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# Crowding in Context: An Examination of the Differential Responses of Men and Women to High-Density Living Environments\*

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*This study examines the question of gender-equivalent outcomes of mental health and social behavior in the context of crowding stress. It tests the hypothesis that gender will influence the exhibition of stress outcomes resulting from exposure to high-density living environments, with women displaying internalized responses and men responding with externalized styles. Expanding on the types of gender-appropriate disorders examined in this area of research, I selected depression, aggression, and withdrawal as gender-specific disorders based on theory and prior research. Multilevel analyses of data from a survey of Toronto residents indicate that, while the effects of household density are conditioned by gender, support for the existence of gender-equivalent outcomes is mixed. While women living in crowded homes are more likely to be depressed, men exposed to high-density living environments do not report increased aggression. However, men report higher levels of withdrawal, and some males respond with both aggression and withdrawal.*

A growing body of literature examines the relationship between environmental stressors and mental health outcomes. However, this research has been criticized for its reliance on measures of internalized symptoms such as depression and anxiety (Horwitz and Davies 1994; Horwitz, White, and Howell-White 1996). Examining single outcomes misses the possibility that responses to exposure to stress may vary across individuals, and this strategy results in an underestimation of the overall influence of the stressor (Cassel 1974; Pearlin 1989). The reliance on single outcome measures, particularly internalized outcomes, may

be especially problematic when estimating gender differences in response to stressors as higher rates of internalized distress among women are well documented (see, for review, Cleary 1987; Dohrenwend and Dohrenwend 1976; Dohrenwend et al. 1980; Gove 1979; Nolen-Hoeksema 1987); and males exhibit higher rates of antisocial personality and alcohol and drug use and abuse (Aneshensel et al. 1991; Horwitz and Davies 1994; Horwitz and White 1987; Kessler et al. 1994; Lennon 1987; Myers et al. 1984; Regier et al. 1988; Robins et al. 1984; Rosenfield 1999; Simon 1998).

This paper argues that our understanding of the social and behavioral consequences of crowding across different social groups has been obscured by relying on single outcome measures because these groups likely exhibit different responses to stressors (Aneshensel, Rutter, and Lachenbruch 1991; Horwitz 2002; Horwitz et al. 1996). More specifically, reliance on gender-linked outcome measures in prior research may have led some researchers

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to conclude that women are more negatively affected by high density living<sup>1</sup> than men. The current study extends previous research supporting the notion of gender-equivalent responses to the same stressor (Horwitz and Davies 1994; Horwitz and White 1991; Horwitz et al. 1996) by exploring the existence of gender-equivalent outcomes for the environmental stressor of high-density living environments.

## **THEORY AND EVIDENCE**

### ***Responses to Crowding Stressors***

In this article, I argue that there is a need to rethink the way that effects of density on human social behavior have been specified, particularly the failure to examine the possibility that men and women may be differentially affected by density. There are several theoretical reasons to expect that men and women will exhibit different responses to crowding stress. Gender stratification and divisions of power likely impact how males and females respond to high-density living environments. Power shapes people's perceptions of their ability to act on and influence the environment (Rosenfield 1992). Furthermore, adult social roles shape the lives of men and women differently (Turner and Turner 1999). Even today, women remain primarily responsible for domestic labor and emotion work (Rosenfield, Vertefuille, and McAlpine 2000). These divisions in power and labor lead to women placing a greater emphasis on the collectivity. However, attending to the feelings and desires of others interferes with one's ability to act in one's own interest and results in a lower sense of control (Rosenfield 1999). In the case of crowding, these divisions will make it difficult, if not impossible, for women to withdraw from the crowded living situation or aggressively reassert control over their own environment. Unable to meet their own needs or establish a sense of control, women may feel helpless and hopeless, resulting in symptoms of depression (Rosenfield et al. 2000). In contrast, the tendency of males to emphasize their own interests over others encourages the view that these others are an interference to be moved out of the way (Rosenfield 2000). The social roles and power of men thus provide a context for males to use aggression to cope with crowding stress.

Thus, research is needed which simultaneously examines male and female styles of

pathology in order to investigate whether men and women respond differently to crowded living environments. I explore four outcome measures in this study: depression, aggression, withdrawal, and the combination of aggression and withdrawal.

*Depression.* Because internalized responses to stressors in the form of depression and anxiety are more consistent with sex-role socialization and cultural norms regarding appropriate gender roles for women (Cloward and Piven 1990; Rosenfield 1980), I select depression as the female-typed reaction to crowding stress.

*Aggression.* Externalized feelings of distress in the form of alcohol use and abuse and other means of acting out are culturally normative forms of male behavior (Robbins 1989). Studies find lower thresholds of frustration among males, leading to more impulsive and aggressive behavior (see Gove 1979). In arguing for the need to expand outcome measures to include violent behavior, Umberson, Williams, and Anderson (2002) remark that alcohol abuse has come to be the classic measure of externalized distress in sociological research. However, externalizing styles consist of various forms of behavioral expression, including suicide, alcohol consumption, and antisocial behavior. Just as violent behavior can be regarded as an externalized expression of psychological distress, so can aggressive behavior.

