

## **Overweight Prevalence in Persons with Down Syndrome**

**Stephen S. Rubin, James H. Rimmer, Brian Chicoine, David Braddock, and Dennis E. McGuire**

**Abstract:** Prevalence of overweight among the general population has been reported to be 33% for males and 36% for females. We undertook this study to establish overweight prevalence data in a cohort with Down syndrome and to stratify the incidence of overweight by living arrangement. We measured Body Mass Index (BMI) in 283 persons with Down syndrome and found a higher prevalence of overweight in this group compared to the general population. Individuals with Down syndrome living in a family setting had a higher incidence of overweight than did those living in a group home setting. Overweight prevalence among persons with Down syndrome should be considered a major public health concern that warrants further attention from researchers, practitioners, family members, and individuals with Down syndrome.

The number of overweight Americans has been rising in the United States for the last 20 years (Stamler, 1993). The Centers for Disease Control and Prevention (1997) recently published the Third National Health and Nutrition Examination Survey, which is the most comprehensive tracking system in the nation on the prevalence of overweight among Americans. This survey revealed that between 1987 and 1993, overweight prevalence increased 3.3% for men and 3.6% for women. The total number of overweight Americans now stands at 33% for men and 36% for women. These increases have raised serious concerns about the health of the nation and prompted health experts to wage a national campaign against obesity.

Overweight is a major risk factor for many chronic diseases, including heart disease, Type II diabetes, and arthritis (Leon et al., 1996; Manson et al., 1990). Being overweight also exacerbates other health problems, such as high blood pressure, high blood cholesterol, and asthma (Colditz, 1992). All of these conditions impose a serious burden on our health care system and deteriorate the quality of life for millions of Americans. Colditz (1992) estimated that the economic costs of obesity in this nation totals \$40 billion annually, or 5.5% of the total cost of illness.

As part of the nation's efforts to improve the health of all Americans, a major national policy decision was formulated in the 1970s to set 10-year health objectives for all Americans, including persons with disabilities. The plan was called *Healthy People 2000*. In the report, there is an objective related to the reduction in overweight prevalence for all Americans (U. S. Department of Health and Human Services, 1991). For people

ages 20 and older, *overweight* was defined as a Body Mass Index (BMI) equal to or greater than 27.8 for men and 27.3 for women. The goal in the *Healthy People 2000* report is to reduce the incidence of overweight among persons with disabilities from 36% to 25% by the year 2000. To our knowledge, there are no large published data sets on overweight prevalence in specific subgroups of persons with disabilities, including adults with Down syndrome. Subsequently, when new reports are published in the year 2000, there will be no way to generalize the findings and recommendations to adults with Down syndrome. Although there are published data on the incidence of overweight among persons with mental retardation (Fox & Rotatori, 1982; Frey & Rimmer, 1995; Kelly, Rimmer, & Ness, 1986; Rimmer, Braddock, & Fujiura 1993), there is very little information on the prevalence of overweight among a large cohort of adults with Down syndrome. In one of the few investigations on overweight prevalence among persons with Down syndrome, Bell and Bhate (1992) evaluated the BMI of 58 adults with Down syndrome and compared them to a group of adults with mental retardation who did not have Down syndrome. The subjects resided in England and lived with their family or in a small apartment subsidized by the government. The investigators found that there was a high percentage of overweight among adults with Down syndrome and that there was a greater percentage of overweight adults with Down syndrome (71% of males and 96% of females) compared to adults with mental retardation who did not have Down syndrome (49% of males and 63% of females).

Because of the growing emphasis on reducing the incidence of overweight among all Americans, it becomes important to establish baseline data for specific subgroups of individuals with disabilities. Developers of specific intervention strategies must take into consideration the physical, psychological, and socioeconomic factors that may interplay with the disability and the prevalence of overweight. Our purpose in this study was to determine the incidence of overweight among a large cohort of adults with Down syndrome and compare these data to existing standards established in *Healthy People 2000*. An additional purpose was to compare BMI and prevalence of overweight between persons living at home with their family and those residing in a group home setting.

## **Method**

### *Subjects*

Body Mass Index data were collected on persons with Down syndrome as part of a retrospective study. Medical records from 283 adults with Down syndrome (146 males, 137 females) were examined at one of the largest adult Down syndrome clinics in the nation. Subjects were ambulatory, ranged in age from 15 to 69 years, and came to the clinic on an annual basis for a complete physical examination at which time they were evaluated on several health indices. Of these participants, 126 lived with a family member and 157 lived in a group home.

