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The relationship between social network, social support and periodontal disease among older Americans

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Abstract

Aim: The objectives of this study were to examine the relationship between social network, social support and periodontal disease among older American adults and to test whether social network and support mediates socioeconomic inequality in periodontal disease.

Materials and Methods: Data pertaining to participants aged 60 years and over from the National Health and Nutrition Examination Survey 2001–2004 were used. Periodontal disease variables were extent loss of periodontal attachment $\geqslant 3$ mm and moderate periodontitis. Social support and networks were indicated by the need for emotional support, number of close friends and marital status.

Results: Widowed and those with lowest number of friends had higher rates of the extent of loss of periodontal attachment (1.27, 95% CI: 1.03, 1.58) and (1.22, 95% CI: 1.03, 1.45), respectively. Marital status and number of friends were not significantly associated with moderate periodontitis after adjusting for behavioural factors. The need for more emotional support was not related to periodontal disease in this analysis. Social networks and support had no impact on socioeconomic inequality in periodontal disease.

Conclusion: Certain aspects of social network, namely being widowed and having fewer friends, were linked to the extent of loss of periodontal attachment but not to the definition of moderate periodontitis, in older adults.

Key words: older adults; periodontal disease; social network; social support

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Lower levels of social network, support and isolation are related to various aspects of physical and mental disease, and to rates of mortality (Berkman & Kawachi 2000, Stansfeld 2006). There is an inverse relationship between higher levels of social network and support on the one hand and morbidity, coronary heart disease and cause-specific mortality rates, on the other hand (Ruberman et al. 1984, Orth-Gomer & Johnson 1987, Berkman et al. 1992, Kawachi et al. 1996, Eng et al. 2002, Stansfeld 2006, Hoppmann & Gerstorf 2009, Mead et al. 2010). Several theories have been postulated about the mechanism linking social network and support to health and mortality (Berkman 1985, Stansfeld 2006). They include direct financial and physical support to engage in health-enhancing behaviours and to access care, gaining information from the social network pertaining to innovative health-promoting behaviours and health hazards. Furthermore, social and emotional support could help mitigate the consequences of stressful events and coping with diseases, risk factors and the negative effect of social isolation (Berkman 1985, Kawachi et al. 1996) through alterations in neuroendocrine and immunological control systems (Brunner & Marmot 2006). As there are common pathways affecting general and oral health (Sheiham & Nicolau 2005, Sabbah et al. 2008, Borrell & Crawford 2011), some dental studies

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have examined the relationship between social network and support and other societal characteristics with oral health in children and adolescents (Hanson et al. 1994, Pattussi et al. 2007, 2008, Aida et al. 2008, 2009) and in adults (Monteira da Silva 1996, McGrath & Bedi 2002, Merchant et al. 2003). One study examined the relationship between social networks and periodontitis among male health professionals in the United States and found that individuals having friends and who participated in social activities were less likely to have peridontitis (Merchant et al. 2003). Another study reported an association between social isolation and periodontitis (Monteiro da Silva 1996). However, these two studies on the relationship between periodontitis and social network and support were either conducted in a specific occupational group or on a relatively small sample.

While social support and networks were suggested to mediate the socioeconomic inequalities in general health (Stansfeld 2006), no study has examined this possible role of social support and networks in relation to oral health. Therefore, we set out to examine the relationship between social network and support and periodontal disease in a nationally representative sample of American older adults, and to assess whether social network and support mediated the known socioeconomic inequality in periodontal diseases (Stansfeld 2006).

We postulated that higher levels of social network and support were inversely related to periodontal disease among older American adults. Considering the different mechanisms through which social network and support influences health (Berkman 1985, Kawachi et al. 1996), our second hypothesis was that social network and support mediates the relationship between socioeconomic position and periodontal disease in older adults. The objectives of the study were to test (1) the relationship between three markers of social network and support (Cohen et al. 2000), namely number of close friends, need for emotional support and marital status, with periodontal disease; (2) whether social network and support mediated the socioeconomic disparities in periodontal disease, in a national representative sample of Americans aged 60 years and older.

Materials and Methods

Data were on participants aged 60 years and over who participated in the National Health and Nutrition Examination Survey (NHANES) from 2001 to 2004. NHANES 2001–2004 collected information on a nationally representative sample in each year using a stratified, multi-stage design to obtain a representative probability sample of the civilian non-instutionalized population of the United States (CDC 2010). The survey collected data on individual characteristics such as gender, age, race/ethnicity, education, income and marital status. The interviewer also asked questions about selected behaviours, including smoking and dental visits. Furthermore, the survey included questions on social network and support providing data on emotional, material and network (the number of members in a network) support (CDC 2010). The questions were selected from the Yale Health and Aging Study and the Social Network Index – Alameda County Study (Ruberman et al. 1984).

