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Residential Density and Urban Child Maltreatment: An Aggregate Analysis[1]

Susan J. Zuravin[2]

This study assessed the relationship between residential density and two types of child maltreatment, abuse and neglect, by using aggregate data to test two models of density effects: (a) density as an intervening variable, and (b) density as a spurious relation. To test the models, child abuse and child neglect reporting rates for 202 Baltimore, Maryland census tracts were regressed on census tract population characteristics measuring class, ethnicity, and residential density. Results are inconclusive for density measured as percent of households with 1.01 or more persons/room because of a high degree of collinearity between density and structural variables. Results for density measured as 1.51 or more persons/room support the density as an intervening variable model. Considering that Baltimore, Maryland's household crowding rate is very close to that of the rather low U.S. average, findings suggest that despite improvements in residential density over the last 30 years, crowding still negatively impacts on some families.

KEY WORDS: crowding; density; ecology; child abuse; child neglect.

INTRODUCTION

Child abuse and neglect are complicated, multidetermined phenomena—the end-product of complex interactions between characteristics of the individual, family, environment, and culture (Belsky, 1980; Garbarino,

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[2]School of Social Work and Community Planning, University of Maryland at Baltimore, 525 West Redwood Street, Baltimore, Maryland 21201.

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1981). To date, researchers have directed relatively little attention to child maltreatment's hypothesized connection to environmental factors, particularly physical ones. Consequently, definitive answers to questions about the relationship between various types of child maltreatment and such physical characteristics of environments as household crowding, neighborhood traffic levels, population density, specific architectural features of housing, number of neighborood recreation areas, etc. are nonexistent.

Notwithstanding this absence of definitive answers, information about the physical surroundings associated with child maltreatment is not totally lacking. Residential density has received research attention. Sociologists interested in the density-pathology hypothesis have examined the relationship between quality of parent-child relations and residential density (Baldassare, 1978; Booth and Edwards, 1976; Gove and Hughes, 1983; Mitchell, 1971). Family violence researchers, interested in the ecology of child maltreatment, have explored the association between residential density and various types of child maltreatment (Kotelchuck, 1982; Lichtenstein, 1983; Martin and Walters, 1982; Newberger *et al.*, 1977; Smith, 1975; Starr, 1982; Wolock and Horowitz, 1977).

In general, the density-pathology literature supports the hypothesis of a relationship between parental child care inadequacies and household overcrowding. The many examinations of the relationship between overcrowding and parental supervision have repeatedly shown that parents living in crowded households have less knowledge about and less control over their children's whereabouts and outside activities than parents living in less crowded conditions, even after controlling for major confounding variables like ethnicity and class (Galle and Gove, 1983; Hassen, 1977; Loo, 1980; McCarthy and Saegert, 1979; Mitchell, 1971). Further, the few investigations of the association between crowding and physical discipline also have found a weak positive relationship between these two factors after controlling for ethnicity and class (Booth and Edwards, 1976; Galle and Gove, 1983). However, in the final analysis, these findings can neither confirm nor deny a relationship between overcrowding and either physical abuse or neglect. This is because previous studies have not used definitions of child neglect and child abuse to operationalize child care adequacy. As a result, it is impossible to determine if the seemingly inadequate supervision and increased physical discipline referenced by these investigations is severe enough to be labeled child maltreatment.

Unfortunately, existing child maltreatment research cannot confirm or deny a relationship between residential density and the two types of child maltreatment either. Of the six studies that examined the association between overcrowding and child abuse (Kotelchuck, 1982; Martin and Walters, 1982; Newberger *et al.*, 1977; Smith, 1975; Starr, 1982; Wolock and Horowitz, 1977), five found no relationship. The credibility of this

negative finding, however, is diminished by several problems including failure of studies to: (1) completely report their density findings, (2) operationalize density with persons/room, (3) rigorously control important demographic variables, and (4) separately analyze reports of abuse and neglect. Interestingly, findings from the two studies that are methodologically adequate enough to warrant a clear interpretation conflict. Starr's (1982) hospital-based interview study of 174 families (87 with a child under 5 hospitalized for abuse and 87 individually matched controls) found no relationship between the person/room ratios for abuse vs. control families. An almost identical effort by Kotelchuck (1982) revealed that high person/room ratios not only discriminated between abuse and controls, but also was the sixth best predictor of membership in the Trauma X group (40 hospitalized abused and eight hospitalized failure-to-thrive children less than five years old).

