Neighborhoods and Obesity in Later Life

Irina B. Grafova, PhD, Vicki A. Freedman, PhD, Rizie Kumar, MA, and Jeannette Rogowski, PhD

Objectives. We examined the influence of neighborhood environment on the weight status of adults 55 years and older.

Methods. We conducted a 2-level logistic regression analysis of data from the 2002 wave of the Health and Retirement Study. We included 8 neighborhood scales: economic advantage, economic disadvantage, air pollution, crime and segregation, street connectivity, density, immigrant concentration, and residential stability.

Results. When we controlled for individual- and family-level confounders, living in a neighborhood with a high level of economic advantage was associated with a lower likelihood of being obese for both men (odds ratio [OR]=0.86; 95% confidence interval [CI]=0.80, 0.94) and women (OR=0.83; 95% CI=0.77, 0.89). Men living in areas with a high concentration of immigrants and women living in areas of high residential stability were more likely to be obese. Women living in areas of high street connectivity were less likely to be overweight or obese.

Conclusions. The mechanisms by which neighborhood environment and weight status are linked in later life differ by gender, with economic and social environment aspects being important for men and built environment aspects being salient for women. (*Am J Public Health.* 2008;98:2065–2071. doi:10.2105/AJPH.2007.127712)

Over the past few decades the prevalence of obesity has been rising for men and women across all age groups, including the elderly.[1] For example, in 2001 to 2002 in the United States, about 1 in 3 adults 60 years or older was obese.[2] This trend raises concerns because excess weight is associated with a number of chronic health conditions, including diabetes, high blood pressure, asthma, and arthritis.[3] Moreover, obesity can have very important implications for publicly financed health care.[4] Recent research suggests that a number of demographic, socioeconomic, and family factors[5] influence obesity, but the role of the neighborhood context has not been fully explored.

Excess weight results from an energy imbalance in which caloric intake exceeds energy expenditures, the latter closely related to physical activity. The neighborhood environment may influence energy intake (through its influence on food availability[6]) and energy expenditure (by facilitating or impeding physical activity). For example, the presence of supermarkets in the neighborhood is associated with higher fruit and vegetable intake,[7] whereas eating at fast-food restaurants is associated with a high-fat diet and higher body mass index (BMI; weight in kilograms divided by height in meters squared).[8] In terms of physical activity, individuals living in neighborhoods with less crime,[9–13] higher land-use mix,[14] higher street connectivity,[11,14,15] higher residential density,[11,14] a greater number of destinations,[9,16] better aesthetics,[9,10,17] and sidewalks[10,12,17,18] tend to walk more often.[19,20]

Only a handful of studies linking neighborhood features to late-life obesity have focused on older adults.[11,13,16,21–23] National studies are particularly lacking for the elderly. Yet evidence from national studies of adults of all ages suggests plausible connections between obesity and neighborhood factors. Using the 1990 to 1994 waves of the National Health Interview Survey, for example, Boardman et al.[24] found that adults residing in neighborhoods with a high concentration of poverty and in neighborhoods with a high percentage of Blacks were more likely to be obese. In another study, Robert and Reither[25] found that higher community socioeconomic disadvantage was related to higher BMI among women but not among men. Because these studies had very limited characterizations of the neighborhoods, the mechanism through which poor neighborhoods result in obesity remains unclear. It could be, for instance, that poor neighborhoods tend to have fewer supermarkets[26–28] and more-limited access to places for physical activity.[29,30]

Using a large, nationally representative survey, we examined the relationship between the economic, built, and social environments and weight status among men and women 55 years and older. We included 8 previously validated neighborhood scales reflecting neighborhood safety and segregation, concentration of immigrants, air pollution, residential stability, connectivity, density or access, and high and low neighborhood socioeconomic status.[31] We modeled both obesity and overweight status by using multilevel modeling techniques in which we controlled for detailed individual- and family-level confounders.

METHODS

Data

Our study was based on the Health and Retirement Study (HRS), a longitudinal, nationally representative survey of persons 50 years and older funded by the National Institute on Aging and conducted by the University of Michigan. The HRS sample design is a nationwide multistage area probability sample of households. The survey collects extensive information on health and demographic and socioeconomic characteristics of its respondents. We primarily drew upon the 2002 wave.[32] Although the HRS follows the same individuals over time and it has been collecting data since 1992, we were unable to fully capitalize on prior waves for 2 reasons. First, some of the neighborhood characteristics, such as street connectivity, are not uniformly available for most years prior to 2000. Second, all prior waves of the HRS are coded to earlier (1990) census boundaries.

