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GEOPHYSICAL VARIABLES AND BEHAVIOUR: IMPACT OF ATMOSPHERIC CONDITIONS ON OCCURENCES OF INDIVIDUAL VIOLENCE AMONG CANADIAN PENITENTIARY POPULATIONS[1]

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Summary.- This project studied the effects of weather variables and population on minor and major violence rates within six prisons in the Kingston, Ontario, Canada, area from January, 1980 through December, 1983. While weather variables have been studied in relation to mood changes within the general population, this study was the first to analyze the impact of weather variables on rates of violence within the prison setting using forward inclusion multiple regression . Analysis showed that: (1) Population size consistently appeared to be positively correlated with assaults on other inmates among the male medium-security prisoners during the summer months. (2) In the summer months, temperature tended to be positively related to some minor kinds of offenses, but in the winter months the relationship was negative. (3) Humidity, rain, sunshine hours, snow, and snow on the ground were not consistently related to incidences of minor and major violence. (4) Indices of geomagnetic disturbances had statistically significant inverse relationships with attempted suicide/self-inflicted injury rates among the male prisoners during the summer months. (5) Over 12 months, wind was generally negatively correlated with incidences of major and minor violence among the male inmates. For 6-month periods, wind was generally positively correlated with violence rates during the winter months and negatively correlated during the summer months among the male inmates. (6) The findings relating weather variables to violence rates in the woman's prison were consistently in opposition to those found for male prisoners during the 4-yr period.

The atmospheric environment has pronounced effects on human behavior, health, emotion and mood, according to several recent investigations (Rosen, 1979). Such variables as heat during the summer months, humidity, barometric pressure, and solar flux (Lowensohn, 1977; Whitton, et al., 1982), and moon phases have been reported to be correlated with various types of violent behavior, including collective outbreaks, as well as individual violent behaviors like rape, robbery, assault, burglary, larceny, theft and other disorderly types of conduct (Feldman & Jarmon, 1979). Other variables such as wind speed, the amount of precipitation, and geomagnetic disturbances caused by solar radiowave emission were related to changes in mood (Persinger & Levesque , 1983; Schlosberg & Zakai, 1973; Goldstein, 1972). Sex appears to have no impact on mood scores when weather variables are assessed (Sanders & Brizzolara, 1982).

Some of the specific findings of the aforementioned studies include: (1) The probability of violence increases with temperature (Carlsmith & Anderson, 1979; Feldman & Jarmon, 1979), at least through the mid-80's F (Baron & Ransberger, 1978). Beyond this point, however, further increments in temperature are associated with a decrease in the incidence of violence (Baron & Ransberger, 1978). In general, the highest rates of violent crime occur during the summer (Chang, 1972; Feldman & Jarmon, 1979). (2) The probability of violence increases noticeably during full moon phases (Tasso & Miller, 1976, Lieber, 1978). (3) In the general population, correlations are noted among police calls and temperature, pressure, precipitation, and foggy weather conditions (Will & Sells, 1969).

Some of the limitations of former studies are that (1) Small samples are usually tested with regard to weather and mood research, this lowers the reliability of the findings. (2) Most of the weather/mood research is conducted in generally non-violent settings (classrooms and psychiatric hospitals), which limits the applicability of the findings to prison populations. (3) Most analyses in weather/mood/violence research involve bivariate statistical procedures rather than multivariate statistical techniques that allow for examination of the interrelationships of weather variables in accounting for increases in the incidences of violence.

The present study investigated the impact of some weather variables and crowding on the rates of minor and major incidences of violence among prisoners. Besides overcoming some of the previously mentioned shortcomings, this study was the first attempt to focus on effects of weather variable within prison walls and so to investigate the applicability of previous findings to a population already identified as being more prone to violence. To date, the most comprehensive research on factors influencing violent occurrences within prisons have focused on crowding. Two major findings have been reported: The rate of violent behavior is higher in larger, overcrowded institutions than in smaller, overcrowded ones (Paulus, et al., 1981; Farrington & Nuttall, 1980; Porporino & Dudley, 1984). Also, institutions having young populations have more incidences of violence (Carr, 1980; Nacci, et al., 1977; Ellis, et al., 1974; Myers & Levy, 1978).

In keeping with earlier findings, it was hypothesized that

atmospheric conditions would affect imprisoned populations in ways similar to those described in studies of the effect on general mood. Specifically, the monthly means and standard deviations of the following variables were of interest: levels of temperature, humidity, rainfall, snowfall, snow on the ground, hours of sunshine, wind speed, and the geomagnetic disturbance index[1]. The following relationships were hypothesized: (1) direct correlation of violence with crowding, temperature, humidity, rainfall, and geomagnetic disturbances; (2) inverse relationship of violence with number of sunshine hours and wind speed; and (3) significant relationship between violence and the amounts of snowfall and snow on the ground.

METHOD

Overview

To test these hypotheses, a primarily archival- type of investigation was conducted. Three major data files were obtained: (1) Twenty different categories of major and minor types of individual violence as defined by Correctional Services Canada and recorded monthly for six correctional institutions of the Kingston, Ontario, Canada, area during the target period (January 1980 to December 1983). (2) Weather matrix data from Environment Canada's monthly summaries from the Kingston, Ontario, Canada, airport. (3) Geomagnetic A_p indices from relevant volumes of the Journal of Geomagnetic Research for months of the target period.

[1]Changes in the earth's magnetic field due to the sun's radiation. See Persinger, 1980, for more details.