Both investigations that examined the relationhip between neglect and household crowding (Martin and Walter, 1982; Wolock and Horowitz, 1977) found a significant relationship. However, the Martin and Walters (1982) report, a case record review study, used such an ambiguous measure of crowding—too many children for home/income—that interpretation of findings is unclear. On the other hand, results from the Wolock and Horowitz (1977) study of AFDC recipients are quite clear. They found that their maltreatment group (93% of which were neglecting) lived in significantly more crowded households than control families: 33% of the maltreating families versus 20% of the couple occupied quarters characterized by person/room ratios of 1.5 persons or greater.

The aggregate study described in this paper had one objective: to assess the relationship between household crowding and two types of child maltreatment, child abuse and child neglect, by testing the Galle, Gove, and McPherson density-pathology model (Galle and Gove, 1979; Galle *et al.*, 1972). To the best of our knowledge, this prototypic model and methodology (Choldin, 1978), used by "density" sociologists early in the development of knowledge about the relationship between various types of density and a range of different social and health pathologies, has never been employed to examine the association between household overcrowding and any type of child maltreatment.

THE DENSITY-PATHOLOGY MODEL AND METHOD OF GALLE, GOVE, AND McPHERSON (1972)

The Original Study

In April of 1972, *Science* magazine published the most famous as well as the most controversial aggregate test of the density-pathology hypothesis—Galle *et al.* (1972) "Population Density and Pathology: What

Are the Relations for Man?" This study explored the relationship between four measures of density—persons per room, rooms per housing unit, housing units per structure, and structures per acre and five pathologies—mortality, fertility, public assistance, juvenile delinquency, and mental illness—for 74 community areas of Chicago by testing two alternate models of the density-pathology relationship. Model 1, the null or "density-pathology as a spurious relation" hypothesis, posits that any relationship between density and pathology reflects nothing more than the correlation of both pathology and density with the social structural factors, class and ethnicity. Model 2, the test or "density as an intervening variable" hypothesis, posits that the relationship between the two major structural variables, class and ethnicity, and pathology is partially interpreted by density.

Research findings generally support Model 2. "The components of density interpret the relation between the social structure variables and the pathologies" (Galle *et al.*, 1972, p. 72). And, "of the four components of density number of persons per room is the most important determinant of the effect of density on pathology" (Galle *et al.*, 1972, p. 72).

Subsequent to the publication of this study, several investigators suggested that "methodological flaws might have affected the results" (Galle and Gove, 1980, p. 27). Yet, to date, every "methodologically" improved reanalysis of the original data (Galle and Gove, 1980; Loftin and Ward, 1983, McPherson, 1975; Ward, 1975) as well as every analysis of the same data from other years (Galle and Gove, 1980; McPherson, 1975) has at the very least supported the finding that household crowding partially interprets the relationship between social structure and one or more of the five pathologies.

Aggregate Methodology: Justification of Its Use

Both aggregate and individual level research methodologies can be used to examine the relationship between household crowding and the various types of child maltreatment. However, given the very early developmental stage of current knowledge about this relationship, an aggregate level approach is an appropriate strategy: it "permits falsification of the hypothesis" (Choldin, 1978) with minimal expenditure of funds. More specifically, it is cost effective in that: (a) it can be carried out on existing data, and (b) if the aggregate test fails to support the hypothesis, there is probably not much need for expensive, in-depth, individual level analyses. According to Choldin (1978), "if there is no correlation between density and pathology over the surface of the map of a city, that suggests that the

hypothesis is false. After all, how could density cause pathology if the densest places are not most pathological?" (Choldin, 1978, p. 101).

The major weakness of aggregate methodology relates to precise interpretations of positive findings—findings that support rather than falsify the hypothesis. In other words, is it reasonable to infer a causal relationship between household crowding and child maltreatment at the individual level from the findings of an aggregate level study? Social ecologists (Firebaugh, 1978; Gove and Hughes, 1980; Hammond, 1973; Hanushek *et al.*, 1974) respond affirmatively given a properly specified model where the effects of important confounding variables are controlled, and there is the ability to theoretically rule out the possibility of a contextual effect (i.e., the situation where the causal variables' impact on the individual is indirect, channeled through its affect on the social and/or physical environment).