Characteristics of neighborhoods of residence were determined through linkage to data from several secondary data sources provided primarily through Rand's Center for Population Health and Health Disparities. We used census tracts from the year 2000 US Census as proxies for neighborhoods. Although census tracts do not necessarily represent a clear neighborhood boundary, they are commonly used as proxies for neighborhoods.[16,27,33]

We restricted the sample to HRS respondents in 2002 55 years or older who were not institutionalized at the time of the interview. Further, we dropped 7.7% of the sample because of missing geographic code links or other variables of interest. The resulting final sample consisted of 15 221 observations.

Outcomes

Weight status was calculated from self-reports of weight in 2002 and height at baseline interview. These measures are known to be biased in 2 ways. First, women generally underestimate weight and men generally overestimate height relative to measured values.[34,35] Second, because of musculoskeletal changes, older adults may lose height as they age; consequently, baseline reports of height may be too high relative to true values.[36] To adjust for these potential reporting errors, we predicted measured height and weight in our sample by using information on the relationship between measured and reported values in the 1999 to 2002 waves of the National Health and Nutrition Examination Survey.[34,35] We then adjusted height according to formulae available in Neiwenweg et al.[36] to allow for loss of height that may have occurred between a respondent's baseline interview and 2002. Details of these procedures are available from the authors upon request. From these adjusted measures we calculated BMI according to the standard formula. A person with BMI of 25 kg/m^2 or more to less than 30 kg/m^2 was considered to be overweight, and a person with BMI of 30 kg/m^2 or more was considered to be obese.

Neighborhood Scales

We characterized neighborhoods by using 8 previously validated scales[31]: 2 scales reflecting the economic environment, 3 representing the built environment, and 3 reflecting the social environment. Scales were formed based on factor analysis estimated with tracts in the 2002 HRS and reestimated with the entire 2000 US Census. Following convention, items that loaded together at 0.40 or higher were standardized and added together. The resulting Cronbach α for these scales fell in the 0.89 to 0.96 range, indicating a high degree of internal consistency. Each scale has been standardized for ease of interpretation and comparison across scales; thus, a 1-unit change in a given scale represents a change of 1 standard deviation.

Economic environment. The economic disadvantage scale includes the percentage of the total population in poverty, the percentage of the population 65 years and older in poverty, the percentage of households receiving public assistance income, the unemployment rate among persons 16 years and older, the percentage of housing units without a vehicle, and the percentage of the population that is Black. The economic advantage scale reflects the upper quartile value of owner-occupied housing units in the tract, the percentage of families with total annual income of $75 000 or more, and the percentage of adults with a college degree.

Built environment. The street connectivity scale was primarily drawn from the 2000 Topologically Integrated Geographic Encoding and Referencing system.[37] It includes the number of street segments per square mile, the number of nodes per square mile, and 2 indices reflecting connectivity—"alpha" and "gamma."[38,39] The alpha index uses the concept of a circuit—a finite, closed path starting and ending at a single intersection or end of a cul-de-sac. The alpha index is the ratio of the number of actual (observed) circuits to the maximum number of possible circuits. The gamma index equals the ratio of actual number of street segments to the maximum possible given the number of intersections. Both gamma and alpha indices range from 0 to 1, with higher values representing a more connected network.

We also included the average age of units in the tract, which may capture differences in street design. For example, many neighborhoods built before 1950 tend to have a "grid" design, whereas neighborhoods built after 1970 tend to have a "loops and lollipops" design.[16] Density was captured by the number of food stores, restaurants, and housing units per square mile as well as by population density. County-level information on the number of food stores and restaurants was obtained from the 2002 Economic Census (US Census Bureau, 2002 Economic Census, Geographic Area Series, unpublished data), and tract-level population density was obtained from the 2000 US Census.[38] The air pollution scale was derived from the Environmental Protection Agency's Air Quality System,[39] and includes quarterly measures of particulate matter at 10 μm or less and a summertime ozone average.