The MEC examination included a detailed oral examination (Dye et al. 2007b). Participation in the oral health component was limited to age groups considered most critical for monitoring oral health (13 years and older for periodontal examination). Information was also obtained from the home interview covering assessments on perceived oral health status (CDC 2010). The NHANES periodontal examination protocol was based upon the NIDCR criteria with minor modifications (Dye et al. 2007b).

Periodontal disease variables

Periodontal assessments in NHANES 2001–2004 were made at three facial sites (mesio-, disto- and mid-facial) on each fully erupted permanent tooth, except third molars, in two randomly selected quadrants (one maxillary and one mandibular). Detailed information on the NHANES dental examinations for the survey periods are published elsewhere (Drury et al. 1996, Dye et al. 2007a, b). Periodontal data were used from the surveys 2001–2002 and 2003–2004 for consistency in the number of sites diagnosed for periodontal disease. Two variables were created: (1) extent of loss of periodontal attachment of 3 mm or more (expressed as the percentage of affected sites) and (2) moderate periodontitis was defined by the presence of two or more inter-proximal sites with loss of attachment of 4 mm or more (not on same tooth), or two or more inter-proximal sites with pocket depth 5 mm or more (not on same tooth) (Page & Eke 2007).

Social network and support variables

Three variables indicating social network and support were used. Whether the participants needed more emotional help during the past year was used as a measure of social support. Number of close friends and marital status were used as indicators of social networks. These three markers of social network and support have been repeatedly used in medical (Manzoli et al. 2007, Hoppmann & Gerstorf 2009, Mead et al. 2010) and dental studies (Marcenes & Sheiham 1996, Merchant et al. 2003, Aida et al. 2009). The need for emotional support was a dichotomous variable (yes, no), the number of close friends was categorized into tertiles. Marital status was grouped to indicate whether the participants were (1) married or live with a partner, (2) widowed and (3) divorced, separated or single.

Behavioural variables

These included smoking and dental visits. Smoking indicates whether the person is a current smoker, a former smoker who smoked at least 100 cigarettes or never smoked. Dental visit indicates whether the participant visited a dentist at least once within the past 2 years.

Sociodemographic variables

These included age (continuous variable), gender and race/ethnicity (White, African Americans, Mexican Americans, other Hispanic and other ethnicities). Income was indicated by family poverty–income ratio, which is the ratio between household income and poverty threshold, and is used to account for inflation throughout the years of the survey. Poverty–income ratio was categorized into quartiles. Education reflects whether the participants had less than high school diploma, high school or more than high school.

Statistical analysis

First, we assessed the distribution of all explanatory variables by periodontal status (moderate periodontitis). A series of regression models were conducted for both periodontal disease variables alternatively adjusting for markers of social

network and support. The first model was adjusted for gender, age and race/ethnicity, the second model additionally adjusted for education, income, number of teeth and diabetes, the third model additionally adjusted for dental visits and smoking. The sequence of adjustment is based on the hypothesis that social network and support influence health through an impact on health-related behaviours (Berkman 1985). This method was used in medical research to account for direct and indirect effect of explanatory factors (van Oort et al. 2005). Logistic regression was used in the analysis pertaining to moderate periodontitis, and negative binomial regression in the analysis pertaining to extent of loss of periodontal attachment.

Other studies have indicated that men benefit more than women from social network and support (Berkman 1985, Berkman & Kawachi 2000); hence, we tested for interaction between social support and networks variables and gender. We also tested interaction between social networks and each of age, smoking and dental visits. To demonstrate that the relationship between social support and networks with periodontal disease operates via a behavioural pathway, we also examined the association between the three markers of social support and networks with each of dental visits and smoking, adjusting for sex and age.

Regression models were conducted to measure the variation in income and education disparities in periodontal disease and the impact of adjusting for social support and network on the socioeconomic disparities in periodontal disease. The first model adjusted for age, gender, race/ethnicity, number of teeth, diabetes, smoking status and dental visits, in addition to income and education. The second model additionally adjusted for marital status, number of friends and needing more emotional support, in order to assess whether the relationship between income and education and periodontal disease is attenuated after adjustment for social networks and support. A 4-year weight variable based on the 2-year mobile examination weight was created and used to adjust for the complexity of the survey. Stata survey command was used throughout the analysis.