### *Procedure*

All data were collected at the Adult Down Syndrome Center. A Health -O-Meter scale was used to measure height to the nearest inch and weight to the nearest pound. Data were then converted to meters (height) and kilograms (weight) to compute BMI ( $\text{Weight}[\text{kg}]/\text{Height}[\text{m}]$ ). This technique has been internationally accepted as an index for expressing overweight (Bray, 1992; Tokunaga et al., 1991). Body Mass Index, also known as the Quetelet index, is calculated by dividing a person's body weight in kilograms by his or her height in meters squared. It has been found to be highly correlated with other estimates of adiposity (body fat) and minimizes the effect of height (Frankle, 1988). The criteria used for *overweight* was defined from *Healthy people 2000* as a BMI of 27.3 or higher for women and 27.8 or higher for men (U. S. Department of Health and Human Services, 1991.)

### *Data analysis*

We used descriptive statistics and two-tailed independent t tests to test differences in BMI levels between males and females and individuals in both living arrangements. The alpha level for significance was set at .05.

## **Results**

The anthropometric characteristics of the subjects by living arrangement appear in Table 1. Females were shorter,  $p < .05$ , and lighter,  $p < .01$ , than males but had a higher BMI,  $p < .05$ . The reference height for an adult male in the general population is 1.74 m and for females, 1.64m (McArdle, Katch, & Katch, 1991). Our data show that the height of adults with Down syndrome was lower for both males and females compared to the general population. This is consistent with results of other researchers who have examined the height and weight of persons with Down syndrome (Rimmer, Braddock, & Fujiura, 1992; Thelander & Pryor, 1966). Rimmer et al. also compared the height of persons with Down syndrome to individuals with mental retardation who did not have Down syndrome. They found that adults with Down syndrome were shorter than were persons with mental retardation due to other causes (with Down syndrome: males=1.57m, females=1.50 m; mental retardation due to other causes: males=1.71m, females=1.56m). In the present study, there were not differences in height for males and females living in the family or group home setting. However, body weight and BMI were significantly higher for males and females living in the family setting compared to those living in the group home setting,  $t(261) = 2.204$ ,  $p < .05$ .

Figure 1, which reflects the standards for overweight established in *Healthy People 2000* of 27.8 kg/m for men and 27.3 kg/m for women (U.S. Department of Health and Human Services, 1991), illustrates that 45% of men and 56% of women were classified as overweight. Figure 1 also shows that a higher percentage of overweight subjects resided in the family setting compared to the group home setting for both sexes and that in both settings a greater proportion of females than males were overweight.

Figure 2 shows the mean BMI levels for each living arrangement and for males and females within each setting. Mean BMI levels were significantly higher for the family setting when males and females were combined,  $t(229) = 2.20, p < .05$ . There was no significance, however, when males and females were separated within each setting. Although not statistically significant, BMI levels were consistently higher in the family setting compared to the group home setting for both males and females.

Figure 3 shows that BMI for adults with Down syndrome appears to increase up until age 30, then begins to decline from ages 31 to 70. This contrasts with the trend in the general population, which shows a steady rise in BMI, stabilizing at overweight levels after age 40. Adults with Down syndrome appear to be above the *Healthy People 2000* overweight level for age decades 20 through 50, whereas adults in the general population tended to first reach overweight levels after age 40.

## Discussion

The prevalence of overweight in the United States is extremely high (Stamler, 1993). The Centers for Disease Control and Prevention (1997) reported that over 33% of men and 36% for women in the United States are overweight. Adults with Down syndrome, however, have significantly higher tendencies to be overweight. Using the criteria established in the National Health and Nutrition Examination Survey and *Healthy People 2000* reports, we found that 45% of males and 56% of females were overweight. These figures are substantially higher than those for the general population and should be of concern to health care professionals, caregivers, and persons with Down syndrome.

The data also revealed that BMI levels for males and females combined were significantly higher in the family setting than in the group home setting. Although comparisons by setting and gender were not statistically significant, they do have practical significance in that the BMI values were 2 points higher for the males (29.8 vs. 27.8) and almost 2.5 points higher for the females (32.1 vs. 29.7). The reason we did not find significant differences in BMI levels between the two settings when separating males and females was that statistical power was reduced with the smaller sample size. We also were not able to detect significant differences in overweight prevalence, despite the fact that BMI levels were significantly higher in the family setting. This result is consistent with those in other studies in which investigators have shown a trend toward higher overweight prevalence in the family setting (Rimmer et al., 1993; Rimmer, Braddock, & Marks, 1995).