Procedure

A number of categories were defined as being relevant for study: (1) Individual minor variables were minor assault of staff, minor assault of inmate, attempted suicide/self-inflicted injury, escape from minimum security, attempted escape from maximum or medium security, escape under escort from medium or minimum security, preparation or plotting for escape, minor disturbance, and fire/suspected arson. (2) Individual major variables were murder/manslaughter, major assault on staff, hostage-taking, escapes involving violence, major assault on inmates, attempted suicide, escape from prison, multiple escape from maximum or medium security, escape of maximum security inmates from escort, and major disturbances. (3) Institutional classification by name, included one maximum security prison (mean population size = 329, SD = 36.49), three medium security prisons (mean population sizes = 384, 421 and 401, SDs = 38.23, 42.38, and 28.12), and one psychiatric correctional institution (mean population size = 62.33, SD = 7.25) for male inmates, as well as one multiple-security prison for female inmates (mean population size = 90.27, SD = 10.30). (4) Average monthly population counts per institution were those recorded by Correctional Services Canada. (5) Monthly major and minor rates of violence, the dependent measures in this study, were calculated as the amount of violence per hundred inmates per month. (6) Monthly weather index averages and standard deviations were developed from Environment Canada daily data for the Kingston, Ontario, area. (7) Geomagnetic indices cited as monthly averages and maximums were obtained from the earlier quoted source.

The following statistical procedures were conducted: (1) The time series of the weather variables were plotted to detect visible seasonal patterns. (2) Pearson correlations as well as nonparametric correlations were computed (a) to detect whether the particular subtypes of minor violence across and within institutions were correlated with each other, (b) to determine whether minor and major violence incidents within and across institutions were correlated with each other, and (c) to ascertain whether the minor and major rates of violence were correlated with the weather variables for each institution. (3) An analysis of variance program was run to determine whether the minor and major violence rates were significantly different for the seven institutions. This analysis was followed by a series of *t* tests that delineated the specific variables which were significantly different between pairs of institutions. (4) A series of forward inclusion multiple regression programs were completed to determine the impact of the weather variables and the size of the institutions' populations on (a) major violence rates, (b) minor violence rates, and (c) rates for subtypes of minor violence for each of the six institutions and for different seasons (calculated in 2-mo, 3-mo, 6-mo, and 12-mo periods).

For all analyses, the significance level was set at $p < 0.05$.

RESULTS

Time Series

Completion of time series analyses on the weather variables using the SPSS Box-Jenkins program indicated that all but the geomagnetic variables had visible seasonal patterns which were

either in phase with or out of phase with temperature cycles. All variables had some random variation. The most random variation patterns were observed in the snow-on-the-ground and the humidity variables. Because the weather variables in general, were highly correlated caution was used to prevent multicollinear predictions in later regression analyses.

Pearson Correlations

The analysis detecting whether the minor violence rates across the five institutions were correlated (Pearson product-moments method) with each other for the 4-yr period are given in Table 1. Only the minor violence types having regular occurrences over the 4-yr period were included for analysis. Because the psychiatric prison monthly means were close to 0 for all subtypes, this institution was omitted from the present analysis.

INSERT TABLE 1 ABOUT HERE

The highest pairs of computed correlations were: (i) for the male maximum security minor assaults on staff with minor assaults on inmates (r = 0.80, p <0.001); (ii) for the male maximum security minor assaults on staff with medium security minor assaults on inmates (r = 0.72, p <0.001); (iii) for male maximum security minor assaults on inmates with male medium security minor assaults on inmates (r = 0.62, p <0.001).

The Pearson correlations of the minor and major violence rates across the six institutions were over the study period are presented in Table 2. The highest pairs of computed correlations were between the male maximum security prison's minor

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rates and the two male medium security prisons minor rates (r = 0.55, $p < 0.001$; r = 0.35, p = 0.007); and between minor and major violence rates at the male maximum security prison (r = 0.45, p = 0.001).

The Pearson correlations among the major and minor violence rates with the weather variables for each of the six institutions are given in Table 3. No consistent patterns were noted, with the exception of geomagnetic disturbance variables.

INSERT TABLE 3 ABOUT HERE

Here, the geomagnetic disturbance index was correlated with the following: i) minor violence in the psychiatric prison (r = -0.33, p = 0.01); (ii) minor violence in the women's prison (r = 0.33, p = 0.01); (iii) minor violence in one medium security prison (r = 0.29, p = 0.02). The relationship between minor and major violence rates and weather variables were later analyzed by season Stable patterns were then noted. The results are detailed below.

Analysis of Variance

To assess the relative impact of the institutions on minor violence, a one-way analysis of variance computation was conducted The results are presented in Table 4. The findings indicate

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differences among the institutions. A series of t tests were then conducted to delineate further the statistically significant

differences among institutions on the minor violence monthly means. The results indicated that (i) the maximum security male prisoners were significantly different from the other groups tested, having a mean monthly violence rate of 2.06 (SD = 1.56); (ii) the female prisoners were significantly different from the other groups tested, having a mean monthly violence rate of 4.12 (SD = 5.33), (iii) the psychiatric prison was significantly different from the remaining institutions, having the lowest monthly violence rate of 0.38 (SD = 0.73), (iv) the remaining groups- the three medium security male prisons- were not significantly different from each other, having respective means of 1.49 (SD = 1.15), 1.15 (SD = 0.81), 0.76 (SD = 0.77).

To assess the relative impact of the institution variables on major violence, a separate one-way analysis of variance was then computed. The results appear in Table 5. The findings show that

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INSERT TABLE 5 ABOUT HERE

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there are significant differences in mean monthly major violence rates across the institutions. A series of t tests indicated the following specific outcomes: The psychiatric prison was significantly different from all but one medium security prison. Both of these prisons had the lowest major violence rates, with those for the psychiatric and the one medium security prison being 0.03 (SD = 0.21) and 0.08 (SD = 0.14), respectively. The major violence rate for the women's prison was 0.28 (SD = 0.60). The rates for the men's maximum security prison and the other two medium security prisons were respectively: 0.36 (SD = 0.40), 0.20

(SD = 0.30), and 0.14 (SD = .23). The last three rates were not statistically different from one another.

Forward Inclusion Multiple Regression Analysis

Based on the preceding analyses, further multivariate analysis using forward inclusion regression analysis procedures (MRA) were conducted. To optimize the return on this analysis stage, several adaptations were made at this point. First, the major violence rates were only minimally analyzed, as the minor categories were the dominating source of violence . Most multiple regression analyses were conducted on the latter data base. Second, the bulk of analyses were done on the following individual subgroupings, derived from the analysis of variance computations: (i) the maximum security males, (ii) the women's prison, and (iii) the combined medium-security prisons. The psychiatric prison was dropped from further analysis because major and minor violence rates were very low (practically nonexistent).