Results

The analysis was conducted for 1632 older adults aged 60 years and over who had complete social network and support and periodontal disease data in NHANES 2001–2004. There was no significant difference in periodontal disease between the 1632 individuals included in the analysis and the 134 individuals excluded for having incomplete data in this age group. The mean age was 69.7 years. The prevalence of moderate periodontitis was 23.1% and 17.1% among participants aged 60–70 years and 71 and older, respectively. Married and cohabiting individuals had lower prevalence of moderate periodontitis (18.6%) than widowed (23.7%) and divorced (19.1%). Similarly, individuals with the highest number of friends had the lowest prevalence of periodontitis (Table 1).

The mean age of widowed individuals (74.8 years) was higher than that of married and cohabiting (68.9 years) and divorced and single (67.5). On the other hand, more women were widowed (37.5%) than men (10.8%). The mean age across tertiles of number of close friends was 69.7, 69.8 and 70.5 years in the highest, middle and lowest friend group.

There was a relationship between the three markers of social support and networks, and smoking and dental visits. Smoking was highest among divorced (22%) than widowed (8%) and married (7%). Similarly, 13% of participants with least number of friends were smokers, compared with 8% among participants with more friends. Individuals who needed emotional support had higher prevalence of smoking (10%) than those who did not need emotional support (9%). Married participants reported more visits to a dentist (82%) than widowed (73%) and divorced (72%). Individuals with highest number of friends reported more dental visits (83%) than those in the middle (81%) and lowest (70%) friend groups. Participants who did not need emotional support reported more dental visits (80%) than those who needed emotional support (71%).

Widowed and divorced participants were more likely to be a current or former smoker compared with married participants, with odds ratios of 1.58 (95% CI: 1.16, 2.14) and 1.79 (95% CI: 1.41, 2.27), respectively, in a regression model adjusting for sex and age. Widowed and divorced individuals were also less likely to visit a dentist with odds ratios of 0.50 (95% CI: 0.38, 0.65) and 0.62 (95% CI: 0.49, 0.78), respectively. On the other hand, participants in the middle and lowest number of friends groups had insignificant odds ratios of 1.07 (95% CI: 0.86, 1.34) and 1.12 (95% CI: 0.92, 1.39), respectively, for being current or former smokers in a regression model adjusting for sex and age. Participants with the lowest number of friends were significantly less likely to visit a dentist than those with highest number of friends with odds ratios of 0.52 (95% CI: 0.42, 0.64). The odds ratios for the associations between need for support and being a current or former smoker, and dental visits were not significant with odds ratios of 0.93 (95% CI: 0.74, 1.16) and 0.82 (95% CI: 0.63, 1.05), respectively.

Table 2 shows the association between the three markers of social network and support (marital status, needing more emotional support and number of friends) with extent of loss of periodontal attachment of 3 mm or more and case definition of moderate periodontitis (Page & Eke 2007). Widowed and divorced had higher levels of loss of periodontal attachment than married persons, with rate ratios 1.60 (95% CI: 1.27, 2.01) and 1.33 (95% CI: 1.09, 1.63), respectively. After adjusting for income, education, smoking and dental visits, widowed still had significantly higher levels of loss of periodontal attachment (Table 2). Widowed individuals were significantly more likely to have moderate periodontitis than married individuals (OR 1.65, 95% CI: 1.09, 2.05). However, this relationship lost significance after adjusting for income, education, smoking and dental visits. Participants with the least number of friends had significantly higher levels of loss of periodontal attachment than those with the highest number of friends. This relationship remained significant even after adjusting for socioeconomic and behavioural factors (rate ratio 1.22, 95% CI 1.03, 1.45) (Table 2). Similarly, persons who had the lowest number of friends were significantly more likely to have moderate periodontitis (OR 1.53, 95% CI: 1.15, 2.04). The relationship was eliminated after adjusting for behaviours. Needing more emotional support did not appear to have an association with periodontitis or the extent of loss of periodontal attachment (Table 2).