While this study does employ a properly specified model, it is impossible to rule out a contextual effect. Findings from the density-pathology literature suggest the hypothesis that neighborhoods with many crowded households may be less supportive and cohesive places to live than neighborhoods where there are fewer crowded households. Therefore, according to the Garbarino Ecological Hypothesis (1980), they may be at higher risk for child abuse and neglect. Three density-pathology survey investigations have found that persons/room are negatively correlated with both number of friends and quality of relationships with neighbors and positively correlated with number of arguments outside of the house (Choldin *et al.*, 1975; Gove and Hughes, 1980; Mitchell, 1971).

In the final analysis, despite the inability to determine whether a positive finding reflects an individual and/or contextual effect of residential density, an aggregate level analysis is an optimal method for early examination of the relationship between types of child maltreatment and household crowding. This approach is economical, it permits "falsification of the hypothesis" (Choldin, 1978), and if the hypothesis is falsified, there is no need for expensive, individual level of analysis studies. On the other hand, if the hypothesis is supported, researchers can more easily justify the expensive and time consuming individual level study.

METHOD

Study Site

The geographic context of this study was Baltimore, Maryland, 12th largest city in the United States. For purposes of the 1980 census, the city was divided into 202 census tracts with a household population. The

average tract contains 3878 persons, the largest tract 8263 people, and the smallest tract 439 persons. According to the census, 5% of Baltimore's occupied housing stock, 15,134 units, contains 1.01 or more persons per room and 1.2% of the stock, 3632 units, contains 1.51 or more persons per room. The rate of 5% for units with 1.01 or greater persons/room is slightly higher than the total U.S. rate (4.5%), slightly lower than the average U.S. central city rate (5.8%), and significantly lower than the rate for other large central cities such as Los Angeles (13%), Miami (19.9%), Chicago (8.1%), Honolulu (15%), and Newark (12.3%).

Social Structural and Density Variables

The source of information for the social structural variables, class and ethnicity, and the density variable (household crowding), was 1980 census data. Each variable was measured with the same census items used by Galle and Gove (1980) in their reanalysis, a replication of the original 1972 study which incorporated various methodological improvements suggested by other investigators. Race was measured by one variable: percentage of census tract population that is black. Class was measured by three variables: percent of adults 25 and older with less than 8 years of school, percent of persons 18 and over employed in lower, blue-collar occupations (laborers, service workers, and private household workers), and percentage of families with income below the 1980 poverty level. Household crowding was measured by two variables: percent of housing units that have 1.01 or more persons per room and percent of housing units that have 1.51 or more persons per room. While the Galle and Gove studies used only one measure of residential density, pecentage of housing units with 1.01 or more persons per room, this study employed the additional measure, percentage of housing units with 1.51 or more persons per room, to increase the probability of rejecting the null hypothesis. At this point, there is no definitive empirical evidence which specifies what particular level of crowding leads to adverse intrafamilial relations. However, there is evidence which suggests a positive linear relationship between social pathology and crowding (Gove and Hughes, 1983). Thus, the higher the level of crowding, the more likely the adverse effect.

Child Abuse and Child Neglect Incidence

The incidence of child abuse and child neglect was measured by the 1983-1984 average family report rate per 1000 households with persons

under 18. This rate was calculated by dividing the average number of families reported one or more times to the Baltimore City Department of Social Services for child abuse or neglect for 1983 and 1984 by the number of households with persons under 18/census tract and multiplying the result by 1000. This calculation yielded a standardized, unduplicated rate—one that compensates for risk population size differences between census tracts and counts each family only once regardless of how many times they were reported for the type of maltreatment/year.

Separate rates were calculated for child abuse and child neglect because there is no clear consensus that the determinants of the two are the same (Polansky, 1975). Physical and sexual abuses were grouped together and one rate calculated for both since the number of sexual abuse reports per year per census tract was so small that yearly rates would be subject to considerable random error variance. Reported rather than substantiated instances of maltreatment were used to calculate rates because rates based on reports are more likely to represent some fixed proportion of the true rate than rates based on incidents substantiated by child protective service caseworkers. The substantiation process is an extremely subjective one, very much dependent on investigator and client characteristics as well as administrative concerns such as caseload size (American Humane Association, 1983; DiLeonardi, 1980).