For both the major and minor data bases, the multiple regression analyses completed on seasonal classifications; the procedure used commenced at the macro-stage (12-month periods) and continued through groupings at the micro-stage (6-month, 3-month, 2-month periods). To save space, only the significant findings are reported below. Table space will be confined to the major findings on the minor data refinements.

Major violence.- Three sets of multiple regression analyses were completed with major violence as the dependent variable and the weather variables and population size as the independent variables. The subgroups tested were the women prisoners, the male

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maximum security prisoners, and the grouping of medium security prisoners. The results showed that the only factor influencing major violence rates over the 12-mo period was temperature--and only in the women's prison (Beta = 0.33, R^2 = 0.11; p = 0.02; correlation with dependent variable= 0.33). It appears that for women prisoners, as temperature increases, major violence also increases.

Minor violence.- A procedure similar to that described above was followed with minor violence as the dependent variable. Over the 12-mo period, wind appeared to be a major weather variable affecting minor violence rates. For the male maximum security population, wind had an inverse effect on minor violence (Beta = -0.39, R^2 = 0.15, $p < 0.01$, r with dependent variable = -0.39). For the women prisoners, maximum level of geomagnetic disturbance was directly related to minor violence rate (Beta = 0.41, R^2 = 0.17, p = 0.01; r with dependent variable = 0.41); wind was the next major impacting factor, but the residual proved not to be statistically significant in the regression equation. In the third subgroup tested, wind was again correlated with minor violence over the 12-mo period (r = -0.25), but the estimated regression equation was not significant.

To understand better the relationship between wind and minor violence, another set of analyses were conducted on seasonal time frames for the three major groupings. The following major findings emerged (i) For the male maximum security population, wind was a significant predictor of minor violence in the summer months; the

relationship appears to be an inverse one (Beta = -0.88, R^2 = 0.78, $p < 0.001$; r with dependent measure = -0.88. One other variable was also a significant predictor: average monthly humidity was negatively related to minor violence (Beta = -0.30) and accounted for an additional 9% of the variance in the dependent measure. (ii) For the female population, wind was again a significant predictor of minor violence, but for this group, there appears to be a direct relationship--especially during the summer months of June, July, and August (Beta = 0.61, R^2 = 0.38, p = 0.03; correlation with dependent measure = 0.61). The former was the only independent weather variable significantly affecting on the minor violence measure for this subgroup. (iii) Wind was consistently a major predictor of minor violence in the medium security prisons, especially during the same 3-mo summer period (Beta = -0.83, R^2 = 0.70, p = 0.001; r with dependent measure = -0.83). The other variables in explaining the residual variation were not statistically significant.

Breakdown of Categories of Minor Violence.- The most frequent minor violence subtypes for the three populations were as follows: (i) Clearly for the women's population, attempted suicide and self-inflicted injuries were the most common (monthly mean = 2.55, SD = 3.55). (ii) For the male maximum security prison, five major subtypings were frequent, with attempted suicide again heading the list (monthly mean = 0.72, SD = 0.61). (iii) For the medium security prisons, suicide attempts and assaults on inmates were commonly high, with the monthly rates falling in the 0.26 - 0.40 range.

The results of the aforementioned multiple regression analyses suggest that there may be different predictors for different categories of minor violence over the seasonal periods across the types of penitentiaries. For the present analysis, three time frames over the 48-mo period were analyzed across the five institutions of interest: the spring months (March, April, May), the winter months (November, December, January), and the summer months (June, July, and August). These three time frames were prime periods of impact of weather variables on minor violence rates.

Another set of multiple regression analyeses were completed, using the minor violence categories of suicide attempts and assault on inmates as the dependent variables for most of the five institutions, and including all of the weather variables and the size of the population as the independent variables of interest. (Only suicide attempts or self-inflicted injuries was used as the dependent variable in the women's prison, as the remaining categories had many zero cells.)

The major findings were: (i) Most of the significant results of the Multiple regression analysis fell in the June, July, August period. For this 3-mo period, geomagnetic disturbance ratings were consistently inversely related to suicide attempts/self-inflicted injuries; see Table 6 for the summary tables of the five institutions. While some statistically significant results were

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INSERT TABLE 6 ABOUT HERE

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found during the winter months, there was no clear pattern extending the findings across the institutions. With regard to assaults on inmates, again most of the significant results of the

Multiple regression analysis fell in the 3-mo summer period. Generally for the medium security prison populations, population level had a positive relationship with the dependent variable; see Table 7 for the results of the four populations tested during the June- July- August period. No consistent pattern was found for the other two time periods

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INSERT TABLE 7 ABOUT HERE

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tested. This relationship was not tested with the female prison population because this type of violence in that institution was very low.

It should be noted that average rate of minor offenses did not show reliable patterns across the institutions or across the seasonal periods.

DISCUSSION

With regard to the hypotheses stated, the results of this study show that: (i) The size of the population consistently appeared to be positively correlated with assaults on other inmates among the male medium-security prisoners in the summer months. (ii) There was also some indication that in the summer months, temperature had a positive relationship with some minor kinds of offenses, but in the winter months there was a negative relationship. However, the former finding was not a consistently stable pattern found across all institutions tested. (iii) Humidity and rain variables did not show any consistent pattern on minor and major violence rates across institutions. (iv) Indices of geomagnetic disturbance had statistically significant inverse

relationships with attempted suicide/self-inflicted injury rates among the male prisoners during the summer months. During other seasonal periods tested, inconsistent findings were reported. (v) Over a 12-month period, wind was generally negatively correlated with minor violence rates among the male inmates. When 6-mo periods were observed, wind was generally positively correlated with violence rates during the winter months and negatively correlated during the summer months among the male inmates. (vi) No consistent relationships were found between violence rates and the following variables: sunshine hours, snowfall, and snow on the ground. (vii) The findings relating weather variables to violence rates in the women's prison were consistently in opposition to those noted for male prisoners during the test periods; see Table 6.

