1008		3855	4033	3878
0.1464872	20.3	16.5	8.481	42.919		3962	3941	3950
1.032812295	18.3	18.9	9.9414	42.6586		3816	3967	3724
0.06502395	21.6	32.4	20.898	43.602		3934	3877	3960
-0.875389818	25.3	40.2	24.8034	36.8966		3776	3835	3751
-0.910291991	24.1	33.4	18.4034	36.6966		3787	3979	3866
0.030558192	17.1	18.1	7.3486	33.2514		3932	3905	3887
-0.760631849	25.1	33.5	19.9995	39.7005		3809	3978	3856
0.703240692	20.3	32	17.76	37.74		3916	4071	3911
-1.61076002	34.8	51.4	48.7272	46.0728		3722		3707
-0.120667534					3936	3674		3687
0.257519783	16.3	18.1	8.6699	39.2301		3770	3875	3789
0.302008452	24.5	35.7	24.5616	44.2384		4020	3992	3922
0.046736869	22.5	27.3	17.0352	45.3648		3833	4003	3876
0.427568666	21.9	29.8	16.539	38.961		3770	4011	3681
0.245492584	20.2	27.9	13.8384	35.7616		3827	3924	3804
0.278973745	24.1	38.3	23.746	38.254		3688	3981	3830
1.154267107	20.2	26.1	15.2424	43.1576		3829	4067	3853
-0.422603093	32.8	42.1	35.5324	48.8676		3870	3951	3824
0.41957377	21.2	31.6	16.4004	35.4996		3871	3993	3873
-0.04086228	27.9	43	35.475	47.025				
0.195794024	23.6	40.37	23.69719	35.00281		3802	3914	3768
1.651347026	18.7	25	14.175	42.525				
0.870339988	23.6	30.9	21.63	48.37		3869	4082	3901
0.073719453	24.8	33.3	24.309	48.691		3849	4040	3894
						4061	4014	3914
						3851	3938	3879
-0.258071299	22.2	22.7	13.0071	44.2929	4245	3850	4197	3844
0.131711224	24.2	28	18.452	47.448	4041	3963	4151	3968
-0.284436985	20.6	13.8	8.1558	50.9442	3838	3874	3849	3748
0.004598664	16.5	16.6	7.3372	36.8628	3919	3650	3954	3630
-0.594540872	20	17.1	8.2251	39.8749	3876	4102	3963	4119
0.852703476	20.6	14.1	9.1086	55.4914	3868	3920	3927	4010
-0.052725997	20.4	10.6	6.1798	52.1202	3811	3864	3904	3775
	21.3	15.9	9.3015	49.1985	4098	3962	4146	3973
0.497412798	22.1	17.5	11.4625	54.0375	4070	3845	4012	3914

-0.570305219	18.3	20.2	9.8778	39.0222	3884	3961	3802	3921
-0.205310778	18.6	17.9	8.9858	41.2142			3911	3584
-0.437225521	18.8	27.6	13.3032	34.8968				
-0.370943338	19.4	29	15.457	37.843		3852	3955	3898
-0.245350429	21.1	31.1	17.4471	38.6529		3893	4043	3874
-0.298623999	18.9	25.8	12.3582	35.5418	3989		3941	
0.533249563	17.6	16.2	8.0514	41.6486			3998	3753
-1.003753272	24.3	32.5	20.3125	42.1875	3898	3619	3843	3544
-0.423118827	19.9	25.3	12.3717	36.5283				
-0.790285747	24.9	30.6	18.5436	42.0564			3897	3577
-0.880236762	23.3	31.4	18.1492	39.6508	3941		3963	
-0.901972761	22.2	35.8	19.69	35.31	3896		3802	
0.429462144	20.2	33.6	17.3712	34.3288	3831	3799	3604	3737
-0.497545507	22.5	35.9	20.822	37.178				
-0.388436618	20.9	26.6	15.4812	42.7188				
0.452373973	23.9	28.1	19.0237	48.6763	4017		4119	
1.482248832	17.4	16.4	7.9048	40.2952			3894	3794