Several studies report a positive relationship between density and various forms of aggression and violence (e.g., Booth, Welch, and Johnson 1976; Booth and Edwards 1976; Gove and Hughes 1983; Gove, Hughes, and Galle 1979). Freedom of choice and access to resources may be limited in crowded environments (Altman 1975; Baldassare 1979; Baron and Rodin 1978; Baum and Valins 1979). Aggression may be an effective reaction in such situations, encouraging others to relocate elsewhere, relinquishing some of their space to the aggressive individual, in turn alleviating a number of the constraints connected with crowding (Baum and Paulus 1991).

*Withdrawal.* High-density environments may lead to withdrawal from social life (Altman 1975; Milgram 1970; Wirth 1938). Consistent exposure to other individuals is stressful. People in urban areas are exposed to more social information than can be suitably processed. The result is a kind of nervous sys-

tem overload, which Simmel ([1905] 1957) termed “overstimulation,” producing aloof attitudes toward others. A number of studies reveal clear manifestations of social withdrawal as a response to crowding among adults and children (e.g., Aiello, Thompson, and Baum 1984; Baum and Paulus 1991; Gove and Hughes 1983; Loo 1972, 1973; Sundstrom 1978).

*A fourth outcome: aggression and withdrawal.* This article examines whether males not only report more aggression and withdrawal due to exposure to high-density situations, but also whether a single individual uses both types of behavioral responses. In other words, individuals who are highly aggressive are not necessarily withdrawn. This pattern is evident in the findings of Umberson and colleagues (2002) who find a significantly greater likelihood of engaging in domestic violence among men who also exhibit tendencies to avoid/withdraw from partner conflict. This article hypothesizes that the co-existence of aggression and withdrawal will be most likely to occur among males.

### ***Prior Research on Gender and Crowding***

Although the view that crowded living environments are unhealthy is well supported by research on animal populations, findings from studies on the effects of crowding among humans have been far less consistent. For example, analyses by Booth and his colleagues of data derived from a sample of Toronto families failed to reveal support for effects of neighborhood and household crowding on mental health (Booth and Cowell 1976), and of crowding on family relations (Booth and Edwards 1976), but they did reveal some effect of perceived space and privacy on the mental and physical health of women (Duvall and Booth 1978). In contrast, Gove and his colleagues (1979, 1983) argue that their research demonstrates substantial health effects resulting from household crowding.

That males and females may react differently to crowded situations may be central to understanding the inconsistent findings of past research. Of the studies to date (summarized in the appendix), some use samples consisting of males only (e.g., Dooley 1978; Evans et al. 1989; Marsella, Escudero, and Gordon 1970; Rodin, Solomon, and Metcalf 1978) or females only (e.g., Duvall and Booth 1978; Gabe and Williams 1986; Ineichen and Hooper 1974; Mackintosh, West, and Saegert 1975), preclud-

ing an examination of gender-specific responses to density.

The findings of several studies support the notion that men and women may be differentially affected by high-density situations. For example, Gillis (1977) found a positive relationship between the floor level of the dwelling unit and psychological strain for women and a negative relationship between these variables for men. Other research shows that males are more negatively affected by household crowding than women (Booth and Cowell 1976). Gove and Hughes (1983), in contrast, find a tendency for women, especially married women, to be more affected than men.

Experimental research varying room size reveals a relatively consistent pattern of gender differences, with more aggressive responses to limited space found among males than those observed among women (Baum and Koman 1976; Epstein and Karlin 1975; Freedman et al. 1972; Mackintosh, Saegert, and West 1975; Stokols et al. 1973). Studies examining the effects of density on children also report sex differences in responses to density, with boys displaying heightened aggression (Loo 1972, 1978). Research on gender differences in withdrawal has produced more mixed findings (e.g., Loo 1978). Still other research finds no evidence of sex differences in discomfort as a result of crowding (Aiello, Epstein, and Karlin 1975; Baum and Valins 1977) or in the impact of crowding (Evans et al. 2000). Several longitudinal studies of the impact of household crowding on psychological distress among college students reveal no differential effect by gender (Evans and Lepore 1993; Lepore, Evans, and Schneider 1991). However, Karlin, Epstein, and Aiello (1978) report more physical and psychological problems among crowded women than men.

However, the bulk of previous research, especially non-experimental studies, fails to look at whether men and women have different reactions to density, which may have obscured the findings. Given that women are more prone to internalized outcomes such as depression and men are more inclined to externalized outcomes such as violence, it is imperative to investigate whether males react aggressively and females become depressed when exposed to high-density environments.

## METHODOLOGY

### *Sample*

The current research uses data from the Toronto Mental Health and Stress Study to assess differential outcomes of men and women to high-density living environments. The design of the study involved a multi-stage cluster sampling strategy. Investigators randomly selected individuals from households in a representative sample of dwelling addresses drawn from within 200 “census enumeration areas” (of a total of 3,088 census enumeration areas that comprise the six borough target areas). The first wave, conducted in 1990–1991, yielded 1,393 interviews (with a response rate of 75.3%). The second wave, conducted approximately one year later, reinterviewed 1,206 respondents (with a response rate of 86.6%).

The location of the study is especially valuable in light of the subject matter. A common criticism of early correlational studies of the relationship between density and various forms of social pathology was their inability to distinguish between the effects of density per se and the effects of factors like poverty, which tend to coexist with high density (see Factor and Waldron 1973; Gove and Hughes 1983). However, Toronto is unusually structured in the sense that high-rise buildings are spread across neighborhoods of varying socioeconomic levels. Therefore, the presence of a crowding–SES correlation is offset by the fact that some of the more crowded areas of the city are high socioeconomic neighborhoods. Further, more suburban areas, which are lower in density, are often not high in socioeconomic status.