The aforementioned statements are based on the regression model, where multicollinearity among independent weather variables prevented inclusion of some relevant variables in the regression equations.

The major limitation of this study was that only monthly data were used to test the hypotheses; while daily databases would have provided more reliable information for hypothesis testing of the impact of weather variables on minor and major violence rates, only monthly data for violence rates were available for analysis. If the daily data becomes available, further analysis of the cross-effects of temperature with wind and humidity on violence rates can be undertaken . Moreover, time frames exceeding four years would produce results which would be more generalizable.

In addition, to analyze further the crowding effect and appropriate satiation levels for the institutions studied, more

information is needed to assess building plan objectives and in-house design capacities. More research is needed on the impact of weather and population variables on violence rates among women prisoners. The present study was limited to one women's institution in the Kingston, Ontario, Canada area. Further studies should be replicated using larger cross sections to assess the stability of the present findings.

Avenues of study could include the present finding supporting a negative relationship between population levels and female prisoners' minor violence rates which suggests that transiency may be a significant variable unaccounted for in this study. Another confounding factor in the present study that clouds the relationship between the weather variables and female prisoners' violence rates is that the women's prison included a mix of security levels; security level was accounted for in the various male prisons.

Finally, the findings of this study imply that prison officials should take special precautionary measures during the hot summer months when peak outbreaks of minor violence occur. As the wind effect indicates, weather stagnation during the summer days should be considered as an alarm. In addition, the researchers suggest that in-house climate-controlled environments may provide relief from the perils of outbursts of violence during hot weather.

REFERENCES

BARON, R. A., & RANSBERGER, V. M. Ambient temperature and the occurrence of collective violence: the "Long, Hot Summer" revisited. Journal of Personality and Social Psychology 1978, 36, 351-360.

CARLSMITH, J. M., & ANDERSON, C. A. Ambient temperature and the occurrence of collective violence: a new analysis. Journal of Personality and Social Psychology, 1979, 37, 337-344.

CARR, R. S. The effects of crowding on recidivism, cardiovascular deaths, and infraction rates in a large prison system. Unpublished Ph.D. dissertation, Georgia State Univ., 1980.

CHANG, D. H. Environmental influences on criminal activity in Korea. Criminology, 1972, 10, 338-352.

ELLIS, D., GRASNICK, H., & GILMAN, B. Violence in prisons: a sociological analysis. American Journal of Sociology, 1974, 80, 16-34.

FARRINGTON, D., & NUTTALL, C. Prison size, overcrowding, violence, and recidivism. Journal of Criminal Justice, 1980, 8, 221-231.

FELDMAN, H. S., & JARMON, R. G. Factors influencing criminal behavior in Newark (NJ): a local study in forensic psychiatry. Journal of Forensic Sciences, 1979, 24, 234-239.

GOLDSTEIN, K. M. Weather, mood, and internal-external control. Perceptual and Motor Skills, 1972, 35, 786.

LIEBER, A. L. Human aggression and the lunar synodic cycle. Journal of Clinical Psychiatry, 1978, 39, 385-387, 390-393.

LOWENSOHN, B. A. An investigation of the relation between atmospheric quality and crime rates in the greater Los Angeles area. Dissertation Abstracts International, 38, 5, 2432B.

MYERS, L., & LEVY, G. Description and prediction of the intractable inmate. Journal of Research in Crime and Delinquency, 1978, 15, 214-228.

NACCI, P. L., TEITELBAUM, H. E., & PRATHER, J. Population density and inmate misconduct rates in the federal prison system. Federal Probation, 1977, 41, 26-31.

PAULUS, P., MCCAIN, G., & COX, V. C. Prison standards: some pertinent data on crowding. Federal Probation, 1981, 45, 48-54.

PERSINGER, M. A. The weather matrix and human behavior. New York, NY: Praeger Publisher, 1908.

PERSINGER, M. A., & LEVESQUE, B. F. Geophysical variables and behavior: XII. The weather matrix accomodates large portions of variance of measured daily mood. Perceptual and Motor Skills, 1983, 57, 868-870.

PORPORINO, F. J., & DUDLEY, K. An analysis of the effects of over-crowding in Canadian penitentiaries. Ottawa, Ontario, Canada: Ministry of the Solicitor General, 1984.

ROSEN, S. Weathering: how the atmosphere conditions your body, your mind, your moods--and your health. New York: Evans, 1979.

SANDERS, J. L., & BRIZZOLARA, M. S. Relationships between weather and mood. Journal of General Psychology, 1982, 107, 155-156.

SCHLOSBERG, A., & ZAKAI, D. Psychiatric admissions and climatic factors inthe coastal regions of Israel. Israel Annals of Psychiatry and Related Disciplines, 1973, 11, 23-32.

TASSO, J., & MILLER, E. The effects of the full moon phase on human behavior. Journal of Psychology, 1976, 93, 81-83.

WHITTON, J. L., KRAMER, P., & EASTWOOD, R. Weather and infraradian rhythms in self-reports of health, sleep, and mood measures. Journal of Psychosomatic Research, 1982, 26, 231-235.

WILL, D. P., & SELLS, S. B. Prediction of police incidents and accidents by meteorological variables. FortWorth, TX: Texas Christian University Institute of Behavioral Research, 1969.