The present study was strictly descriptive in nature; causality was not investigated. It is possible, however, that higher BMI levels in the family setting were due to greater opportunity for food intake and less participation in exercise and activity. In group home settings, there is often more involvement in community skills training, such as mobility and activity planning, and domestic skills training, such as menu planning and meal preparation (Martin, 1988). Future investigators should examine the variables associated with a higher prevalence of overweight among persons with Down syndrome in the family setting and attempt to determine why BMI levels seem to decline as the population ages.

Adults with Down syndrome are more likely to experience the effects of premature aging compared to the general population (Zigman, Seltzer & Silverman, 1994). Such effects often include earlier declines in intellectual and adaptive functioning and an increase in age-related health and sensory conditions, such as hypothyroidism, immune system deficiencies, sleep apnea, and hearing and vision losses (Adlin, 1993; Hawkins, Eklund, & Martz, 1992; Heller, 1997; Zigman et al., 1994). Perhaps the precocious aging of individuals with Down syndrome may be partly responsible for the rapid decline in weight at earlier stages of life in the general population ( see figure 3).

This is the first study in which the prevalence of overweight in a population of individuals with Down syndrome in the United States was examined. Bell and Bhate (1992), who investigated the prevalence of overweight among persons with mental retardation with and without Down syndrome in England, included only 58 subjects with Down syndrome. Because they used a different set of criteria for establishing overweight, it is not possible to compare our results to their findings. Our data, however, are consistent with their finding that the prevalence of overweight among persons with Down syndrome is much higher than in the general population.

Our findings reveal that the prevalence rate reported in the *Healthy People 2000* report (33% for men, 36 % for women) is not representative of persons with Down syndrome. Based on our findings, persons with Down syndrome are at higher risk than are individuals in the general population for diseases related to overweight conditions. The goal reported in *Healthy People 2000* of reducing the incidence of overweight among persons with disabilities to less than 25% by the year 2000 is unrealistic for persons with Down syndrome. We, therefore, recommend that additional research be conducted to develop the test weight-reduction strategies for persons with Down syndrome, specifically to empower individuals with Down syndrome to become proactive with their health and fitness and that the *Healthy People 2010* goals currently being formulated be inclusive for males and females with Down syndrome.

## References

- Adlin, M. (1993). Health care issues. In E. Suttan, A. Factor, B. Hawkins, T. Heller, & G. Seltzer (Eds.), *Older adults with development disabilities: Optimizing choice and change* (pp. 49-60). Baltimore: Brooks.
- Bell, A. J., & Bhate, M. S. (1992). Prevalence of overweight and obesity in Down syndrome and other mentally handicapped adults living in the community. *Journal of Intellectual Disability Research*, 36, 359-364.
- Bray, G.A. ( 1992). Pathopsiology of obesity. *American Journal of Clinical Nutrition*, 55, 488S-

494S.

- Centers for Disease Control and Prevention. (1997). Update Prevalence of overweight among children, adolescents and adults-United States, 1988-1994, *Morbidity and Mortality Weekly Report*, 6, 199-202.
- Colditz, G.A. (1992). Economic costs of obesity. *American Journal of Clinical Nutrition*, 55, 503S-507S.
- Fox, R., & Rotarori, A.F. (1982). Prevalence of obesity among mentally retarded adults. *American Journal of Mental Deficiency*, 87, 228-230.
- Frankle, R. T. (1988). Weight Control for the adult and elderly. In R. T. Frankle & M. Yang (Eds.), *Obesity and weight control* (pp. 361-389). Rockville, MD: Aspen.
- Frey, B., & Rimmer, J. H. (1995). Comparison of body composition between German and American adults with Mental Retardation. *Medicine and Science in Sports and Exercise*, 27, 1439-1443.
- Hawkins, B. A. Elklund, S. J., & Martz, B.L. (1992). *Detection of decline in aging with developmental disabilities: A research monograph*. Cincinnati Research in Training Center Consortium on aging in persons with developmental Disabilities.
- Heller, T. (1997) Older adults with mental retardation and their families In N. Bray (Ed.), *International review of research in mental retardation* (Vol. 20, pp. 99-136). New York: Academic Press.
- Kelly, L.E., Rimmer, J. H., & Ness, R.A. (1986). Obesity levels in institutionalized mentally retarded adults. *Adapted Physical Activity Quarterly*, 3, 167-176.
- Leon, D. A., Koupilova, I., Lithell, H.O., Berglund, McKeigue, P. M. (1996). Failure to realize growth potential in utero and adult obesity in relation to