The possibility of a self-selection of individuals into certain residential environments is a major issue in crowding research. Persons who have physical or mental difficulties or have tendencies toward antisocial behavior may be drawn to dense urban areas, or they may be compelled to live there by economic or social constraints (Baum and Paulus 1991). The longitudinal component of the Toronto Mental Health and Stress Study permits an examination of the effects of density on depression, aggression, and withdrawal while controlling for prior levels of these variables, making it possible to control for self-selection.

### *Independent Variables*

*Household density.* The survey contains data on the number of persons in the household

and the number of rooms in the household, and thus persons per room can be calculated by dividing the latter by the former. I tested squared and cubed versions and included them in the models when significant, as both low and high levels of crowding may negatively impact mental health. Further, previous analyses of these data revealed non-linear effects of household density, a pattern supported elsewhere (e.g., Gabe and Williams 1986; Galle and Gove 1978; Gillis 1979; Regoeczi 2002). The use of persons per room as a measure of crowding has been validated by Gove et al. (1979, 1983), who demonstrate that persons per room is strongly related to both lack of privacy and felt demands.

*Neighborhood density.* I measured neighborhood density by dividing the total population of the neighborhood by the number of residences in the “forward sortation area” (FSA) of the postal code.<sup>2</sup> While a given FSA may not correspond precisely with neighborhood boundaries, it does provide an indication of the areal characteristics in which a household is located.

*Sex.* I measure respondent’s sex with a binary variable for which females were assigned a value of 1 and males were assigned a value of 0.

### *Dependent Variables*

*Depression.* I measured depression using the Center for Epidemiologic Studies Depression Scale (CES-D). This scale is frequently used to measure depression and has been shown to have high reliability (Radloff 1977). For the current study, Cronbach’s alpha was .91 for both waves.

*Aggression.* I constructed a scale of aggressive behavior on the basis of the responses to the following self-ratings: “I am too aggressive toward other people” (0 = “not at all well” to 4 = “extremely well”); “I manipulate other people too much to get what I want” (0 = “not at all well” to 4 = “extremely well”); “submissive/forceful” (1 = “submissive” to 7 = “forceful”); “not at all aggressive/aggressive” (1 = “not at all aggressive” to 7 = “aggressive”); “I like people to be afraid of me”; “I try to get into positions of authority” (1 = “very unlike me” to 5 = “very like me”) (scale alpha = .69 for wave 1 and .70 for wave 2). Higher values on these statements should reflect greater levels of self-salience, personal control, and a tendency to put one’s own interests first while viewing

others as an interference, all of which are conducive to externalized responses to stress (Rosenfield 2000; Rosenfield et al. 2000).

*Withdrawal.* I constructed a scale measuring withdrawn behavior on the basis of respondent self-ratings on the following statements: “I keep other people at a distance too much”; “It is hard for me to feel close to other people”; “It is hard for me to experience a feeling of love for another person”; “It is hard for me to show affection to other people”; “It is hard for me to socialize with other people”; “It is hard for me to introduce myself to new people”; “It is hard for me to join in on groups.” The items were scaled such that 0 = “not at all well”; 2 = “moderately well”; 4 = “extremely well” (scale alpha = .87 for both waves).

*Combined categorical variable.* Aggression and withdrawal in their continuous forms were combined into a four-category nominal-level variable by dividing them at their mean values and then combining them to create four categories: low aggression/low withdrawal ( $n = 404$  at time 1;  $n = 452$  at time 2), low aggression/high withdrawal ( $n = 298$  at time 1;  $n = 240$  at time 2), high aggression/low withdrawal ( $n = 352$  at time 1;  $n = 312$  at time 2), and high aggression/high withdrawal ( $n = 313$  at time 1;  $n = 363$  at time 2).

### Control variables

Each model includes a series of control variables that have been established as predictors of depression, withdrawal, and violent behav-

ior. I present descriptive statistics for these and all other variables in Table 1. With the exception of gender, all control variables are grand-mean centered.

### Analysis

The nested structure of the data set (individuals nested in neighborhoods) required the use of a program that could incorporate its multi-level nature. In order to account for the complex error structure of the data, I carried out the analyses using hierarchical linear modeling or HLM (Raudenbush, Bryk, and Congdon 2000). Ordinary least squares regression assumes homoscedasticity and independent residuals, both of which are violated when using nested data. Under such circumstances, estimation by iterative maximum likelihood is appropriate. The final models included significant random effects for the intercept and some of the slopes, further emphasizing the need to use a technique like hierarchical linear modeling to appropriately model these data.