Social environment. To assess crime and segregation, county-level measures of crime were drawn from the 2002 Uniform Crime Reporting Program Data.[40] These include a number of serious crimes, such as aggravated assaults, burglaries, larcenies, motor vehicle thefts, murders, and robberies, divided by the size of the county population. The level of racial segregation within tracts may reflect the degree of social isolation. To measure segregation, we included both isolation and dissimilarity indices created for non-Hispanic Blacks from the 2000 US Census. Immigrant concentration was captured by the percentage of the population that was Hispanic, foreign-born, and with limited English skills, all measured at the tract level. In addition, a county-level Hispanic isolation index measure was included with this factor. Residential stability was reflected by the percentage of the population that lived in the same house since at least 1995 and by the median number of years of residence in the housing unit. All measures of neighborhood economic and social environment were based on the 2000 US Census and were measured at the census tract level.

Control variables. We controlled for a number of individual-level characteristics that could potentially confound the relationship between neighborhood environment and obesity in later life. The variables included age, race, ethnicity, education, marital status, total household assets, the income-to-needs ratio, current census region of residence, whether the interview was provided by a proxy respondent, retrospective measures of childhood self-assessed health, childhood socioeconomic status, and region of birth.

Statistical Analysis

To analyze the association between weight status and neighborhood environment for men and women, we calculated unadjusted and multivariate-adjusted odds ratios (ORs) from logistic regression models.

Several sensitivity analyses were conducted. We estimated logistic regression models with and without adjustments for reporting error and height loss to find similar results. We report here the models with adjusted weight status, which we believe to be more accurate. We also reestimated the models for the subsample that excluded underweight individuals

(BMI≤18.5 kg/m^2) and found these results to be substantially similar to those reported in this article.

Next, we estimated a series of 2-level random intercept logistic regression models. These models are multilevel models for binary outcomes, with standard errors adjusted for nonindependence of adults within neighborhoods. This series of models included all neighborhood environment characteristics and adjusted for the observed individual-level confounders described previously. We also augmented final models with individual self-reported health status, and found that ORs changed only slightly; we therefore present the more parsimonious models here. To explore the relative magnitude of neighborhood influences on obesity, we calculated the probability of being obese with unstandardized coefficients from the multilevel models, varying the value of selected predictors one at a time, and holding all other characteristics constant at group means. Finally, we explored whether associations between neighborhood characteristics and weight status could be attributed to selection. We addressed this issue by exploring the pattern of residential mobility between the 2000 and 2002 waves of HRS.

RESULTS

Among adults 55 years and older, 76% of men and 67% of women were either obese or overweight (Table 1), and 31% of men and 32% of women were obese.

Neighborhood socioeconomic status was found to be associated with obesity among both men and women (Table 2) after we controlled for individual-level predictors. For instance, living in an economically advantageous area was associated with reduced odds of being overweight or obese (OR=0.91; 95% confidence interval [CI]=0.85, 0.97) and being obese (OR=0.85; 95% CI=0.80, 0.91) for men. Living in economically disadvantaged areas was associated with a higher likelihood of being obese (OR=1.09; 95% CI=1.01, 1.17) for men. The effects of economic advantage and disadvantage were similar for women.

The results also suggest a potentially important role for the social and built environments. Women living in areas with high levels of street connectivity were less likely to be overweight or obese (OR=0.94; 95% CI=0.89, 1.00). Also, men living in areas with high immigrant concentration (OR=1.08; 95% CI=1.00, 1.17) and women living in areas with high residential stability (OR=1.06; 95% CI=1.01, 1.11) were more likely to be obese.

Other associations between neighborhood characteristics and outcomes were clearly confounded by individual- and family-level characteristics. For example, among men, the effect of living in a high-density area and the effect of living in an area of high residential stability disappeared once individual- and family-level characteristics were introduced. Similarly, among women, the effect of living in a high-crime, high-segregation area and the effect of living in an area with a high concentration of immigrants disappeared in the adjusted regression models.

When all neighborhood features were included in the same model (Table 3), several relationships between neighborhoods and weight status dissipated. For example, economic disadvantage was no longer associated with the likelihood of being obese for men or women once we controlled for other neighborhood factors. Similarly, living in a high-density area was no longer associated with the likelihood of being obese or overweight for women.