- blood pressure in 50 year old Swedish men. *British Medical Journal*, 312, 401-406.
- Manson, J. E. Colditz, G.A., Stampfer, M. J., Willett, Hennekens, C. (1990). ?A prospective study of obesity and risk of coronary heart disease in women. *The New England Journal of Medicine*, 322, 882-889
- Martin, J. E.. (1988). Providing training in community and domestic skills. In L.W. Heal, J.I. Haney, & A. R. Amado (Eds.), *Integration of developmentally disabled individuals into the community* (pp. 169-192). Baltimore: Brookes.
- McArdle, W.M., Katch, VL. (1991). *Exercise physiology: Energy, nutrition, and human performance*. Philadelphia: Lea and Febiger.
- Rimmer, J.H., Braddock, D., & Fujrua, G. (1993). Prevalence of obesity in adults with mental retardation: Implications for health promotion and disease prevention. *Mental retardation*, 31, 105-110.
- Rimmer J.H. Braddock D. & Marks, B. (1995). Health characteristics and behaviors of adults with mental retardation residing in three living arrangements. *Research in Developmental Disabilities*, 16, 489-499.
- Stamier J. (1993). Epidemic obesity in the United States. *Archives of Internal Medicine*, 153, 1040-1044.
- Thelander, H.E. & Pryor, H.B. (1966). Abnormal patterns of growth and development in mongolism. An anthropometric study. *Clinical Pediatrics*, 5,493- 501.
- Tokunaga, K., Matsuzawa, Y.,Kotani, K., Kobastake, T., Fujioka, S., & Tauri, S. (1991). Ideal body weight estimated from the total body mass index with the lowest morbidity. *International Journal of Obesity*, 15, 1-5.

U. S. Department of Health and Human Services.  
(1991). *Healthy people 2000. National Health Promotion and Disease Prevention Objectives* (DHHS Public No. (PHS) 91-50212). Washington, DC: Author.

Zigman, W., Seltzer, G., & Silverman, W. (1994). Behavioral and mental health changes associated with aging in adults with mental retardation with and Without Down syndrome. In M. M. Seltzer, M.W. Krauss, & M. Janicki(Eds.), *Life course perspective in adulthood and old age* (pp. 67-92). Washington, DC: American Association on mental Retardation.

Received 7/7/97, first decision 8/26/97, accepted 10/17/97.

Editor-in-charge: Steven J. Taylor

The authors are grateful for the support of Sheila Hebein, Executive Director of the National Association for Down Syndrome, and Kim Xidas, Donna Mirro, Karen Cornell, and Nancy Halligan of the Adult Down Syndrome Center in Glenview, Illinois, for their contributions in data entry, organization, and management. This project was funded, in part, by Grant No. H133B30069 from the U.S. Department of Education, Office of Special Education and Rehabilitative Services, National Institute on Disability and Rehabilitation Research, Rehabilitation Research Training Center on Aging with Mental Retardation and Grant No. 90DD0290 from the U. S. Department of Health and Human Services, Administration on Developmental Disabilities Aging Training Initiative. The opinions in this expressed in this article are those of the grantee and do not necessarily reflect those of the U.S. Department of Education.

*Authors:* **STEPHEN S. RUBIN, PhD**, Research Associate (e-mail: rubin@uic.edu), and **DENNIS E. MCGUIRE, PhD**, Coordinator of Adult Down Syndrome Project, Rehabilitation Research and Training Center on Aging with Mental Retardation: **JAMES H. RIMMER, PhD**, Director, Center on Health Promotion Research for Persons With Disabilities; and **DAVID BRADDOCK, PhD**, Professor and Head, Department of Disability and Human Development, and Associate Dean for Research, College of Health and Human Development Sciences, Institute on Disability and Human Development, University of Illinois at Chicago, 1640 W. Roosevelt Rd., Chicago, IL 60608. **BRIAN CHICOINE, MD**, Medical Director, Adult Down Syndrome Center of Lutheran General Hospital, 1255 N. Milwaukee Rd., Glenview, IL 60025. Requests for reprints should be sent to the first author.

Authors should be aware of the policy of the American Association on Mental Retardation (AAMR) on the Internet and articles submitted to or published in Mental Retardation or the American Journal on Mental Retardation:

The Publications Committee of the AAMR following the American Psychosocial Association had adopted the following interim policy for publishing and the Internet. Authors are instructed not to put their manuscripts on the Internet at any stage (draft, submitted for publication, in press, or published). Authors should be aware that (a) they run a risk of having their papers stolen, altered, or distributed without their permission and, very importantly, (b) an editor regards such papers as previously published and eligible as a submission. In addition, after acceptance for publication, the publisher is copyright holder. AAMR does not permit authors to post the full text of their AAMR published papers on the Internet at this time. The Publications Committee will follow Internet developments and will soon recommend a longer term AAMR policy.