## RESULTS

Table 2 reports the results of the analyses examining the effects of gender, household density, neighborhood density, and the control variables on depression, aggression, and withdrawal. In all six models, prior levels of reported depression, aggression, or withdrawal are strong predictors of current levels of these outcomes, underscoring the importance of controlling for self-selection. Model 1 shows a sig-

**TABLE 1. Descriptive Statistics**

	Mean	Standard Deviation
Persons per room (wave 1)	.535	.311
Persons per room (wave 2)	.560	.384
Depression (wave 1)	11.877	9.387
Depression (wave 2)	10.455	8.838
Aggression (wave 1)	14.775	4.302
Aggression (wave 2)	14.719	4.207
Withdrawal (wave 1)	6.872	5.970
Withdrawal (wave 2)	6.713	5.705
Persons per residence	17.697	11.248
Female	.566	.496
Household income (15-point scale ranging from under 5,000 to 135,000 and above)	8.863	3.080
Currently married	.483	.450
Never married	.391	.488
Previously married	.126	.332
Black	.080	.271
East Asian	.083	.275
South Asian	.046	.210
Euro-Mediterranean	.228	.419
Age (in years)	36.66	10.01

**TABLE 2. Hierarchical Linear Models Testing for Conditional Effects of Gender on Persons per Room for Depression, Withdrawal and Aggression ( $N = 1,018$ )**

	Model 1 Coefficient (Std. error)	Model 2 Coefficient (Std. error)	Model 3 Coefficient (Std. error)	Model 4 Coefficient (Std. error)	Model 5 Coefficient (Std. error)	Model 6 Coefficient (Std. error)
	Depression		Withdrawal		Aggression	
Intercept	12.553*** (.789)	12.616*** (.796)	7.359*** (.227)	7.215*** (.228)	14.977*** (.143)	14.947*** (.171)
Persons per room	1.941 (1.128)	2.425 (1.590)	-.036 (.753)	-1.113 (1.150)	-.023 (.426)	-.587 (.658)
(Persons per room) <sup>2</sup>	-2.342* (1.136)	-3.526** (1.312)	.096 (.463)	2.123* (1.076)	-.024 (.148)	.599 (.766)
(Persons per room) <sup>3</sup>	.478* (.243)	.608* (.260)	n/a	n/a	n/a	n/a
Persons per residence	-.018 (.024)	-.019 (.024)	-.030** (.010)	-.030** (.010)	.001 (.007)	.002 (.007)
Depression (time 1)	.495*** (.029)	.496*** (.030)	n/a	n/a	n/a	n/a
Withdrawal (time 1)	n/a	n/a	.661*** (0.026)	.660*** (0.027)	n/a	n/a
Aggression (time 1)	n/a	n/a	n/a	n/a	.705*** (.021)	.709*** (.021)
Female	1.011* (.430)	.891* (.430)	-1.115*** (.279)	-.946*** (.281)	-.425* (.173)	-.434* (.196)
(Female) × (Persons per room)		-.520 (1.832)		1.345 (1.197)		.627 (.853)
(Female) × (Persons per room) <sup>2</sup>		1.148* (.580)		-2.420* (1.175)		-.342 (.875)
Household income	.329*** (.075)	-.324*** (.075)	.067 (.045)	.059 (.045)	.080* (.033)	.082* (.033)
Age	.027 (.028)	.027 (.028)	.021 (.017)	.019 (.017)	-.002 (.012)	-.003 (.011)
Never married <sup>a</sup>	.651 (.617)	.685 (.613)	.425 (.399)	.371 (.396)	-.068 (.309)	-.102 (.294)
Previously married <sup>a</sup>	.295 (.851)	.287 (.850)	.409 (.450)	.316 (.445)	.118 (.304)	.091 (.299)
Black <sup>b</sup>	.670 (1.015)	.619 (1.028)	-.050 (.658)	.105 (.652)	.032 (.316)	.045 (.317)
East Asian <sup>b</sup>	-.950 (.621)	-.977 (.610)	-.305 (.456)	-.332 (.456)	.221 (.410)	.235 (.415)
South Asian <sup>b</sup>	.815 (1.042)	.765 (1.032)	-.646 (.639)	-.596 (.631)	-.273 (.652)	-.465 (.606)
Euro-Mediterranean <sup>b</sup>	.215 (.668)	.183 (.668)	-.229 (.402)	-.212 (.401)	.252 (.237)	.278 (.233)

Note: \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$  (two-tailed tests)

<sup>a</sup> Reference category = Currently Married

<sup>b</sup> Reference category = white

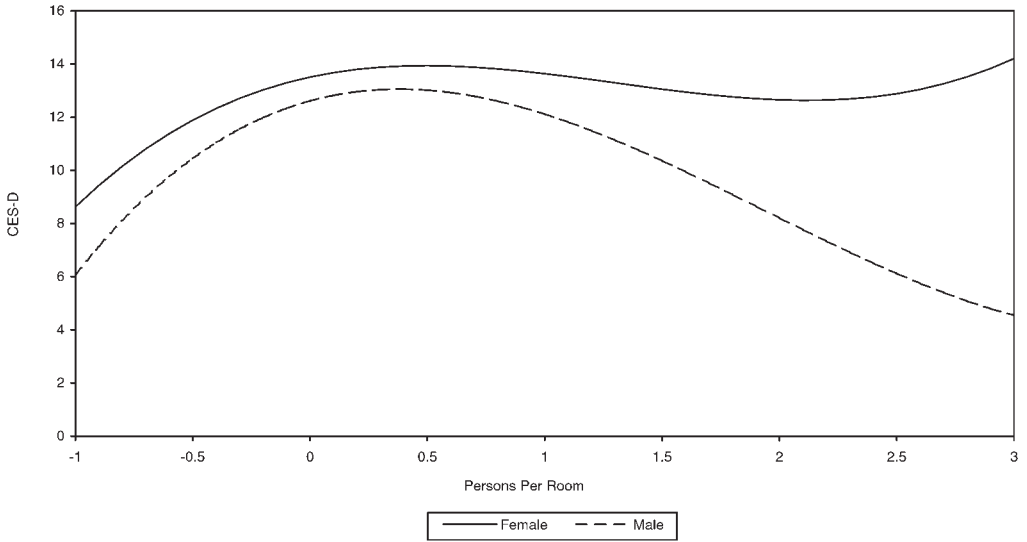
nificant cubic relationship between crowding and depression, with both very low and very high levels of density leading to increased reporting of depression symptoms. The negative sign for the squared term suggests there is a middle range of density that is optimal for mental health. As expected, the coefficient for gender is positive and significant, indicating that women report higher levels of depression than men.

