DEVELOPING MULTIVARIATE MODELS FOR EARTHQUAKE CASUALTY ESTIMATION

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Introduction

Considerable emphasis has been given in recent years to the development of methodologies for use in earthquake loss estimation (c.f., Steinbrugge, 1982, Applied Technology Council, 1985 Spangle, et al., 1987; Panel on Earthquake Loss Estimation, 1989). While the results of these efforts are impressive, and while we now know considerably more about potential earthquake losses than we did ten years ago, this knowledge is still quite uneven and incomplete (Tierney, 1990). For example, we know much more about probable losses to the building stock than about other kinds of losses, and the data base lacks regional balance.

Moreover, some types of potential earthquake impacts have been given very little emphasis. The estimation of earthquake casualties is among these under-emphasized topics. In fact, it would not be too much of an exaggeration to characterize the present state of knowledge in the casualty estimation area as rudimentary

Gross estimates of potential injuries and deaths under different earthquake scenarios have been in existence for quite some time. For example, the well-known FEMA/National Security Council report (1980) projected deaths and hospitalized injuries for major earthquakes on two Northern and two Southern California faults However, these estimates were derived from expert judgments, not empirical research, and they were acknowledged at the time to be "uncertain by a possible factor of two to three." While extremely useful in terms of raising awareness and concern about the earthquake threat, such estimates are too general--and based on too little data--to be useful as policy or planning tools

The reasons we don't have better earthquake casualty estimates are doubtless obvious to everyone at this workshop, but I'll state them anyway. First and foremost is the lack of an empirical