When calculating rates, each family was counted only once even if multiple reports of the same type were made during the year interval. We believe that an unduplicated rate more accurately reflects the at-riskness of a neighborhood. Our experience with report data reveals that, some families are reported for the same incidence of maltreatment by many different sources or many times by the same source. As a result, basing rates on number of reports rather than families reported could lead to spurious findings—the rates of certain neighborhoods would be artificially inflated by multiple reports on the same families. Finally, rates were calculated on the basis of the average number of reports for 1983 and 1984 rather than on

Table I. Information on 1983-1984 Average Child Abuse and Neglect Report Rates Per 1000 Families With Children Living in Baltimore, Maryland Census Tracts

Variable	Mean	Standard Deviation	Minimum	Maximum
Child abuse	23/1000	14/1000	0/1000	76/1000
Child neglect	26/1000	20/1000	0/1000	98/1000
Child maltreatment (abuse plus neglect)	49/1000	33/1000	0/1000	167/1000

a separate rate for each year since yearly rates of low-base rate phenomena for small aggregate units such as census tracts are unduly affected by random error variance.

In most instances, the type of maltreatment being reported was defined at the time of report by child protective service central screening unit personnel. Their operational definitions for the three major types of maltreatment—neglect, physical abuse, and sexual abuse—were based on definitions set out in state law. Probably the two most important criteria are (1) whether the child is in danger because of acts of commission, physical abuse, and sexual abuse, or acts of omission, child neglect, and (2) whether the maltreator can reasonably be considered a caretaker of the child. During 1983, the majority of abuse reports were allegations of superficial injuries to one child, the majority of sexual abuse reports were allegations of intercourse, and the majority of neglect reports were allegations of either inadequate supervision or medical care.

In 1983, 2545 families were reported for neglect and 1936 for physical and/or sexual abuse. By 1984, the number of families reported for abuse totaled 2654; the number reported for neglect was 2401. Included in Table I are relevant facts about child abuse and neglect rates for Baltimore census tracts for the years 1983 and 1984.

Study Limitations

Two study limitations must be considered when interpreting results. *First,* as mentioned earlier, positive findings cannot be precisely interpreted. In other words, if findings fit the test model—crowding as an intervening variable—it will not be possible to ascertain whether the source of the effect is contextual, channeled through its impacts on the social environment, or individual, a result of its impact on the behavior of the crowded parent. *Second,* findings based on incidents of child maltreatment reported to public child protective agencies cannot be generalized to all incidents of child maltreatment. Conceivably, such cases may over-represent poor families and the more severe instances of maltreatment, and under-represent more "normal appearing" as well as more affluent families.

RESULTS AND DISCUSSION

Data Analysis

The primary statistical technique employed in the present study was the same one used in the reanalysis by Galle and Gove (1980): forced order

multiple regression analysis. The analysis is carried out by forcing the structural measures into the analysis first as a block and then entering the overcrowding measure. If the data fit the null model (household density as a spurious relation), the regression analysis will show that the measure of crowding, percentage of housing units with 1.01 more persons/room or percent of housing units with 1.51 or more persons/room, does not account for a significant amount of variance in the maltreatment rate when forced into the analysis after the control variables (ethnicity and class). However, if the data fit the test model (household density as an intervening variable) the regression results will be just the opposite (i.e., household overcrowding will account for a significant amount of variance in the reported rate of child maltreatment after controlling for ethnicity and class).

Multiple Regression Findings

Results of the multiple regression analyses were mixed. Findings regarding household crowding operationalized as 1.01 or more persons/room (Table II) were not significant after controlling for class and ethnicity (Table II, Column 3). On the other hand, findings relative to crowding operationalized as 1.51 or more persons/room (Table III) revealed significant relationships between crowding and both types of maltreatment after controlling for structural factors (Table III, Column 3). For the 1.01 measure, the significant zero-order relationships between density and the two types of child maltreatment (Table II, Column 1) were insignificant after controlling for the structural variables (Table II, Column 3). For the 1.51 measure, the significant zero-order relationships between density and the two types of child maltreatment are (Table III, Column 1) reduced, but not to statistical insignificance (Table III, Column 3) when ethnicity and class are controlled. In other words, when the structural variables are forced into the analysis first, the 1.51 crowding measure but not the 1.01 measure accounts for a significant amount of the remaining variance in census tract child abuse and child neglect rates for Baltimore, Maryland.