TABLE 1—Characteristics of Participants 55 Years and Older: Health and Retirement Study, 2002

	Men	Women
Outcomes		
Obese, %	30.7	32.4
Obese or overweight, %	76.1	66.9
Do physical activity or exercise, %	48.1	36.6
Individual-level variables		
Age, y		
55 to 59	25.5	22.7
60 to 64	20.4	17.8
65 to 69	16.5	15.3
70 to 74	14.3	14.3
75 to 79	11.2	12.7
80 to 84	7.5	10.2
≥85	4.6	7.0
Race/ethnicity, %		
White	84.1	82.8
Black	8.1	9.5
Hispanic	5.5	5.6
Other	2.3	2.1
Education, %		
≤8 y	11.6	10.2
9–11 y	12.1	14.3
12 y	30.6	37.8
≥13 y	45.6	37.8
Marital status, %		
Married	79.0	52.0
Widowed	8.8	31.0
Divorced or separated	9.1	13.6
Never married	3.1	3.4
Nonhousing assets, in $100 000s	4.3	3.4
Region of birth, %		
Northeast	22.9	20.9
South	30.3	31.8
Midwest	29.7	29.2
West	9.2	9.5
Foreign born	7.9	8.6
Current region, %		
Northeast	18.2	19.1
South	37.0	35.1
Midwest	24.9	26.0
West	19.9	19.8
Rate health as child, %		
Excellent	52.2	50.2
Very good	25.3	25.2
Good	17.3	17.9
Fair or poor	5.0	6.6
Rate family SES, %		
Pretty well off financially or about average	66.3	69.1
Poor	33.4	30.7
Proxy response, %	13.9	5.0
Income category, %		
Poor (<100% poverty line)	5.5	10.0
Near poor (100%–129% poverty line)	3.4	6.1
Working class (130%–184% poverty line)	8.2	11.3
Moderate income (185%–299% poverty line)	17.9	21.1
High income (≥300% poverty line)	65.0	51.6

Note. SES = socioeconomic status. All estimates are weighted.

TABLE 2—Odds Ratios (ORs) From Unadjusted and Adjusted Logistic Regression Models for Neighborhood Effects on Obesity Among Participants 55 Years and Older: Health and Retirement Study, 2002

	Obese		Obese or Overweight	
	Unadjusted[a] OR (95% CI)	Adjusted[b] OR (95% CI)	Unadjusted[a] OR (95% CI)	Adjusted[b] OR (95% CI)
Men (n = 6601)				
Economic disadvantage	1.06 (1.01, 1.12)	1.09 (1.01, 1.17)	0.99 (0.93, 1.05)	1.02 (0.95, 1.11)
Economic advantage	0.83 (0.79, 0.88)	0.85 (0.80, 0.91)	0.91 (0.87, 0.96)	0.91 (0.85, 0.97)
Street connectivity	0.96 (0.91, 1.01)	0.98 (0.92, 1.04)	0.93 (0.88, 0.99)	0.96 (0.89, 1.02)
Density	0.94 (0.89, 1.00)	0.97 (0.92, 1.03)	0.95 (0.90, 1.00)	0.96 (0.91, 1.02)
Air pollution	0.96 (0.91, 1.01)	0.98 (0.92, 1.05)	1.01 (0.95, 1.07)	1.03 (0.97, 1.10)
Crime and segregation	0.98 (0.92, 1.03)	0.98 (0.93, 1.04)	0.96 (0.90, 1.02)	0.98 (0.92, 1.05)
Immigrant concentration	0.99 (0.93, 1.05)	1.08 (1.00, 1.17)	0.98 (0.92, 1.04)	1.02 (0.94, 1.11)
Residential stability	1.07 (1.01, 1.13)	1.04 (0.98, 1.10)	1.08 (1.02, 1.14)	1.06 (0.99, 1.13)
Women (n = 8620)				
Economic disadvantage	1.33 (1.27, 1.39)	1.10 (1.04, 1.17)	1.28 (1.22, 1.35)	1.04 (0.97, 1.11)
Economic advantage	0.70 (0.66, 0.74)	0.80 (0.76, 0.86)	0.77 (0.74, 0.81)	0.87 (0.83, 0.92)
Street connectivity	1.06 (1.01, 1.11)	0.98 (0.93, 1.04)	1.02 (0.98, 1.07)	0.94 (0.89, 1.00)
Density	1.00 (0.95, 1.05)	0.95 (0.90, 1.00)	0.99 (0.93, 1.04)	0.94 (0.89, 0.98)
Air pollution	0.98 (0.93, 1.02)	0.96 (0.90, 1.01)	1.00 (0.95, 1.05)	0.98 (0.93, 1.03)
Crime and segregation	1.09 (1.04, 1.14)	0.97 (0.92, 1.02)	1.08 (1.03, 1.13)	0.99 (0.94, 1.04)
Immigrant concentration	1.05 (1.00, 1.11)	1.01 (0.95, 1.08)	1.05 (1.00, 1.11)	1.02 (0.95, 1.09)
Residential stability	1.09 (1.04, 1.14)	1.06 (1.01, 1.11)	1.09 (1.04, 1.15)	1.04 (0.99, 1.10)