FOOTNOTES

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TABLE 1

Correlations for Minor Violence Rates Across Five Institutions

		RM1	RM2	RM3	RM8	RM10	RW3	RC2	RC3	RR2	RR3
RM1	r		0.795*	0.062	0.202	0.091	-0.190	0.717*	0.230*	0.160	-0.025
	n		48	48	48	48	48	48	48	48	48
RM2	r			0.165	0.227*	-0.079	-0.161	0.618*	0.221	0.230*	-0.013
	n			48	48	48	48	48	48	48	48
RM3	r				0.136	0.061	0.095	0.086	0.086	0.170	0.391
	n				48	48	48	48	48	48	48
RM8	r					0.0651	-0.1694	0.1295	0.1201	-0.1270	-0.1432
	n					(48)	(48)	(48)	(48)	(48)	(48)
RM10	r						-0.185	-0.045	0.000	-0.071	0.122
	n						48	48	48	48	48
RW3	r							-0.105	-0.112	-0.124	0.075
	n							48	48	48	48
RC2	r								0.157	0.245	-0.003
	n								48	48	48
RC3	r									0.109	0.035
	n									48	48
RR2	r										0.320*
	n										48

TABLE 1 (CONT)

Correlations for Minor Violence Rates Across Five Institutions

		RJ2	RJ3
RM1	r	0.276 *	-0.033
	n	48	48
RM2	r	0.294 *	-0.108
	n	48	48
RM3	r	0.3616*	0.153
	n	48	48
RM8	r	0.0585	0.3062 *
	n	48	48
RM10	r	0.1780	-0.1328
	n	48	48
RW3	r	-0.1660	0.0724
	n	48	48
RC2	r	0.3000 *	-0.1903
	n	48)	48
RC3	r	0.0574	-0.0507
	n	48	48
RR2	r	0.1375	-0.1353
	n	48	48
RR3	r	0.3139*	0.0015
	n	48	48
RJ2	r		-0.0792
	n		48

Legend

RM1 - Male Maximum Security, Minor Assault on Staff
RM2 - Male Maximum Security, Assault on Inmate
RM3 - Male Maximum Security, Suicide Attempt/Self-inflicted Injury
RM8 - Male Maximum Security, Minor Disturbance
RM10 - Male Maximum Security, Fire/Suspected Arson
RW3 - Women's Prison, Suicide Attempt/Self-inflicted Injury
RC2 / RJ2 - Male Medium Security, Assault on Inmate
RC3 / RJ3 - Male Medium Security, Suicide Attempt/Self-inflicted Injury
RR2 - Male Medium Security, Assault on Inmate
RR3 - Male Medium Security, Suicide Attempt/Self-inflicted Injury
* - $p \leq .05$

TABLE 2

Correlations for Minor and Major Violence Rates Across Six Institutions

		MIMIN	PSMIN	WOMIN	COMIN	WAMIN	JOMIN	MIMAJ	PSMAJ	WOMAJ	COMAJ
MIMIN	r		-0.100	-0.160	0.551 *	0.230 *	0.349*	0.4479 *	-0.100	0.144	-0.089
	n		49	48	49	48	48	48	48	48	48
PSMIN	r			-0.028	-0.325 *	-0.172	0.123	-0.145	0.228 *	0.089	-0.176
	n			48	49	48	48	48	48	48	48
WOMIN	r				-0.142	-0.201	-0.110	-0.293 *	-0.0511	0.193	0.224
	n				48	48	48	48	48	48	48
COMIN	r					0.082	0.015	0.347 *	-0.077	0.258 *	-0.028
	n					48	48	49	48	48	48
WAMIN	r						0.236 *	0.194	-0.095	-0.160	-0.075
	n						48	48	48	48	48
JOMIN	r							0.084	0.023	-0.039	0.075 *
	n							48	48	48	48
MIMAJ	r								-0.009	-0.020	-0.354
	n								48	48	48
PSMAJ	r									-0.069	0.027
	n									48	48
WOMAJ	r										0.084
	n										48

*$p \leq .05$

TABLE 2 (Cont)

Correlations for Minor and Major Violence Rates Across Six Institutions

		WAMAJ	JOMAJ
MIMIN	r	0.180	0.074
	n	48	48
PSMIN	r	0.024	-0.077
	n	48	48
WOMIN	r	0.076	0.194
	n	48	48
COMIN	r	0.017	-0.111
	n	48	48
WAMIN	r	0.078	-0.014
	n	48	48
JOMIN	r	0.170	0.263
	n	48	48
MIMAJ	r	-0.266*	-0.203
	n	48	48
PSMAJ	r	-0.074	0.071
	n	48	48
WOMAJ	r	0.160	-0.161
	n	48	48
COMAJ	r	0.404*	0.264*
	n	48	48
WAMAJ	r		0.159
	n		48

Legend

MIMIN - Male, Maximum Security: Minor Violence
PSMIN - Male, Psychiatric: Minor Violence
WOMIN - Women's Prison: Minor Violence
COMIN - Male, Medium Security: Minor Violence
WAMIN - Male, Medium Security: Minor Violence
JOMIN - Male, Medium Security: Minor Violence
MIMAJ - Male, Maximum Security: Major Violence
PSMAJ - Male, Maximum Security: Major Violence
WOMAJ - Women's Prison: Major Violence
COMAJ - Male, Medium Security: Major Violence
WAMAJ - Male, Medium Security: Major Violence

p - $\leq$ .05

TABLE 3

Pearson Correlations of Major and Minor Violence Rates with Weather Variables for Each of Six Institutions

		MIMIN	PSMIN	WOMIN	COMIN	WAMIN	JOMIN	MIMAJ	PSMAJ	WOMAJ	COMAJ
TEMPM	r	0.230*	-0.225	0.099	0.200*	-0.137	0.115	0.141	-0.287*	0.271*	0.146
	n	48	48	48	48	48	48	48	48	48	48
TEMSD	r	-0.145	0.316*	-0.082	-0.118	0.051	-0.113	0.098	0.344*	-0.084	-0.276*
	n	48	48	48	48	48	48	48	48	48	48
AVHUM	r	0.064	-0.301*	-0.039	0.151	0.108	-0.064	-0.016	-0.074	0.224	0.012
	n	48	48	48	48	48	48	48	48	48	48
AVHUS	r	0.046	0.005	-0.143	-0.069	0.050	0.116	0.001	-0.105	-0.124	0.064
	n	48	48	48	48	48	48	48	48	48	48
RAINM	r	0.188	-0.226	0.137	0.015	-0.037	-0.039	0.129	-0.277*	0.193	0.154
	n	48	48	48	48	48	48	48	48	48	48
RAINS	r	0.179	-0.111	0.062	0.046	-0.102	-0.060	0.281*	-0.310	0.101	-0.102
	n	48	48	48	48	48	48	48	48	48	48
SNOWM	r	0.124	0.271*	-0.233*	-0.097	0.102	0.095	-0.008	0.131	-0.239*	-0.267*
	n	48	48	48	48	48	48	48	48	48	48
SNOWS	r	-0.121	0.280*	-0.258*	0.059	0.161	0.047	-0.006	0.134	-0.254*	-0.220*
	n	48	48	48	48	48	48	48	48	48	48
SNGM	r	-0.125	0.218	-0.095	-0.053	-0.082	-0.011	-0.117	0.436	-0.192*	-0.200*
	n	48	48	48	48	48	48	48	48	48	48
SNGS	r	-0.093	0.310*	-0.197	-0.107	0.035	0.067	-0.031	0.304*	-0.257*	-0.212*
	n	48	48	48	48	48	48	48	48	48	48
WINDM	r	-0.388*	0.275*	0.160	-0.256*	0.080	-0.115	-0.123	-0.020	-0.164	0.015
	n	48	48	48	48	48	48	48	48	48	48