I calculated coefficients for the effects of persons per room on depression for males and females and graphed them together to facilitate drawing comparisons; I present this analysis in Figure 1. Since persons per room is grand-

mean centered, I plotted the equations using values of persons per room both above and below the mean of zero. All other variables in the equation were set to their mean values. The graph displays distinctly different relationships for men and women. Men become less depressed once an average level of crowding is reached. For women, depression increases as levels of crowding go from low to average levels, at which point the effect tapers off. However, depression begins to increase again once higher levels of crowding are reached.

Model 3 displays the main effects of crowding and gender on withdrawal. While persons per room does not have a significant effect on

**FIGURE 1. Non-Linear Interaction of Gender and Persons per Room on Depression**

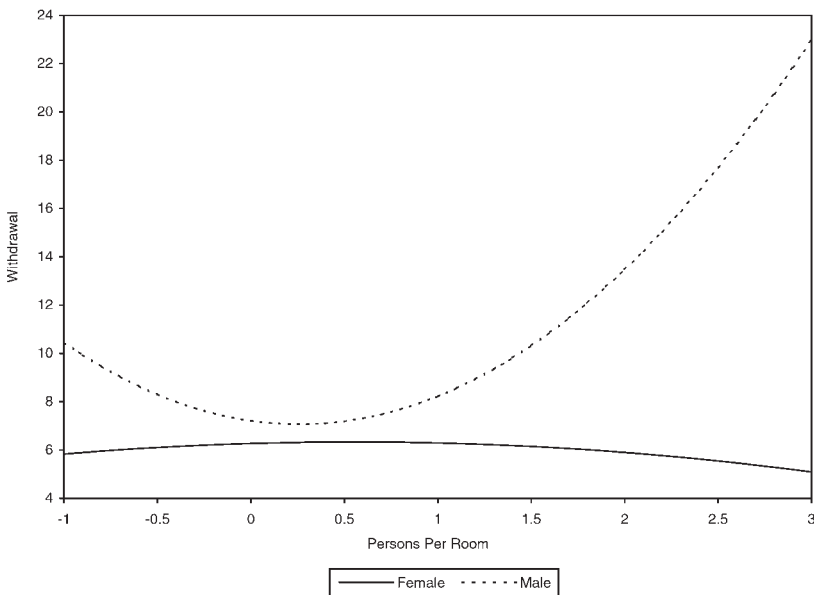


withdrawal in this model, persons per residence in the neighborhood does. The coefficient for gender is also significant and supports the hypothesis that men are more likely to withdraw than women. Model 4 includes two interaction terms in the model testing for conditional effects of gender and crowding on withdrawal. The results reveal significant effects of household and neighborhood density, as well as a significant interaction between

gender and persons per room-squared (graphically displayed in Figure 2).

The graph reveals very divergent effects of crowding on the likelihood of withdrawal by men and women. The graph for men shows a J-curve, with slight declines in withdrawal at low levels of household crowding, but a deleterious positive effect of persons per room beginning to take off once average levels of household crowding are surpassed. The curve for women, on the other hand, is essentially flat.

**FIGURE 2. Non-Linear Interaction of Gender and Persons per Room on Withdrawal**





Model 5 reports the results for the main effects of crowding and gender on aggression. While crowding does not have a significant effect on aggression alone, the coefficient for gender is significant, indicating that women are significantly less likely to be aggressive. There are no significant interactions between crowding and gender on aggression (model 6). However, it is still possible that there are gender differences in both aggressive and withdrawn responses together (by the same individual). To test for this possibility, additional models were analyzed using the combined aggression/withdrawal variable. With a four-category dependent variable, the full multinomial model produced three sets of coefficients, each category—low aggression/high withdrawal, high aggression/low withdrawal, and high aggression/high withdrawal—contrasting with the reference category (low aggression/low withdrawal). Since the models in Table 2 have already examined relationships for aggression and withdrawal alone, in the interests of space I report in Table 3 only the coefficients for the comparison between high aggression/high withdrawal versus low aggression/low withdrawal.

In both models displayed in Table 3, prior levels of reported aggression and withdrawal

are strong predictors of current levels of these outcomes. Household density has a significant, non-linear effect in model 2, just missing conventional significance levels in model 1 ( $p = .06$ ). Model 1 reveals that gender has a significant main effect for the contrast between high aggression/high withdrawal versus low aggression/low withdrawal; women are significantly less likely to report this combination of responses. Model 2 tests for an interaction between gender and persons per room and squared persons per room, revealing significant interaction terms in both cases. Figure 3 displays this conditional effect graphically.