Note. CI = confidence interval. Overweight was defined as a body mass index (BMI) of 25.0–29.9 kg/m^2. Obese was defined as a BMI of 30.0 kg/m^2 or more. See "Methods" section for details on how neighborhood characteristics were measured.
[a]Unadjusted models included only the single neighborhood scale.
[b]Adjusted models included the single neighborhood scale and all individual-level variables described in Table 1 (i.e., respondent's age, race/ethnicity, education, marital status, nonhousing assets, region of birth, current region, rating of health as a child, rating of family socioeconomic status as child, proxy response, and income).

Nevertheless, 2 neighborhood characteristics remained important in predicting obesity for men: living in an economically advantaged neighborhood (OR=0.86; 95% CI=0.80, 0.93) and in a high immigrant area (OR=1.12; 95% CI=1.03, 1.22). For women, neighborhood economic advantage (OR=0.83; 95% CI=0.77, 0.89), air pollution levels (OR=0.93; 95% CI=0.88, 0.99), and residential stability (OR=1.06; 95% CI=1.01, 1.12) remained significant predictors of obesity. Women living in areas with high street connectivity were also less likely to be overweight or obese (OR=0.94; 95% CI=0.88, 1.00).

Given the consistent results with respect to neighborhood economic advantage, we probed this finding further. We re-estimated models presented in Table 3 by substituting neighborhood advantage scale with each of its 3 components and found that all 3 components were strongly related to weight status of older adults (data not shown). We also assessed the magnitude of these effects relative to individual-level socioeconomic indicators. We found that a difference in neighborhood economic advantage scale from 25th to 75th percentile was associated with a –0.04 difference (0.43 to 0.39) in the probability of being obese among older men. Similarly, among women we found a –0.05 difference (0.46 to 0.41). These differences are similar in magnitude to those found by varying individual-level education. For example, having completed more than a high school education compared with less than a high school education was associated with a –0.05 difference in probability of being obese for both men (0.43 to 0.38) and women (0.46 to 0.41).

Are these significant associations the result of selection? There are several ways in which residential mobility can contribute to selection. First, individuals with excess weight may be more (or less) likely to move. Second, obese and overweight individuals may tend to move to neighborhoods with environments that do not promote physical activity or healthful eating, or conversely, those of normal weight might move to neighborhoods that promote physical activity and healthful eating. Finally, it is possible that the move experience itself may influence weight status.

In Table 4 we show that 12.1% of the sample moved between the 2000 and 2002 waves. We found that movers and nonmovers did not differ appreciably by weight status. In both groups, approximately 30% to 31% were obese and 70% to 71% were obese or overweight in 2000. No changes in weight status were observed for movers or nonmovers between 2000 and 2002, although in 2002 movers were slightly less likely than were nonmovers to be overweight or obese (68% vs 71%). Neighborhood characteristics of those who moved and those who did not move were not significantly different on average in 2000 with 1 exception: movers tended to live in the neighborhoods with less residential stability. The neighborhoods that individuals moved to by 2002 had fewer low socioeconomic status households, lower concentrations of immigrants, lower crime levels, less air pollution, and less street connectivity, but did not differ along 2 dimensions—economic advantage and residential stability—found to be salient relative to weight status in our analysis. When we repeated this latter analysis for overweight and obese individuals, we found (data not shown) that mobility patterns did not differ by respondents' weight status. For example, both overweight and nonoverweight elderly people tended to move to areas of lower connectivity. We found little evidence that associations between neighborhood environment and individual weight status were results of residential mobility decisions.