While there was clear income gradient in moderate periodontitis, education did not seem to have a great impact on moderate periodontitis for this age

Table 1. Mean extent of loss of periodontal attachment and percentage of moderate periodontitis within groups of explanatory variables among older Americans ($n = 1632$)

Explanatory factors (*N*)	Percentage with moderate peridontitis (95% CI)	Mean extent of loss of periodontal attachment (95% CI)
Gender		
Males (832)	24.6% (21.3, 28.3)	0.24 (0.21, 0.26)
Females (800)	15.7% (13.5, 18.2)	0.16 (0.14, 0.17)
Age group		
60–70 years (884)	17.1% (14.2, 20.4)	0.17 (0.15, 0.19)
71 and over (748)	23.1% (20.4, 26.1)	0.22 (0.20, 0.25)
Race/ethnicity		
White Americans (948)	17.5% (15.2, 20.0)	0.18 (0.16, 0.20)
African Americans (252)	29.9% (24.7, 35.6)	0.25 (0.22, 0.28)
Mexican Americans (353)	31.6% (24.3, 40.0)	0.25 (0.20, 0.29)
Other Hispanic (40)	37.2% (22.7, 54.3)	0.30 (0.23, 0.37)
Other ethnicities (39)	21.8% (11.0, 38.8)	0.21 (0.13, 0.29)
Education		
More than high school (701)	16.0% (13.2, 19.2)	0.16 (0.14, 0.17)
High school (384)	18.8% (15.2, 23.0)	0.18 (0.16, 0.21)
Less than high school (547)	30.2% (24.9, 36.0)	0.29 (0.25, 0.33)
Poverty–income ratio		
Highest quartile (410)	14.8% (11.7, 18.6)	0.15 (0.13, 0.16)
Second highest (407)	16.5% (13.2, 20.4)	0.18 (0.15, 0.20)
Second lowest (406)	25.6% (20.9, 30.9)	0.23 (0.20, 0.26)
Lowest quartile (409)	34.7% (27.7, 42.4)	0.32 (0.28, 0.36)
Marital status		
Married/cohabiting (1056)	18.6% (16.2, 21.2)	0.18 (0.16, 0.20)
Widowed (341)	23.7% (18.9, 29.4)	0.23 (0.19, 0.26)
Divorced, separated, single (253)	19.1% (14.0, 25.4)	0.22 (0.18, 0.25)
Number of close friends		
Highest tertile (621)	16.2% (13.7, 19.1)	0.16 (0.15, 0.18)
Middle tertile (519)	19.4% (16.7, 22.4)	0.19 (0.17, 0.21)
Lowest tertile (492)	26.2% (21.9, 31.1)	0.25 (0.22, 0.28)
Need more emotional help		
Yes (235)	18.5% (12.9, 25.9)	0.20 (0.16, 0.24)
No (1397)	19.9% (17.6, 22.3)	0.19 (0.18, 0.21)
Dental visits		
Within past 2 years (1197)	17.4% (15.1, 20.1)	0.17 (0.15, 0.18)
Longer than 2 years (435)	28.2% (23.8, 33.2)	0.29 (0.26, 0.32)
Smoking		
Current smoker (168)	34.8% (27.1, 43.5)	0.37 (0.32, 0.42)
Former smoker (656)	22.9% (19.9, 26.3)	0.21 (0.18, 0.23)
Never smoked (808)	14.3% (12.0, 17.0)	0.15 (0.13, 0.17)
Diabetes		
Yes (274)	21.9% (16.8, 28.2)	0.23 (0.19, 0.27)
No (1358)	19.3% (17.5, 21.3)	0.19 (0.17, 0.20)

group (Table 3). Overall, social network and support had a very modest impact on the association between income and education, and moderate periodontitis. Individuals in the lowest income quartile had odds ratios of 2.17 (95% CI: 1.26, 3.73) for having moderate periodontitis. After adjusting for social network and support, this odds ratio hardly changed (Table 3). On the other hand, participants in the lowest education group had higher levels of loss of periodontal attachment (rate ratio 1.42, 95% CI: 1.15, 1.76). After adjusting for social network and support, the relationship was slightly attenuated and remained significant (Table 3). There was no interaction between social network variables with neither of age, gender, smoking nor dental visits.

Discussion

Marital status and number of friends were significantly associated with two indicators of periodontal disease measuring case definition and severity of the disease among older Americans aged 60 years and over. Considering the postulated mechanism for the relationship between social network, support and oral health through health behaviours (Berkman 1985), the aforementioned relationships lost significance after adjustment for behaviours, with the exception of the relationships between being widowed and having lowest number of friends with extent of loss of periodontal attachments. Furthermore, social network and support variables did not seem to have an impact on socioeconomic disparities in periodontal disease.