TABLE 3 (Cont)

Correlations of Major and Minor Violence Rates with Weather Variables for Each of Six Institutions

		WAMAJ	JCMAJ
TEMPM	r	0.036	0.003
	n	48	48
TEMSD	r	0.078	-0.111
	n	48	48
AVHUM	r	0.019	-0.090
	n	48	48
AVHUS	r	0.049	0.012
	n	48	48
RAINM	r	-0.065	0.028
	n	48	48
RAINS	r	0.227	-0.207
	n	48	48
SNOWM	r	0.026	-0.097
	n	48	48
SNOWS	r	0.116	-0.093
	n	48	48
SNGM	r	-0.121	-0.108
	n	48	48
SNGS	r	-0.031	-0.162
	n	48	48
WINDM	r	0.191	0.036
	n	48	48
WINDS	r	0.070	-0.056
	n	48	48
SUNM	r	0.115	-0.043
	n	48	48
SUNS	r	0.105	0.212
	n	48	48
GEOM	r	0.068	0.032
	n	45	45
GEOMX	r	0.086	0.022
	n	45	45

Note: For Institutional and Violence Legend, see Table 2

TABLE 3 (Cont)

Correlations of Major and Minor Violence Rates with Weather Variables For Each of Six Institutions

	MIMIN	PSMIN	VOMIN	COMIN	TAMIN	JOMIN	MIMAJ	PSMAJ	VOMAJ	COMAJ
WINDS	-0.210 48	0.365* 48	0.010 48	-0.041 48	0.171 48	-0.079 48	0.031 48	0.009 48	-0.081 48	-0.185 48
SUNM	0.261* 48	0.019 48	-0.011 48	0.160 48	-0.244* 48	0.156 48	0.116 48	-0.071 48	0.133 48	0.004 48
SUNS	0.070 48	0.019 48	0.023 48	-0.025 48	-0.260* 48	0.110 48	-0.249* 48	-0.065 48	-0.122 48	0.222 48
GEOM	-0.110 45	-0.327* 45	0.330* 45	0.091 45	0.293* 45	-0.058 45	-0.187 45	-0.181 45	-0.043 45	0.186 45
GEOMX	-0.136 45	-0.191 45	0.410 45	0.017 45	0.133 45	-0.037 45	-0.190 45	-0.174 45	0.152 45	0.207 45

Weather Variables Legend (Monthly Data)

TEMPM: Mean Temperature
TEMSD: Standard Deviation, Temperature
AVHUM: Mean Humidity
AVHUS: Standard Deviation, Temperature
RAINM: Mean Rainfall
RAINS: Standard Deviation, Rainfall
SNOWM: Mean Snowfall
SNOWS: Standard Deviation, Snowfall
SNGM: Mean Snow on the Ground
SNGS: Standard Deviation, Snow on the Ground
WINDM: Mean Wind Speed
WINDS: Standard Deviation, Wind Speed
SUNM: Mean Number of Sunshine Hours
SUNS: Standard Deviation, Number of Sunshine Hours
GEOM: Mean Geomagnetic Disturbance Index
GEOMX: Mean Maximum Geomagnetic Disturbance Index

* : $p \leq .05$

TABLE 4

Analysis of Variance of Minor Violence by Institution

Source	df	MS	F	p
Main effect, Institution	5	85.78	15.17	Ø.ØØ1
Explained	5	85.78	15.17	Ø.ØØ1
Residual	282	5.65		
Total	287	7.Ø5		

TABLE 5

Analysis of Variance of Major Violence by Institution

Source	df	MS	F	p
Main effect, Institution	5	Ø.77	6.21	Ø.ØØ1
Explained	5	Ø.77	6.21	Ø.ØØ1
Residual	282	Ø.12		
Total	287	Ø.14		

TABLE 6 (Cont)

Forward Inclusion Multiple Regression Analysis of Weather Variables

on Suicide Attempts/Self-inflicted Injuries

Across Institutions

Summary tables

Step	Multr	Rsq	Adjrsq	F(equ)	Sigf	Rsqch	Fch	Sigch		Variable	Betain	Correl
1	0.5618	0.3156	0.2471	4.611		0.3156	4.611	.057	IN:	WINDM	0.5618	0.5618
2	0.7012	0.4916	0.3787	4.352	*	0.1760	3.116	.111	IN:	RAINM	-0.4448	-0.2090
3	0.7671	0.5884	0.4340	3.812		0.0968	1.881	.207	IN:	GEOMX	0.3360	0.5207
4	0.8370	0.7005	0.5294	4.094	*	0.1121	2.621	.149	IN:	SUNM	-0.4548	-0.3084
5	0.9086	0.8255	0.6801	5.678	*	0.1250	4.298	.084	IN:	AVHUM	-0.5699	-0.1959
6	0.9478	0.8984	0.7764	7.368	*	0.0729	3.585	.117	IN:	GEOM	-0.6534	0.3855
7	0.9513	0.9050	0.7387	5.442		0.0066	0.278	.626	IN:	TEMPM	-0.1378	-0.2335
8	0.9531	0.9084	0.6642	3.720		0.0034	0.113	.759	IN:	WOMPO	-0.0805	-0.3223