DISCUSSION

Using a large, nationally representative survey, we found that excess weight in older adults was related to economic, social, and built aspects of the neighborhoods in which they lived. We found that living in areas with greater economic advantage may play a protective role

TABLE 3—Odds Ratios (ORs) From 2-Level Random Intercept Logistic Regression Models for Neighborhood Effects on Obesity Among Participants 55 Years and Older: Health and Retirement Study, 2002

	Obese, OR (95% CI)	Obese or Overweight, OR (95% CI)
	Men (n = 6601)	
Economic disadvantage	1.02 (0.93, 1.13)	1.01 (0.91, 1.11)
Economic advantage	0.86 (0.80, 0.93)	0.91 (0.85, 0.98)
Street connectivity	0.94 (0.87, 1.01)	0.95 (0.88, 1.02)
Density	0.98 (0.91, 1.06)	0.98 (0.92, 1.05)
Air pollution	0.95 (0.89, 1.02)	1.02 (0.95, 1.10)
Crime and segregation	0.99 (0.93, 1.06)	0.99 (0.93, 1.06)
Immigrant concentration	1.12 (1.03, 1.22)	1.05 (0.95, 1.15)
Residential stability	1.04 (0.98, 1.11)	1.06 (0.99, 1.13)
	Women (n = 8620)	
Economic disadvantage	1.06 (0.98, 1.14)	1.01 (0.93, 1.09)
Economic advantage	0.83 (0.77, 0.89)	0.88 (0.82, 0.93)
Street connectivity	0.96 (0.90, 1.02)	0.94 (0.88, 1.00)
Density	0.95 (0.89, 1.01)	0.96 (0.91, 1.01)
Air pollution	0.93 (0.88, 0.99)	0.96 (0.91, 1.02)
Crime and segregation	0.99 (0.93, 1.04)	1.02 (0.96, 1.08)
Immigrant concentration	1.04 (0.97, 1.12)	1.06 (0.98, 1.15)
Residential stability	1.06 (1.01, 1.12)	1.04 (0.99, 1.10)

Note. CI = confidence interval. Overweight was defined as a body mass index (BMI) of 25.0–29.9 kg/m^2. Obese was defined as a BMI of 30.0 kg/m^2 or more. Models included all neighborhood scales. Models also included all individual-level variables described in Table 1 (i.e., respondent's age, race/ethnicity, education, marital status, nonhousing assets, region of birth, current region, rating of health as a child, rating of family socioeconomic status as child, proxy response, and income). See "Methods" section for details on how neighborhood characteristics were measured.

against obesity for both older men and women. In addition, for women, high street connectivity was associated with a reduced likelihood of being obese or overweight, but residential stability was associated with an increased risk of being obese. For men, neighborhood immigrant concentration was associated with a higher likelihood of being obese. These associations did not appear to be the result of differential selection by weight status into different types of neighborhoods over the previous 2-year period or by selective weight change associated with moving.

Limitations

Limitations of this analysis include our reliance on reports of weight and height to construct weight status. Another limitation is that all of the regression analysis results are cross-sectional, and although we explored 2-year selection effects, we were unable to rule out longer-term selection processes. Our analysis of neighborhood immigrant concentration did not take into account the country of origin. Finally, because of the lack of data availability, we were unable to consider the effect of some potentially important neighborhood environmental features, such as neighborhood social support, proximity to parks, and availability of physical activity facilities.

Implications

Despite these limitations, our findings have important implications for future research. Researchers have long recognized the importance of socioeconomic status in health and health behavior formation. Most of this research, however, highlights the particular importance of economic disadvantage of the neighborhood.[24,25] The results of our study indicate that careful attention to the benefits that flow from economic advantage is warranted. These influences appear to be as large as those of individual-level socioeconomic status. In our analysis, no single aspect of economic advantage emerged as critical; hence, the question of which of the neighborhood economic advantage features plays the most important role in preventing obesity among older adults merits further investigation.