Figure 3 reveals very divergent patterns for men and women. The effect for men takes the form of a J-curve, with men reporting increasingly high levels of both aggression and withdrawal as a means of coping with crowding stress. It is possible that the use of aggression may allow men to reestablish control over their space within the household. However, since aggressive behavior may be accompanied by an overall deterioration of relationships with others (Booth 1976), withdrawal may also be desirable. Women, on the other hand, are much less likely to report both aggressive and withdrawn behavior, even at very high levels of household density.

**TABLE 3. Hierarchical Linear Models Testing for Conditional Effects of Gender on Persons per Room for High Withdrawal/High Aggression ( $N = 1,018$ )**

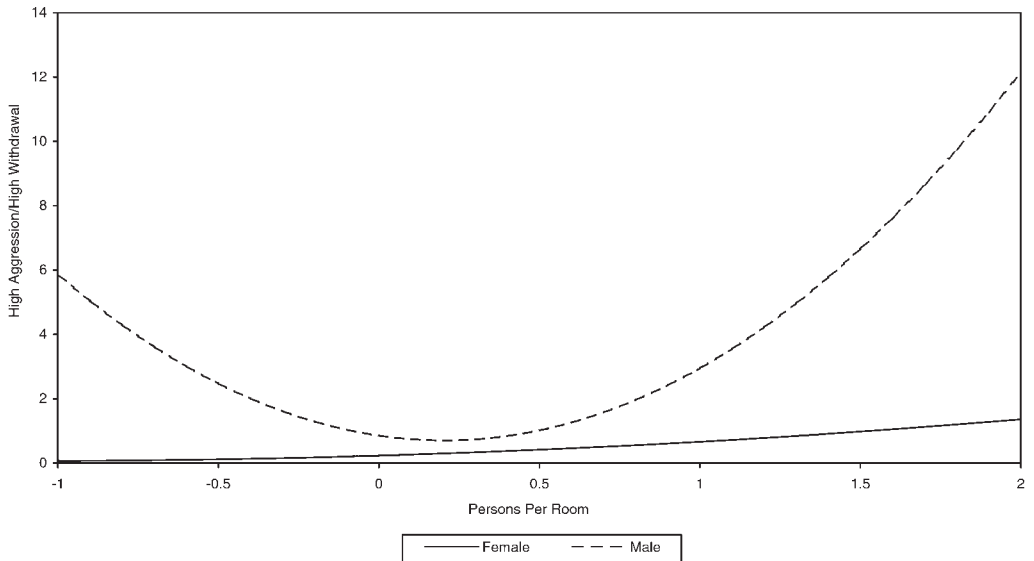
	Model 1: High Aggression/ High Withdrawal vs. Low Aggression/Low Withdrawal		Model 2: High Aggression/ High Withdrawal vs. Low Aggression/Low Withdrawal	
	Coefficient	(Std. Error)	Coefficient	(Std. Error)
Intercept	.983***	(.166)	.857***	(.166)
Persons per room	-.271	(.551)	-1.454	(.827)
(Persons per room) <sup>2</sup>	.608	(.331)	3.550***	(1.075)
Persons per residence	-.004	(.009)	-.002	(.009)
Low aggression/high withdrawal (time 1)	2.267***	(.353)	2.330***	(.334)
High aggression/low withdrawal (time 1)	2.254***	(.339)	2.324***	(.325)
High aggression/high withdrawal (time 1)	4.457***	(.465)	4.544***	(.423)
Female	-.794***	(.187)	-.624***	(.182)
(Persons per room) × (female)			1.751	(1.080)
(Persons per room) <sup>2</sup> × (female)			-3.416**	(1.114)
Household income	.122***	(.037)	.130***	(.036)
Age	.011	(.014)	.009	(.014)
Never married <sup>a</sup>	.248	(.324)	.231	(.317)
Previously married <sup>a</sup>	.228	(.361)	.277	(.358)
Black <sup>b</sup>	-.289	(.473)	-.220	(.456)
East Asian <sup>b</sup>	-.647	(.341)	-.753*	(.320)
South Asian <sup>b</sup>	-1.138	(.659)	-1.133	(.616)
Euro-Mediterranean <sup>b</sup>	-.214	(.306)	-.226	(.298)

Note: \*  $p < .05$ ; \*\*  $p < .01$ ; \*\*\*  $p < .001$  (two-tailed test)

<sup>a</sup> Reference category = Currently married

<sup>b</sup> Reference category = white

**FIGURE 3. Non-Linear Interaction of Gender and Persons Per Room on High Aggression/High Withdrawal vs. Low Aggression/Low Withdrawal**



A final set of models tests for interactions between gender and average persons per residence in the neighborhood. No significant interactions emerged between these variables. Thus, differential responses to density across men and women are most evident at the level of household density. This may reflect the fact that this is where most individuals spend the majority of their time (outside of time spent at work) and where the impact of the different roles of men and women are most consequential.

## DISCUSSION AND CONCLUSION

This article seeks to broaden the literature on the existence of gender-equivalent responses to stress in the context of crowding. Mixed support was found for predictions derived from arguments concerning gender-specific outcomes. It was expected that men (but not women) would respond to crowding stress with aggressive behavior, and women (but not men) would respond with increased depression. The latter hypothesis was supported. I examined withdrawal as an additional male-typed response to crowding stress, and the results indicate that men reported higher levels of withdrawal with increasing density. Based on research by Umberson and colleagues (2002), I predicted that the combination of aggression and withdrawal would be most likely to occur

among men, and the results support that prediction.