In the current study, we used number of friends, needing more emotional sup-

Table 2. Association between social network and support indicators and two measures of periodontal disease among Americans aged 60 years and over ($n = 1632$) (NHANES 2001–2004)

	Marital status (reference group: married)		Need more emotional support	Number of friends (reference group: highest tertile)	
	widowed	divorced/separated		middle tertile	lowest tertile
Rate ratio for extent loss of attachment					
Model 1	1.60 (1.27, 2.01)***	1.33 (1.09, 1.63)**	0.98 (0.74, 1.30)^{NS}	1.05 (0.88, 1.26)^{NS}	1.43 (1.21, 1.68)***
Model 2	1.33 (1.09, 1.63)**	1.14 (0.90, 1.44)^{NS}	0.86 (0.69, 1.07)^{NS}	1.02 (0.85, 1.22)^{NS}	1.23 (1.05, 1.46)*
Model 3	1.27 (1.03, 1.58)*	1.07 (0.86, 1.34)^{NS}	0.87 (0.72, 1.06)^{NS}	0.99 (0.83, 1.19)^{NS}	1.22 (1.03, 1.45)*
Odds ratio for moderate periodontitis					
Model 1	1.65 (1.09, 2.50)*	1.07 (0.70, 1.61)^{NS}	0.86 (0.51, 1.44)^{NS}	1.19 (0.93, 1.53)^{NS}	1.53 (1.15, 2.04)**
Model 2	1.36 (0.88, 2.10)^{NS}	0.88 (0.56, 1.37)^{NS}	0.73 (0.45, 1.20)^{NS}	1.14 (0.87, 1.78)^{NS}	1.32 (0.97, 1.78)^{NS}
Model 3	1.28 (0.82, 2.00)^{NS}	0.80 (0.52, 1.24)^{NS}	0.76 (0.46, 1.25)^{NS}	1.09 (0.84, 1.40)^{NS}	1.29 (0.95, 1.77)^{NS}

Model 1 adjusted for age, gender and race/ethnicity, in addition to the variables of social network/support. Model 2 additionally adjusted for income, education, diabetes and number of teeth. Model 3 additionally adjusted for smoking status (current, former smoker, never smoker) and dental visits.
***$P < 0.001$, **$P < 0.01$, *$P < 0.05$.
NS, not significant.

Table 3. Income and education gradients in periodontal disease for Americans aged 60 years and over ($n = 1632$) (NHANES 2001–2004)

	Education (reference group: ⩾high school)		Income (quartiles of poverty–income ratio, reference group: highest quartile)		
	high school	< high school	second highest quartile	second lowest quartile	lowest quartile
Rate ratios for extent loss of attachment					
Model 1	1.16 (0.94, 1.42)^{NS}	1.42 (1.15, 1.76)**	1.05 (0.86, 1.29)^{NS}	1.49 (1.19, 1.87)**	1.58 (1.23, 2.04)**
Model 2	1.11 (0.89, 1.38)^{NS}	1.38 (1.12, 1.70)**	1.03 (0.84, 1.27)^{NS}	1.44 (1.15, 1.79)**	1.52 (1.18, 1.96)**
Odds ratio for moderate periodontitis					
Model 1	1.18 (0.87, 1.62)^{NS}	1.58 (1.03, 2.44)*	1.10 (0.76, 1.59)^{NS}	1.80 (1.22, 2.67)**	2.17 (1.26, 3.73)**
Model 2	1.13 (0.82, 1.55)^{NS}	1.51 (0.97, 2.37)^{NS}	1.10^{NS} (0.76, 1.59)	1.76 (1.18, 2.64)**	2.19 (1.25, 3.84)**

Model 1 adjusted for age, gender, race/ethnicity, number of teeth, diabetes, smoking status (current, former smoker and never smoker) and dental visits, in addition to income and education. Model 2 additionally adjusted for marital status, number of friends and needing more emotional support.
$^{**}P < 0.01$, $^{*}P < 0.05$.
NS, not significant.

port and marital status to indicate social network and support (Cohen et al. 2000). Numbers of friends and the need for emotional support have both been frequently used as markers of social network and support (Ruberman et al. 1984, Orth-Gomer & Johnson 1987, Berkman et al. 1992, Kawachi et al. 1996, Eng et al. 2002, Stansfeld 2006, Hoppmann & Gerstorf 2009, Mead et al. 2010). Furthermore, two dental studies found that having a greater number of friends was inversely related to periodontal disease (Monteiro da Silva 1996, Merchant et al. 2003). The current study supports these findings by demonstrating them in a nationally representative sample of American older adults. On the other hand, the need for emotional support was not associated with periodontal disease in this study.