Our results also raise new and intriguing questions about how the social environment influences weight status and point to potentially differing mechanisms for men and women. We found, for example, that women living in areas of high residential stability were more likely to be obese. This finding raises the possibility of potentially negative consequences of aging in place, and further investigation of this relationship is needed. Among men, we found paradoxically that despite the lower chances of being obese among those who were foreign born, living in areas with higher concentrations of immigrants was associated with an elevated risk of obesity. Sastry and Pebley[40] obtained a very similar result in their examination of obesity among adolescents. There are several potential explanations for this counterintuitive result, which should be explored further. For example, individuals living in areas of greater concentration of immigrants may be more likely to be engaged in various social activities, including those associated with greater food-related opportunities, or there may be a lack of opportunity for physical activity (e.g., fewer parks and facilities) in the areas with a high immigrant concentration.

Finally, our results indicate the importance of the built environment for women. Consistent with previous research,[11,14,16] we found that older women living in areas with higher street connectivity were less likely to be overweight or obese. Air pollution was also linked to reduced chances of being obese. The latter puzzling result emerged only in the model that controlled for all of the individual and neighborhood variables and was limited to women living in the most polluted neighborhoods. This correlation is robust to inclusion of present and past smoking status and to inclusion of an indicator of ever having had lung disease. It is possible that people in areas of high air pollution may have better access to recreational facilities or other amenities that we did not measure in this study that may play a protective role.

Taken together, our findings have implications for policymakers interested in targeting older adults who are overweight or obese. Our study suggests that areas with few households

TABLE 4—Obesity Prevalence and Mean Neighborhood Characteristics Among Participants 55 Years and Older, by Move Status: Health and Retirement Study, 2000–2002

	Movers[a]		Nonmovers[b]		Total Sample of Movers and Nonmovers
	2000	2002	2000	2002	2000
Weight status, %					
Obese[c]	30.3	30.7	31.0	31.4	30.9
Overweight[d]	39.8	37.5	40.4	39.8	40.3
Obese or overweight	70.1	68.2	71.3	71.2***	71.2
Means of neighborhood scales[e]					
Economic disadvantage	−0.16	−0.22**	−0.14		
Economic advantage	0.15	0.14	0.10		
Street connectivity	−0.08	−0.21**	0.03		
Density	−0.03	−0.07	−0.004		
Air pollution	0.10	0.06*	0.05		
Crime and segregation	0.06	−0.11*	−0.10		
Immigrant concentration	0.03	−0.11**	−0.09		
Residential stability	−0.20	−0.25	0.05**		

[a]Movers are individuals who moved between the 2000 and 2002 interviews. There were 1683 movers (weighted % = 12.1).
[b]Nonmovers are individuals who did not move between the 2000 and 2002 interviews. There were 12 572 nonmovers (weighted % = 87.9).
[c]Obese was defined as a BMI of 30 kg/m^2 or more.
[d]Overweight was defined as a body mass index (BMI) of 25.0–29.9 kg/m^2.
[e]See "Methods" section for details on neighborhood scales.
*Significantly different from movers in 2000 at $P < .05$.
**Significantly different from movers in 2000 at $P < .01$.
***Significantly different from movers in 2002 at $P < .05$.

of high socioeconomic status, high immigrant concentration, low street connectivity, and high residential stability and older adults living in these areas should be targeted for interventions. Our results also suggest that developing neighborhoods in which people of a greater spectrum of incomes reside could be beneficial. Given that 70% of adults 55 years and older are overweight or obese, how best to design and target such interventions to reduce excess weight in later life remains an important public health priority. ■

About the Authors

Irina B. Grafova, Vicki A. Freedman, Rizie Kumar, and Jeannette Rogowski are with the Department of Health Systems and Policy of the School of Public Health, University of Medicine and Dentistry of New Jersey, New Brunswick.

Requests for reprints should be sent to Irina B. Grafova, Department of Health Systems and Policy, School of Public Health, University of Medicine and Dentistry of New Jersey, 683 Hoes Lane West, Piscataway, NJ 08854 (e-mail: grafovib@umdnj.edu).

This article was accepted March 23, 2008.

Contributors

I.B. Grafova led the writing and, with V.A. Freedman and J. Rogowski, originated the study, conceptualized ideas, interpreted findings, and reviewed drafts of the article. R. Kumar completed the analysis and reviewed drafts of the article.

Acknowledgments

This research was funded by the National Institute on Aging (grant R01AG024058). Funding for Rand's Center for Population Health and Health Disparities was provided through the National Institute of Environmental Health Sciences (grant P50 ES12383).

Human Participant Protection

This research was approved by the University of Medicine and Dentistry of New Jersey's institutional review board.

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