Partitioning Findings

It is not possible, however, to *definitively* conclude on the basis of the above statistical results that: (a) the relationship between the two types of child maltreatment and crowding at a level of 1.01 or more persons/room are spurious (support the density as a spurious relation model) and (b) the precise magnitude of the effect of crowding at a level of 1.51 or more persons/room is what it appears to be. Partitioning total explained variance

reveals a high degree of collinearity between the social structure and crowding measures. Together with the 1.01 overcrowding measure, the structural factors explain relative to child abuse 20% of the total variance (Table II, Column 5) and almost half of the explained variance, and relative to child neglect, 22.7% of the total variance (Table II, Column 5), and also, almost half of the explained variance (Table II, Column 6). Together with the 1.51 overcrowding measure, findings are similar: social structure and density together explain between 20% and 25% (Table III, Column 5) of the total variance and a little less than half of the explained variance (Table III, Column 6). This high degree of collinearity between crowding and social structure, stemming from the fact that families lower in the class and ethnic strata are more likely to live in overcrowded housing than families who are higher in both strata, makes it impossible to say with complete confidence that findings, in the case of the 1.01 measure, support the null model and, in the case of the 1.51 measure, are an accurate reflection of the magnitude of the effect of crowding. Conceivably, a significant portion of the variance held in common could, under conditions which minimize the collinearity between crowding and social structure, be allocated to crowding.

Given the above set of statistical findings, characterized by a high degree of collinearity, the following conclusions concerning the relationship between household crowding and the reported incidence of the two types of child maltreatment appear to be reasonable:

1. Household Crowding at the 1.51 Person/Room Level is very likely Associated with Reported Incidents of Both Child Abuse and Neglect

After controlling for class and ethnicity, density accounts for a significant amount of the remaining variance in reported incidence of child abuse (1.8%, $p < 0.01$) as well as child neglect (4.0%, $p < 0.0001$) for Baltimore census tracts (Table 3, Column 3). Results relative to child neglect are consistent with existing findings; two previous studies (Martin & Walters, 1978; Wolock and Horowitz, 1977) support the notion of a relationship between neglect and crowding at the individual level. Results relative to child abuse are inconsistent with those of prior investigations. Instead of confirming the predominant past finding of no relationship between crowding and child abuse, results from this study support such a relationship.

2. Reported Incidence of Child Neglect is More Strongly Associated with Household Crowding at the 1.51 Person/Room Level than Reported Incidence of Child Abuse

Crowding accounts for more than twice as much variance in child neglect as child abuse (4% versus 1.8%) (Table III, Column 3). At this point

Table II. Residential Density-1.01 or More Persons/Room and Reported Rates of Child Abuse and Neglect for Baltimore, Maryland

	Variance (R^2) explained by					
Child Care Problem	Density only (1)	Social structure only (2)	Density independent of social structure (3)	Social structure independent of density (4)	Common variance (5)	Total explained variance (6)
Abuse	20.2[a]	44.9[a]	0.225[b]	24.9[a]	20.0	45.1[a]
Neglect	23.2[a]	51.0[a]	0.547[b]	28.3[a]	22.7	51.5[a]

[a] $p < 0.0001$.
[b] p is not significant.

Table III. Residential Density-1.51 or More Persons/Room and Reported Rates of Child Abuse and Neglect for Baltimore, Maryland

	Variance (R^2) Explained By					
Child Care Problem	Density only (1)	Social structure only (2)	Density independent of social structure (3)	Social structure independent of density (4)	Common variance (5)	Total explained variance (6)
Abuse	22.2[a]	44.9[a]	1.8[b]	24.5[a]	20.4	46.7[a]
Neglect	29.0[a]	51.0[a]	4.0[a]	26.0[a]	25.0	55.0[a]

[a] $p < 0.0001$.
[b] $p < 0.01$.

in the development of the child maltreatment literature, there is no study that is capable of supporting or refuting these findings. However, this is not true for the density-pathology literature. The recent Gove and Hughes (1983) random probability survey of 2000+ Chicago households found a stronger association between density and inadequate supervision of children than between density and physical discipline. Given that inadequate supervision is one of the most prevalent types of reported neglect, (American Humane Association, 1979) the present finding that density accounts for more variance in reported neglect than reported abuse is consistent with the Gove and Hughes (1983) individual level findings.