Step	Multr	Rsq	Adjrsq	F(equ)	Sigf	Rsqch	Fch	Sigch		Variable	Betain	Correl
1	0.5177	0.2680	0.1948	3.662		0.2680	3.662	.085	IN:	RAINM	0.5177	0.5177
2	0.6207	0.3853	0.2487	2.820		0.1172	1.717	.223	IN:	AVHUM	-0.4155	0.0110
3	0.6426	0.4129	0.1928	1.876		0.0277	0.377	.556	IN:	WINDM	-0.1764	0.0072
4	0.6543	0.4281	0.1013	1.310		0.0152	0.186	.680	IN:	WARPO	-0.3441	0.1150
5	0.6807	0.4633	0.0161	1.036		0.0352	0.393	.554	IN:	SUNM	-0.3162	0.1269
6	0.7103	0.5045	0.0701	0.849		0.0412	0.416	.547	IN:	GEOMX	0.3049	0.0631
7	0.7447	0.5546	-0.2249	0.711		0.0501	0.450	.539	IN:	TEMPM	-0.5509	0.3649
8	0.7513	0.5645	0.5970	0.486		0.0099	0.068	.811	IN:	GEOM	-0.3367	0.1261

Legend

WINDM - Monthly Mean, Wind
RAINM - Monthly Mean, Rain
GEOMX - Monthly Maximum Geomagnetic Disturbance Index
GEOM - Monthly Mean, Geomagnetic Disturbance Index
SUNM - Monthly Mean, Number of Sunshine Hours
AVHUM - Monthly Mean, Humidity
TEMPM - Monthly Mean, Temperature

JOYPO - Male Medium Security Prison
MIPOP - Male Maximum Security Prison
COLPO - Male Medium Security Prison
WOMPO - Female Prison
WARPO - Male Medium Security Prison

* - $p \leq .05$

NOTE: To identify institution summary tables, refer to the population variables (e.g., JOYPO)

TABLE 6

Forward Inclusion Multiple Regression Analysis of Weather Variables

on Suicide Attempts/Self-inflicted Injuries

Across Institutions

Summary tables

Step	Multr	Rsq	Adjrsq	F(equ)	Sigf	Rsqch	Fch	Sigch		Variable	Betain	Correl
1	0.5852	0.3425	0.2767	5.209	*	0.3425	5.209	.046	IN:	GEOM	-0.5852	-0.5852
2	0.7163	0.5131	0.4049	4.742	*	0.1706	3.154	.109	IN:	AVHUM	0.4140	0.4507
3	0.7607	0.5786	0.4206	3.662		0.0655	1.244	.297	IN:	SUNM	0.3137	-0.1400
4	0.8742	0.7643	0.6296	5.675	*	0.1857	5.514	.051	IN:	WINDM	0.5697	0.0681
5	0.9029	0.8153	0.6614	5.297	*	0.0510	1.657	.245	IN:	JOYPO	0.4959	-0.5351
6	0.9318	0.9059	0.7931	8.027	**	0.0906	4.818	.080	IN:	RAINM	-0.6187	0.1767
7	0.9393	0.9202	0.7807	6.593	**	0.0143	0.717	.445	IN:	TEMPM	-0.1804	-0.0018
8	0.9600	0.9217	0.7128	4.413		0.0014	0.055	.830	IN:	GEOMX	-0.1182	-0.4577

Step	Multr	Rsq	Adjrsq	F(equ)	Sigf	Rsqch	Fch	Sigch		Variable	Betain	Correl
1	0.5971	0.3565	0.2922	5.541	*	0.3565	5.541	.040	IN:	GEOM	-0.5971	-0.5971
2	0.7661	0.5869	0.4951	6.392	*	0.2303	5.017	.052	IN:	SUNM	0.4918	0.3380
3	0.7804	0.6181	0.4754	4.322	*	0.0316	0.662	.439	IN:	RAINM	-0.1890	-0.4274
4	0.7971	0.6354	0.4271	3.050		0.0170	0.326	.586	IN:	WINDM	0.1743	-0.4125
5	0.8114	0.6583	0.3736	2.312		0.0229	0.402	.549	IN:	GEOMX	-0.3456	-0.4528
6	0.8205	0.6732	0.2810	1.717		0.0148	0.227	.654	IN:	MIPOP	-0.1757	-0.2531
7	0.8209	0.6739	0.1033	1.181		0.0007	0.009	.929	IN:	TEMPM	-0.0487	0.1874
8	0.8212	0.6743	0.1942	0.776		0.0004	0.004	.956	IN:	AVHUM	-0.0719	-0.3320

Step	Multr	Rsq	Adjrsq	F(equ)	Sigf	Rsqch	Fch	Sigch		Variable	Betain	Correl
1	0.6677	0.4458	0.3904	8.044	*	0.4458	8.044	.018	IN:	GEOM	-0.6677	-0.6677
2	0.8577	0.7356	0.6769	12.520	**	0.2898	9.865	.012	IN:	TEMPM	0.5405	0.5958
3	0.8914	0.7947	0.7177	10.321	**	0.0591	2.301	.168	IN:	AVHUM	0.2538	0.1255
4	0.9099	0.8279	0.7296	8.419	**	0.0332	1.352	.283	IN:	WINDM	-0.2082	-0.4778
5	0.9222	0.8505	0.7258	6.824	**	0.0225	0.905	.378	IN:	GEOMX	-0.3025	-0.5854
6	0.9317	0.8680	0.7096	5.479	*	0.0175	0.664	.452	IN:	COLPO	-0.4477	0.1271
7	0.9318	0.8683	0.6377	3.766		0.0003	0.008	.933	IN:	RAINM	0.0375	0.1376
8	0.9318	0.8683	0.5172	2.473		0.0001	0.001	.973	IN:	SUNM	0.0219	0.1475

