

# UP-AND-DOWN DESIGNS II: EXACT TREATMENT MOMENTS

BY STEPHEN D. DURHAM\*, NANCY FLOURNOY  
AND ALI A. MONTAZER-HAGHIGHI

*The University of South Carolina, The American  
University and Benedict College*

## Abstract

Consider a sequence of experiments in which a treatment is applied at a finite number of levels or dosages, and the cumulative number of responses at each level is observed after each trial. We consider such experiments in which the primary objective is to estimate the unknown dose  $\mu$  that has a probability of response equal to a fixed value  $\Gamma$ ,  $0 \leq \Gamma \leq 1$ . We restrict the unknown distribution of treatments so as to avoid treatment levels that are associated with high probabilities of response. When treatment levels are sequentially assigned to subjects in a way that forms a random walk, we give the exact expectation (and variance) of giving treatments that have high probabilities of response.

**1. Introduction.** Consider a sequence of experiments in which a treatment is applied at a finite number of levels or dosages, and the cumulative number of responses at each level is observed after each

---

Received November 1992; revised July 1994.

\*Work supported in part by NSF Grant EPSCoR#OSR-9108772 and by the Westinghouse Savannah River Company, through the South Carolina University Research and Education Foundation.

*AMS 1991 subject classification.* Primary 62L15; secondary 62L05.

*Key words and phrases.* Dose-response, quantile targeting, random walks, toxicity study.