The vulnerability of men to crowding stress may have been understated in prior studies that failed to include both internalized and externalized outcomes. Although greater role obligations experienced by women have been offered as an explanation of their greater reactivity to crowding (see Gove and Hughes 1983), these same responsibilities may limit the available coping mechanisms, increasing the likelihood that their response will manifest as symptoms of depression. The parental and other relationship obligations of women make it difficult to ignore the needs and feelings of others by acting out against them (Rosenfield et al. 2000), reducing the likelihood that they will respond to crowding stress with aggression. Female social roles may also make it difficult to avoid contact with others in spite of the overstimulation caused by high levels of household density. Their roles as mothers, for example, often require interaction with other parents, children, teachers, and additional individuals with whom their children come into contact. Thus, women may have fewer opportunities to resort to withdrawal as a means of coping. Instead, they may seek social support. However, the addition of a variable measuring the presence of children in the household to the interaction models tested in this study produced results (available from the author) vir-

tually identical to those reported in Table 2, and they did not reduce the interactions between gender and household density to non-significance.

The finding that some men respond with the combination of aggression and withdrawal is important as it suggests that withdrawal alone, and combined with aggression, is a gender-specific response. In particular, the current research indicates that both outcomes are exhibited by men. Withdrawal tendencies have not been treated as male-typed responses to stress in previous studies. In much the same way that the roles and responsibilities of women may preclude coping through withdrawal, men may be better able to take advantage of this response. However, they do not withdraw instead of resorting to aggression. Rather, they do both. Thus, when men become frustrated when confronted with the problems of residing in close proximity to many others, they invoke the externalized response of aggression but are also at greater liberty to evade others, spend more time on their own, or withdraw to less dense surroundings either within or outside of the home.

One could argue that men may also be able to use their occupations as a means of withdrawal. This explanation was indirectly tested in supplemental analyses which added a dichotomous measure of employed versus not employed. The results (available from the author) were virtually identical to those presented in Tables 2 and 3. The addition of the employed variable resulted in negligible changes in the coefficients representing interactions between gender and density on withdrawal. The results for the contrast between high aggression/high withdrawal and low aggression/low withdrawal were also essentially unchanged. Thus, these patterns do not appear to be explained by differences in employment status of men and women. The results also diverge from those which have emerged from the experi-

mental literature on density. However, they are relatively consistent with animal research in which males (and in some cases females) have been observed to behave aggressively and withdraw under high density conditions (see, for example, Calhoun 1962).

The findings from this study underscore the need to expand the range of measures used to represent gender-specific responses to stress beyond the typical selections of depression and alcohol use and abuse. Gender differences in styles of expressing distress should not be assumed to extend to all varieties of internal and external outcomes. Future efforts should also seek to understand why and how particular individuals exhibit multiple outcomes in response to crowding and other sources of stress.

Future research should consider adopting additional measures of the outcomes used here. Measures of aggression and withdrawal based on observations of behavior as opposed to self-reports would provide an important test of the validity of these findings. Researchers should be encouraged to adopt measures of aggression which are outside the bounds of legal definitions as not all aggression is illegal. The current reliance on measures of violence derived from crime statistics to investigate whether high density produces aggressive behavior raises several concerns regarding the validity of such measures. Crime statistics only tap into the more extreme forms of aggression, as well as being limited to those which are physical in nature, and they therefore miss what is arguably the larger segment of the continuum of aggression—its milder and more subtle forms. That these less extreme forms of aggression (in combination with withdrawal) showed a strong and consistent relationship to high density in the present research suggests that we have only begun to explore the range of gender-specific outcomes that may form responses to crowding stress.