Marital status was an important determinant of health and mortality, especially among older adults (Manzoli et al. 2007, Hoppmann & Gerstorf 2009). Additionally, Marcenes & Sheiham (1996) demonstrated the importance of the quality of marriage for oral health. In the current study, marital status appeared to be the most important social networks factor in relation to periodontal diseases among older adults with being widowed maintaining its significant relationship with the extent of loss of periodontal attachment even after adjusting for smoking and dental visits. It is worth noting that while widowed persons were generally older than the rest of the sample, which would imply that the observed relationship with periodontal disease is due to the accumulative effect of age. However, there was no interaction between marital status and age. Furthermore, the majority of widowed were women, who generally have lower levels of periodontal disease than men.

This is a cross-sectional study that cannot provide evidence on causal inferences. Being widowed had a stronger relationship with periodontal disease than being divorced or single. As the death of a spouse is very likely to be a stressful life event, this finding is consistent with psychological pathways affecting periodontal disease by reducing host resistance and the ability to cope with stressors (Sheiham & Nicolau 2005). Being divorced may also be a stressful life event, though in this age group it is reasonable to speculate that becoming widowed was probably a relatively more recent life event than being divorced, and this may partly contribute to the stronger association with current periodontal status. On the other hand, periodontitis is a progressive, cumulative disease; hence, the importance of more recent stressful events is questionable. The relatively stronger relationship between being widowed and periodontal disease could also be attributed to the older age of widowed participants, potentially indicating the possibility of residual confounding by age; however, the analysis adjusted for the effect of age group.

In this study, we also examined income and education gradients in periodontal disease and the impact of controlling for social network and support on the aforementioned relationship. There were income and education gradients in periodontal disease. However, social network and support appeared to have no impact on the social gradients in periodontal disease. Stansfeld (2006) found that social network and support had a limited effect on the social gradients in general health. Other studies have indicated that men benefit more than women from social network and support (Berkman 1985, Berkman & Kawachi 2000); in this study, there was no interaction between gender and social network and support.

The effect of social network and support on health was postulated to occur through four pathways (Berkman 1985, Kawachi et al. 1996): first, an instrumental support, for example financial support; second, informational support where individuals acquire knowledge about health-promoting habits and hazards to health from their social network; third, emotional support which help individuals to cope with the disease and with health hazards; fourth, through an influence on host resistance. It is highly likely that similar pathways affect periodontal disease in older adults (Sheiham & Nicolau 2005). For example, social network and support could influence oral health through a change in behaviours (McGrath & Bedi 2002), or by buffering the negative effect of stressful events on periodontal disease (Sheiham & Nicolau 2005). These pathways linking social network and support and oral health could not be tested in this study due to data limitations.

This study demonstrated that social networks, indicated by number of friends and marital status, were significantly related to severity of loss of attachment in a nationally representative sample of older Americans aged 60 years and over. The importance of certain aspects of social networks, namely being widowed, and having few friends were further demonstrated as such individuals remained more likely to have greater levels of loss of periodontal attachment even after adjusting for behavioural determinants of periodontitis such as smoking and dental visits. Social network and support appeared to have no impact on the social gradients in periodontal disease in this age group.

The current study has the advantages of using a nationally representative sam-

ple of American older adults and assessing the impact of social network and support on the social gradients in periodontitis. However, considering the cross-sectional nature of the study, no causal association could be concluded from this study. Additionally, the dataset lacked a number of important behavioural factors, such as toothbrushing, which could have influenced the results. Furthermore, the variable on the need for emotional support is a crude measure of social support as it indicates individuals' perception of the need for emotional support. Others have used a question asking whether an individual received any emotional support (Berkman & Kawachi 2000). In this study, it is possible that even individuals who reported the need for emotional support still received some support.

Social network indicated by number of friends and marital status was significantly related to the extent of loss of periodontal attachment, but not the definition of moderate periodontitis, after adjusting for socioeconomic and behavioural factors in a nationally representative sample of older Americans aged 60 years and over. Social network and support appeared to have no impact on the social gradients in periodontal disease in this age group.

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Clinical Relevance

Scientific rationale for the study: Lower levels of social network and support are related to morbidity and mortality, and poorer oral health. This relationship was not adequately examined in relation to periodontal health of older adults.

Principal findings: Older adults in the United States who reported being widowed or having least number of friends had significantly higher levels of loss of periodontal attachment. Moderate periodontitis was not significantly related to social network and support in models adjusting for socioeconomic and behavioural factors for this age group.

Practical implications: The findings highlight the importance of social relationships in the periodontal health of older adults.