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**DEVELOPMENTS IN TELEVISION RESEARCH**

# A new AGB Guide for television coverage and frequency

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**The Television Audience Research Division of AGB has now completed a major project to extend understanding of the behaviour of coverage and frequency levels of advertising schedules. This work has culminated in the production of a new Coverage and Frequency Guide which will be published later this month. A fresh approach has been adopted to the estimation of the coverage of an advertising campaign based on an extension of the concept of duplication of viewing between spots within the schedule. Many hundreds of schedules were evaluated, using JICTAR panel data, to establish the parameters and to test the model. An outline of the new methodology appears below, together with a description of the new Guide and its accuracy.**

## Introduction

Coverage and Frequency analysis is now a well-established technique employed by Advertisers, their Agencies and Television Companies alike to measure, in terms other than simply total TV Ratings and cost per thousand, the effectiveness of an advertising schedule - real or hypothetical.

It is generally agreed that different types of schedule, with variations in the amount of peak time versus daytime or weekday versus weekend time, can produce significantly different results in terms of both the coverage achieved and the frequency of viewing at various levels.

Several models or guides had been developed between the mid-sixties and early seventies to produce estimates of the coverage and frequency of advertising schedules. All of these models used actual analysis of the JICTAR panel as their base but all share the feature of using an empirical approach to predict coverage.

Like other Guides, AGB's first Coverage and Frequency Guide (Ref. 1) is now some eight years old. Checks in the early part of 1978 suggested that the Guide was not operating as satisfactorily as it was when it was first issued. We also believe that other

agency models were also becoming less 'accurate'. Many reasons can be put forward to account for this:

(i) Between 1971 and 1979 ITV penetration of all homes increased from 91 per cent to 97 per cent.
(ii) Between 1971 and 1979 BBC2 penetration, in ITV homes, increased from 46 per cent to 99 per cent.
(iii) The introduction of daytime transmissions in October 1972.
(iv) As a result of Boundary Surveys, new transmitters and transmitter reallocation the geographical coverage of many ITV areas has changed, increasing or decreasing the number of dual channel ITV households.
(v) While not necessarily influencing coverage other factors may have changed viewing habits. These would include such diverse features as falling average household size and the steady growth in penetration of colour television.

Against this backcloth of both a changing medium, as outlined above, and the knowledge that previous Guides were operationally less sound than when they were developed, a decision was taken in mid-1978 to develop a new Coverage and Frequency Guide. Recognising the weaknesses in previous methodologies it was further decided to adopt a new approach to the estimation of coverage and frequency and at the same time to take the opportunity to extend the range and application of the Guide into areas not previously considered.

**Background**

Besides adopting a fresh methodological approach to the production of the new Guide we also felt it important to seek the guidance of a small number of JICTAR subscribers who are experienced in the use of JICTAR data in general and Coverage and Frequency analyses in particular. To this end this new Guide has been developed in conjunction with the following companies representing each side of the advertising industry:

Geers Gross Ltd.
H. J. Heinz Company Ltd.
London Weekend Television Ltd.
Saatchi and Saatchi Garland-Compton Ltd.

We are grateful for the advice and contributions made by the representatives of these companies who, over the past year in regular meetings, have been instrumental in modifying our thoughts and in refining the parameters used in the generation of the Guide. Through these consultations we hope that the new Guide will provide the media world with a good working document to aid media planners, buyers and researchers alike in the estimation of coverage and frequency results for advertising schedules.

One word of caution, however. A Guide can be no more than its name implies. This new Guide should be used only to determine the coverage and frequency of 'normal' advertising schedules within the operational parameters set down in it. In essence it

should be used as a 'yardstick' to gauge what level of coverage and frequency will, on average, be achieved from a particular type of schedule. It is always possible to devise schedules which will perform better or perform worse than the Guide would suggest. The Guide does not seek to predict results for abnormal schedules such as those bought in a single evening or in a specific programme series or schedules having only a very small number of spots. In these cases the Guide should only be used as a 'norm' to provide a comparison with actual coverage and frequency analyses from the JICTAR database.

**The theoretical basis**

First it must be said that the approach used to predict coverage (1+) in the new Guide, and that used to predict the frequencies within this, are quite different in nature; we will deal firstly with the coverage side.

Our starting point is the statement that the coverage achieved by a given total rating is inversely related to the duplication level across the constituent spots. This statement raises two questions. One, what do we mean by duplication across several spots? Two, can we predict the duplication level and, thereby, coverage?