0.72535566	22.7	22.3	12.0866	42.1134			3937	3917
0.949678207	19.7	25.7	13.3897	38.7103				
-0.29774249	31.5	42.1	31.996	44.004			3846	
1.304819149	19.2	19.2	10.752	45.248				
0.843271064	19.5	24.9	12.4749	37.6251			4159	
1.407873068	22.7	30.8	19.4348	43.6652			3983	3857
0.01093984	28.4	39.6	30.2544	46.1456			4097	3933
0.885770725	22.3	29.2	18.4836	44.8164			4119	3713
0.568706769	21.5	27.3	14.5782	38.8218			4199	3860
0.424309411	24.1	32.2	18.8692	39.7308			4013	3835
0.253497851	27.3	36.3	29.1489	51.1511			4061	3919
-0.13854931	22.5	29.1	15.4812	37.7188			3933	3859
0.988563558	23.8	27.6	19.8996	52.2004			4142	3804
-0.102257811	27.3	36.5	25.039	43.561			3963	3845
0.294372099	21.7	24.8	12.3504	37.4496			4036	3718
1.257043511	20	20.4	11.8524	46.2476				
-0.878589744	28.7	38.1	29.4894	47.9106			3909	
0.24292405	20.8	29.1	18.9441	46.1559	3912		3955	
-0.659043245	27.7	35.5	27.051	49.149			4089	3758
-1.097209449	25.8	36.2	23.5662	41.5338			3830	3643
-0.235552291	19.7	25.1	12.4496	37.1504			4031	3791
-0.933596524	28.4	47.5	35.91	39.69			4040	3579
-0.456310128	21.5	27.6	14.3244	37.5756			4113	3819
-0.140014089	21.8	31.8	18.1578	38.9422				
0.288543824	22.8	23.4	14.3208	46.8792	3858	3974	3980	3918
0.583098177	19	21	10.71	40.29			3864	3755
0.403243222	18.4	17	8.415	41.085			3927	3763
-0.14364308	25.9	37.1	27.0459	45.8541		3799	4117	3819
0.140557558	25.5	34.1	27.0754	52.3246	3907		3859	

-0.065294574	19.3	27	13.203	35.697		3589	3940	3509
-0.551993648	30.4	44.2	38.3656	48.4344		3772	3901	3823
-2.110154343	37.8	51.4	51.914	49.086		3520		3674
-0.103017298	17.4	17	7.888	38.512			3914	3830
-0.685328379	23	30.7	18.5428	41.8572			4072	3666
-1.061891891	29	41.7	33.6936	47.1064			3684	3712
							3976	
-0.580479968	21.1	23.3	12.4422	40.9578		3643	3811	3586
-0.899313345	26.8	45.8	33.205	39.295			4056	3580
-0.015631314	18.8	19.5	9.1455	37.7545				
-0.811178678	20.8	32.1	15.7611	33.3389			3862	3650
-0.425657152	24.2	32.5	23.66	49.14		3668	3807	3701
-1.040714744	27.1	36.4	26.6812	46.6188			3913	3497
-0.693632205	21.9	28.2	16.5816	42.2184			4148	
-0.257554042	21.5	32.8	18.1056	37.0944			3961	3791
-0.116713196	21.1	31.9	18.5658	39.6342			3817	3707
0.062588787	18.7	21.7	11.5661	41.7339			3915	3767
-0.820224481	24.8	34.2	20.9304	40.2696			3879	3967
-1.908329193	32.6	48.4	39.93	42.57			3972	3699
-0.971132098	21.7	25.3	12.1946	36.0054			4003	3805
-1.130980822	27.3	38.8	28.1688	44.4312	3787	3757		
0.435908052	19.4	21.2	12.0416	44.7584			3898	3793
0.25462217	18.6	19.9	10.2286	41.1714			3902	3664
-1.161394763	28.6	40.5	28.1475	41.3525			4023	
0.439193112	19.1	29.2	14.7168	35.6832				
