広島統計談話会
Hiroshima Statistics Study Group

第 242 回談話会を下記のように開催致しますので
御参集下さいますよう御案内申し上げます。
You are cordially invited to the 242nd meeting as scheduled below.

日　時 : 2008 年 10 月 3 日（金）15:00～
Date: October 3, 2008 (Fri) 15:00-

場　所 : 放射線影響研究所　講堂
Place: RERF Auditorium

演　者 : ハリー M. カリングス 博士
（財団法人 放射線影響研究所 統計部 副部長）
Speaker: Harry M. Cullings, Ph.D.
Assistant Chief, Department of Statistics
Radiation Effects Research Foundation

演　題 : 「広島・長崎の原爆被爆者集団の推定値への急性期生存関数のあてはめ」
Title: "Fitting Acute Survival Functions to Estimates of the Population Exposed to the Atomic Bombs in Hiroshima and Nagasaki"

要　約 :
Abstract:
Dose correction factors used to adjust for dose error in the studies of RERF depend on estimating the expected value of true dose x conditional on a given value of estimated dose z, E{x|z}, among the survivors under study. This requires in turn an estimate of the distribution of true doses F(x) received by members of the survivor cohort. The group of interest is typically the Life Span Study (LSS) cohort of 120,321 individuals. Of these, 93,741 were in the cities within 10 km of the hypocenters at the times of the bombings and most have DS02 radiation dose estimates (observed values of z). The estimation of F(x) has typically been done by working backward from the frequency distribution of dose estimates F(z) in the survivors using a particular error model under consideration, F(z|x), to estimate F(x) in the survivors. A different method that may be useful is to construct detailed estimates of true dose distributions in particular subsets of the *exposed population* and fit binary survival probability functions F(s|x), s = 0,1; such as the logit or probit, that represent the probability of surviving for several years after the

bombing and being included in the LSS. The acute survival function F(s|x) can fitted by using the observed F(z) in the survivors divided by the estimated F(z) in the exposed population with a method that accounts for the assumed error in the independent variable z, f(z|x), i.e., a likelihood based model with full parametric specification of the errors involved. This immediately provides an estimate of the F(x) of true doses in the survivors. This method can use detailed error models F(z|x) that depend on x (or factors determining x, i.e., distance and shielding considered separately), as well as models for the over-dispersion of F(s|x) vis-à-vis the binomial, from sources such as neighborhood-related heterogeneity in the areal density (# per square km) of the exposed population.

This talk will focus on the method of reconstructing the distribution of true dose in the exposed population. It relies on detailed map information and estimates of population density per square km that are approached asymptotically at the longest "proximal" distances, where survival is high and asymptotically approaching 100%, and sampling of the master sample (i.e., inclusion in the LSS of all survivors known by census) was as close to 100% as possible. Estimation of numbers of exposed persons is done separately within major shielding categories as a function of distance and shielding. Fitting of acute survival in two dimensions corresponding to distance and shielding, using known DS02 dose functions of distance and shielding, offers advantages in aspects such as considering the effect of combined injury (radiation, blast and thermal), rather than just radiation dose, on acute survival. An important early finding is that a survival effect of shielding can be observed among survivors exposed in typical wooden houses. That is, at the shortest distances, where survival is low, the frequency distribution of reported shielding among survivors is shifted toward heavier shielding.