* $p \leq .05$

TABLE 7 (Cont)

Forward Inclusion Multiple Regression Analysis of Weather Variables

on Assaults on Inmates Across Institutions

Summary table

Step	Multr	Rsq	Adjrsq	F(equ)	Sigf	Rsqch	Fch	Sigch		Variable	Betain	Correl
1	0.8963	0.8033	0.7836	40.838	*	0.8033	40.838	0.000	IN:	WINDM	-0.8963	-0.8963
2	0.9715	0.9439	0.9314	75.663	*	0.1406	22.537	.001	IN:	AVHUM	-0.3833	-0.5526
3	0.9844	0.9691	0.9574	83.495	*	0.0252	6.510	.034	IN:	GEOM	0.1763	-0.1644
4	0.9847	0.9696	0.9522	55.794	*	0.0005	0.124	.735	IN:	GEOMX	-0.0452	-0.1643
5	0.9849	0.9701	0.9451	38.897	*	0.0005	0.097	.766	IN:	MIPOP	-0.0395	0.4903
6	0.9853	0.9708	0.9358	27.720	*	0.0007	0.127	.736	IN:	SUNM	-0.0537	0.5856
7	0.9864	0.9730	0.9257	20.580	*	0.0022	0.321	.601	IN:	RAINM	0.1033	-0.4383
8	0.9866	0.9734	0.9025	13.734	*	0.0004	0.049	.839	IN:	TEMPM	0.0376	0.2673

Legend

WARPO - Male, Medium Security Prison
JOYPO - Male, Medium Security Prison
COLPO - Male, Medium Security Prison
MIPOP - Male, Maximum Security Prison
WINDM - Monthly Mean, Wind
AVHUM - Monthly Mean, Humidity
GEOM - Monthly Mean, Geomagnetic Disturbance Index
GEOMX - Monthly Mean, Maximum Geomagnetic Disturbance Index
SUNM - Monthly Mean, Number of Sunshine Hours
RAINM - Monthly Mean, Rainfall
TEMPM - Monthly Mean, Temperature
* - p .05

NOTE: To identify institution summary tables, refer to the population variables (e.g., JOYPO)

TABLE 7

Forward Inclusion Multiple Regression Analysis of Weather Variables

on Assaults on Inmates Across Institutions

Summary tables

Step	Multr	Rsq	Adjrsq	F(equ)	Sigf	Rsqch	Fch	Sigch		Variable	Betain	Correl
1	0.6006	0.3607	0.2768	5.642	*	0.3607	5.642	.039	IN:	WARPO	0.6006	0.6006
2	0.7345	0.5395	0.4372	5.272	*	0.1788	3.494	.094	IN:	RAINM	0.4449	0.2151
3	0.7531	0.5672	0.4049	3.495		0.0277	0.512	.495	IN:	SUNM	-0.1908	0.1562
4	0.8103	0.6564	0.4616	3.358		0.0902	1.843	.217	IN:	TEMPM	0.3830	0.3765
5	0.8598	0.7393	0.5220	3.403		0.0819	1.884	.219	IN:	GEOMX	0.3515	-0.0224
6	0.9402	0.8839	0.7447	6.347	**	0.1447	6.233	.055	IN:	GEOM	-1.1395	0.0357
7	0.9555	0.9130	0.7607	5.996	*	0.0290	1.335	.312	IN:	AVHUM	0.3577	-0.1850
8	0.9705	0.9419	0.7871	6.083		0.0289	1.495	.309	IN:	WINDM	1.0873	-0.4443

Step	Multr	Rsq	Adjrsq	F(equ)	Sigf	Rsqch	Fch	Sigch		Variable	Betain	Correl
1	0.6679	0.4461	0.3707	8.053	*	0.4461	8.053	.018	IN:	JOYPO	0.6679	0.6679
2	0.7555	0.5708	0.4754	5.984	*	0.1247	2.615	.140	IN:	WINDM	-0.3994	-0.6243
3	0.7624	0.5813	0.4243	3.702		0.0105	0.201	.666	IN:	SUNM	-0.1181	0.2862
4	0.7654	0.5874	0.3516	2.491		0.0061	0.104	.757	IN:	GEOM	0.1087	-0.0204
5	0.7840	0.6146	0.2935	1.914		0.0272	0.424	.539	IN:	GEOMX	-0.3993	-0.2018
6	0.7885	0.6217	0.1677	1.370		0.0071	0.093	.772	IN:	AVHUM	-0.1783	-0.3654
7	0.7949	0.6318	-0.0124	0.981		0.0101	0.110	.757	IN:	TEMPM	0.1360	0.1484
8	0.7949	0.6319	-0.3495	0.644		0.0001	0.001	.979	IN:	RAINM	-0.0276	-0.1670

Step	Multr	Rsq	Adjrsq	F(equ)	Sigf	Rsqch	Fch	Sigch		Variable	Betain	Correl
1	0.8246	0.6800	0.6480	21.246	*	0.6800	21.246	.001	IN:	COLPO	0.8246	0.8246
2	0.8779	0.7707	0.7197	15.125	*	0.0907	3.561	.092	IN:	AVHUM	0.3791	-0.2613
3	0.8985	0.8073	0.7351	11.175	*	0.0366	1.522	.252	IN:	WINDM	-0.2774	-0.7675
4	0.9176	0.8420	0.7518	9.329	*	0.0347	1.537	.255	IN:	SUNM	-0.2388	0.2151
5	0.9283	0.8618	0.7467	7.484	*	0.0198	0.859	.390	IN:	GEOMX	0.1976	-0.1855
6	0.9414	0.8863	0.7498	6.495	*	0.0245	1.076	.347	IN:	RAINM	0.4288	-0.1093
7	0.9472	0.8971	0.7171	4.982		0.0108	0.421	.552	IN:	GEOM	-0.3273	-0.1033
8	0.9474	0.8975	0.6241	3.283		0.0004	0.011	.924	IN:	TEMPM	0.0361	0.2455

$p \leq .05$