0.597263731	22.2	25.3	17.5076	51.6924		3821	3972	3877
0.480593426	22.6	24.7	16.8948	51.5052		3746	4003	3710
0.407803499	20.5	25.5	12.3165	35.9835		3875	4083	3831
0.70713119	22.2	25.5	16.6005	48.4995			4006	3922
-0.147968801	21.5	29	15.254	37.346		3840	4052	3763
-0.187363858	25.6	34.1	23.8359	46.0641		3889	3968	3878
-0.563144292	25.2	32.9	20.2993	41.4007			3997	3608
-0.251113314	22.6	35.6	19.0104	34.3896		3933	4015	3943
-1.028024743	22.7	32.7	18.8025	38.6975	4110		4066	
-1.120662148	28.8	39.8	30.0888	45.5112			3978	3756
-0.69924917	22.1	30.5	18.666	42.534			3758	3729
0.687224543	25.5	32.6	21.5812	44.6188			3993	3601
0.5527802	26	38.2	24.9064	40.2936			4123	3816
-0.712313994	34.5	46.3	46.763	54.237			4057	3703
-0.334781	24.7	35.4	23.4702	42.8298			4017	3726
1.256902853	20.8	22.8	13.11	44.39			4164	3859
0.006561695	19.1	25.2	12.096	35.904				3887
-0.692719225	23	29.5	16.9035	40.3965				
-0.734519269	22.1	26.8	13.0248	35.5752			4045	3777
-1.319220206	35.4	47.7	48.7971	53.5029			4050	3820
-0.228660407	34.1	47.4	43.2288	47.9712	4223		4039	

-0.651221881	27.8	43	29.67	39.33		3896	3728
-0.021759088	24.1	35.4	25.4172	46.3828		4018	3738
0.907215319	17.6	17.9	8.6099	39.4901		3925	3769
-0.094809498	23.2	36.2	23.6386	41.6614			
-1.832423032	27.6	36.6	20.7888	36.0112		4047	3573
-0.135837537	25.7	37	24.309	41.391		4096	3914
-0.463279197	27.7	36.9	26.7525	45.7475		3737	3719
-0.403111521	24.1	29.2	19.0384	46.1616		4192	3746
0.565799386	15.5	13.9	5.2681	32.6319		3884	3827
0.208297713	21.5	28.2	15.5946	39.7054		4032	3743
0.155643766	20	31.4	15.7	34.3		4055	3747
0.371923153	22.3	23.9	15.8696	50.5304		3989	3786
0.875894033	18.5	13.3	7.3283	47.7717		3946	3777
1.157196281	15.9	14.9	5.811	33.189	3989	4008	4027
-0.808237258	21.4	29	14.761	36.139	3835	3960	3707
0.592161891	18.1	18.3	9.6258	42.9742	4032	3819	3992
-0.702898439	25.6	26	17.836	50.764	3686	3938	3693
0.233408671	20.1	17.3	10.2243	48.8757	3797	3931	3790
0.480652948	23	22.2	14.0082	49.0918	3908	3971	3940
0.134236452	24.3	31.5	20.3805	44.3195	3748	3858	3873
0.497050423	22.5	24.9	15.9609	48.1391	3956	4030	3869
2.578809195	20.2	13.8	9.0804	56.7196	4035	4077	3993
0.258061012	29.9	35.8	35.2272	63.1728	3669	3814	3726
1.652062013	25.1	17.2	12.642	60.858	4021	4014	4001
1.86917102	21.3	16.5	10.923	55.277	3903	4047	3882
0.455103738	29	31	26.443	58.857	3922		3782
0.204805957	26.8	24.6	20.541	62.959	3849	4172	3816
1.321957097	18.4	23.8	11.7572	37.6428	3760	4046	3782
0.060989344	25.9	33	23.1	46.9	3841	4248	3882
0.87175873	21.1	14	8.554	52.546	3894	4078	3866
-0.28897411	23.7	17.2	11.0768	53.3232	3661	3967	3615
0.296650179	18.3	10.4	5.3768	46.3232	3863	4023	3899