## APPENDIX. Summary of Crowding Studies

Study	Sample	Outcome Measures	Selected Findings
Aiello, Epstein, and Karlin 1975	60 males and 60 females enrolled in introductory psychology courses at Rutgers University	skin conductance	subjects in higher density setting had significantly higher conductance levels and greater arousal; no sex differences were found
Baum, Aiello, and Calesnick 1978	120 freshman (both male and female) living in dormitories	feelings of control, desire for avoidance, unwanted interaction, problems with social interaction	students living in high density environments report less perceived control, more difficulty regulating social contact, greater desire to avoid or ignore neighbors
Baum and Koman 1976	32 female and 32 male undergraduates at Trinity College	discomfort, seating position, facial regard	men anticipating higher density conditions experienced more crowding and responded more aggressively than women
Booth and Cowell 1976	probability sample of white families with children, female under 45 years of age	physiological indicators of stress derived from interviews, physical exam, urine and blood tests	found more significant effects of crowding on men's health than women's but overall concluded crowding has small adverse effects at best
Dooley 1978	227 male undergraduates at UCLA	intra- and interpersonal affect, task performance	subjects in high social density condition reported more negative interpersonal and interpersonal affect, and reported other group members as more aggressive
Duwall and Booth 1978	subsample of wives from probability sample of white families with children, female under 45 years of age	sedative use, index of psychophysiological disorder, stress-related disease, uterine disorder, days sick in bed	lack of privacy, space and noise problems, major structural deficiencies associated with mental health problems; minor structural deficiencies associated with physical health problems
Epstein and Karlin 1975	42 female and 42 male university students assigned to same-sex groups of 6 members	cognitive tasks, seating dispersion, group cohesiveness, prisoner's dilemma game, attitudes towards group members	as crowding increased, men became more competitive, perceived more dissimilarity and more discouragement of showing discom-fort; opposite found for women
Evans and Lepore 1993	39 female and 33 male college students living in off-campus apartments	Demoralization Index, perceived social support, supportiveness, support seeking, social withdrawal	higher household crowding related to higher social withdrawal in lab setting; household crowding negatively related to social support; no interactions with gender found
Evans, Palsane, Lepore, and Martin 1989	175 male heads of household in Pune, India	Demoralization Index, social support	high residential density associated with higher psychological distress and lower social support
Evans, Rhee, Forbes, Allen, and Lepore 2000	1: 40 college students of mixed gender 2: 52 college students of mixed gender	memory for social information, emotional stress, social withdrawal	students living in more crowded households were more likely to tune out social information and were more stressed when option for social withdrawal was blocked; no interactions with gender found
Freedman, Levy, Buchanan, and Price 1972	72 female and 64 male high school students	competitive vs. cooperative choices in a prisoner's dilemma game	males were more competitive in the higher density room
Gabe and Williams 1986	452 women born in the UK between the ages of 25 and 45 from a larger community sample in West London	Goldberg's General Health Questionnaire designed to measure minor psychological ill-health	a non-linear relationship between crowding and psychological distress exists among women with low and high levels having adverse effects
Gillis 1977	442 residents of public housing projects in Calgary and Edmonton, Canada	Indik et al. scale measuring psychological strain	floor level is positively related to psychological strain among women and negatively related to psychological strain among men

(Continued on next page)

**APPENDIX. (Continued)**

Study	Sample	Outcome Measures	Selected Findings
Gove and Hughes 1983	1,582 randomly selected adults from 80 census tracts in Chicago	mental health, social relationships in and outside the home, physical health, care of children, fertility	women react more negatively to crowding than men; this is particularly the case for married women
Ineichen and Hooper 1974	262 wives aged 40 or less in intact families with children	neurotic symptoms, physical health, behavioral problems of children	women living in central urban areas report more neurotic symptoms; families in high-rise flats report greater behavioral problems of children
Karlin, Epstein, and Aiello 1978	male and female students living in student housing at Rutgers University	cortisol levels, cognitive performance, physical and psychological problems reported on Cornell Medical Index	women in crowded living situations had more physical and psychological problems than uncrowded women and crowded men
Lepore, Evans, and Schneider 1991	173 college students of mixed gender	social support, Demoralization Index	crowding related to increased psychological distress and decreased perceived support; no significant interactions between gender and crowding on psychological distress, perceived crowding, or support
Loo 1972	30 male and 30 female middle-class children 4 and 5 years old	social interaction, aggressive behavior, dominance, nurturance, solitary play	boys were more aggressive in the low-density condition; among girls dominance but not aggression increased in high-density condition
Loo 1978	12 mixed-sex groups of 6 children each	negative interaction, onlooking, self-involved play, avoidance, interrupted activity	greater increase in aggressiveness and avoidance among crowded boys than girls; greater aggression/anger by crowded boys than girls
Mackintosh, West, and Saegert 1975 — Experiment I	28 female students from 2 universities	performances on cognitive and affective tasks	density had significant negative effects on incidental memory
Mackintosh, West, and Saegert 1975 — Experiment II	20 male and 20 female volunteer subjects recruited through ads	aggression, anxiety, social affection, sadness, social affection, skepticism, fatigue	subjects in more crowded condition reported more anxiety, sadness, and less social affection; males reported more feelings of aggression
Marsella, Escudero, and Gordon 1970	91 randomly recruited married Filipino males living in Manila	psychosomatic symptoms, alienation/anxiety, withdrawal, violence	overcrowded living conditions are associated with psychosomatic symptoms, alienation/anxiety, withdrawal, and eruptive violence
Rodin, Solomon, and Metcalf 1978	71 male Yale undergraduates	scales measuring interpersonal impressions, evaluation of room ambience, personal emotional state, control	density was related to perceptions of crowding and room ambience; participants without control felt the room was more crowded
Stokols, Rall, Pinner, and Schopler 1973	512 university students divided into same-sex groups of 8	participants' feelings, observations of jokes, laughter, hostility, measure of group task performance	males perceived selves as more aggressive and recalled fewer names in crowded room, females felt more aggressive and recalled fewer names in less crowded room

## NOTES

1. Density refers to a physical condition concerning the amount of space available, whereas crowding is the subjective experience which results from perceptions of exposure to limited space (Stokols 1972). Although high density does not unconditionally lead to a perception of crowding, a substantial amount of empirical evidence exists indicating a tendency for high density and crowding to coexist (e.g., Baldassare 1979; Baum, Aiello, and Calesnick 1978; Dooley 1978; Epstein and Karlin 1975; Evans et al. 1989; Mackintosh, West, and Saegert 1975; Rodin et al. 1978; Stokols et al. 1973; Sundstrom 1978). Thus, in this article, I use the two terms interchangeably.
2. "Forward sortation areas" (FSAs) comprise the first three characters of the six-character Canadian postal code. They are generally larger than census tracts, another common proxy for neighborhoods.

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