3. Social Structural Factors, Class, and Ethnicity, Are More Strongly Associated with Reported Incidence of Both Child Abuse and Neglect than Household Crowding

Structural factors account for about 12 times more unique variance in reported incidence of child abuse (24.5% versus 1.8%) (Table 4, Column 4) and about 4.5 times more unique variance in reported incidence of child neglect (26% versus 4%) (Table III, Column 4) than density. Once again, child maltreatment findings are not sufficiently developed to support or refute these findings; however, density-pathology findings are. Both the Gove and Hughes (1983) and Booth (1976) surveys found that structural factors (socioeconomic status, education, ethnicity) accounted for major proportions of the variance in parental child care behaviors.

Contextual versus Individual Nature of Crowding Child Maltreatment Relationship

Unfortunately, comparisons of this study's findings with those of existing individual level of analysis studies do not lead to definitive conclusions about the contextual or individual nature of the relationship between child abuse, child neglect, and crowding. Because the neglect and demographic findings of the present investigation are consistent with those of earlier individual level efforts, it is not necessarily the case that the relationships identified by this study are due to an individual level effect. It is equally conceivable that they are due to a contextual effect.

The one set of comparisons that could lead to the conclusion of a contextual effect—those relative to child abuse—do not because of the many methodological problems characterizing previous efforts. Under different circumstances, however (e.g., five methodologically solid, individual level studies all finding no relationship between crowding and abuse and neglect),

it would be appropriate to interpret this study's findings as reflecting a contextual effect. After all, if five well-designed individual level of analysis investigations failed to demonstrate a significant individual effect of crowding on child care adequacy while one aggregate level study found a significant relationship, one possible interpretation would be a contextual effect.

Generalizability Of Findings to Unreported Incidents

The use of data on reported incidents of child abuse and neglect to assess the impact of household crowding on child care adequacy jeoparadizes the generalizability of findings to unreported incidents. Conceivably, only incidents reported to the public child protective service agency covary with density. In other words, the apparent relationship between crowding and both reported abuse and neglect could be an artifact (i.e., a reflection of the fact that families living in crowded households and/or neighborhoods where housing is likely to be very crowded are more likely to be noticed and reported than families living in less crowded conditions).

Unfortunately, findings from existing physical abuse and neglect studies cannot be used to examine this rival hypothesis. To date, all the efforts that have examined the relationship between maltreatment and density also have used samples from clinical populations. However, findings from the density-pathology literature, while not precisely appropriate for testing the rival hypothesis, can provide some insights. Both Gove and Hughes (1983) and Booth (1976) reported a linear relationship between density and pathology. In other words, they found that the greater the density, the greater the likelihood of parental child care inadequacies. Such a pattern of results tends to cast doubt on the notion that only reported incidents of abuse and neglect vary with density.

SUMMARY AND CONCLUSIONS

The purpose of this study was to assess the relationships between two types of child maltreatment (abuse and neglect) and residential density using aggregate data to test two models of density effects. Findings regarding density measured as 1.01 persons per room were inconclusive because of a high degree of collinearity between structural factors and density. Data pertaining to density measured as 1.51 persons per room are compatible with the "density as an intervening variable" model for both child abuse and neglect. However, because of the interpretational limitations associated with the use of aggregate data, and the use of reported instances of child maltreatment,

it is impossible to determine whether these relationships reflect an individual or contextual effect. Nor is it possible to generalize findings to incidents of abuse and neglect that have not been reported to the public child protective system. Despite these limitations, the present results are valuable because they demonstrate that: (a) residential density is more than just a proxy for class, (b) low relative levels of crowding, such as those characterizing Baltimore, appear to negatively impact on parental child care adequacy, and (c) future researchers must employ designs that minimize the collinearity between social structural factors and density.

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