Many readers will be familiar with the literature on duplication (Refs. 2, 3 and 4) mostly due to Prof. A. 5. C. Ehrenberg and G. J. Goodhardt. We can summarise the main conclusion by saying that the proportion of the viewing population who view both of two spots, or programmes, is usually close to the rating of the first multiplied by the rating of the second, times a further factor of about 1.8 if both spots are on the same channel but which is not needed when they are on different channels. This result provides a basis for predicting the coverage of two-spot schedules. What we have done is to extend this approach to more than two spots. The development that follows is to a large extent based on original (unpublished) work carried out in 1977/78 by J. St G. Jephcott, Technical Director of AGB.

The extension may be summarised as follows: If r stands for rating, the duplicated percentage rating for two spots may be written

$$r_{12} = D\, r_1\, r_2/100 \qquad (1)$$

where D is 1.8 or 1.0 as appropriate. If we work in fractions rather than percentages we can drop the factor of 100, so a rating of 30 will henceforth imply r = 0. 3, and so on.

We also know the coverage for the two spots is

$$r_{(2)} = r_1 + r_2 - r_{12} \qquad (2)$$

$$\text{i.e. } r_{(2)} = r_1 + r_2 - Dr_1\, r_2 \qquad (3)$$

If we add a further spot, we find

$$r_{(3)} = r_{(2)} + r_3 - D_2\ r_{(2)}\ r_3 \qquad (4)$$

where $D_2$ stands for the duplication level between viewers of one or other (or both) of the first two spots and viewers of the third spot. Combining equations (3) and (4) now gives

$$r_{(3)} = r_1 + r_2 + r_3 - D\ r_1\ r_2 - D_2\ r_1\ r_3 - D_2\ r_2\ r_3 + D\ D_2\ r_1\ r_2\ r_3 \qquad (5)$$

This is asymmetric in terms of spots. If $D_2$ is set equal to D, which is intuitively a reasonable assumption, then equation (5) simplifies to

$$r_{(3)} = \Sigma\ r_i - D\ \Sigma\ ri\ rj + D^2\ \Sigma\ r_i\ r_j\ r_k \qquad (6)$$

The effect of this approximation does have some implication on the meaning and value of D and also on the consequent tolerance of the predictive formulae. We will show later the implications this move has for the best value of D and the accuracy of fit.

We will also make a further simplification by replacing all the individual ratings by the *average* rating $\bar{r}$, giving

$$r_{(3)} = 3\ \bar{r}\ - 3\ D\ \bar{r}^{2}\ + D^2\ \bar{r}^{3} \qquad (7)$$

which can be justified by practical results. If this argument is applied repeatedly the result for *n* spots turns out to be

$$r_{(n)} = \left(\frac{n}{1}\right)\bar{r} - \left(\frac{n}{2}\right)\bar{r}^{2} + \left(\frac{n}{3}\right)\bar{r}^{3} - \ldots \qquad (8)$$

where $\left(\frac{n}{m}\right) = \frac{n!}{(n-m)!m!}$

and this in turn may be written

$$r_{(n)} = \frac{1}{D}\left(1 - \left(1 - D\bar{r}^{n}\right)\right) \qquad (A)$$

Equation A expresses the coverage of an n-spot schedule in terms of the average rating, the number of spots, and the duplication factor D. Before developing this result further it is interesting to note that (A) may be re-expressed as

$$r_{(n)} = \frac{1}{D}\left[1 - \frac{1}{\left(1 - D\bar{r}\right)^{n}}\right]$$

$$= \frac{1}{D}\left[1 - \frac{1}{1 + nD\bar{r} - \ldots}\right]$$

$$= \frac{n\bar{r}}{1 + nD\bar{r}}$$

Readers may recognise a similarity between this and the Preface formula (Mark I), which was expressed by R. Hulks and S. G. Thomas (Ref. 5) as

$$y = \frac{x}{bx + a}$$

where

$y = r_{(n)}$ = coverage

$x = n\bar{r}$ = total rating

The Preface expression for coverage can now be seen as an approximation to the more exact Equation (A), though as *a* is not constrained to unity so *b* is not necessarily an estimate of D.

**Fitting the model**

The estimation of D was carried out by examining the value implied by Equation (A) for some 280 hypothetical and 80 actual schedules. The hypothetical schedules (each evaluated for five audience groups) were based on a random selection of spots within constraints designed to ensure that all types of schedule of interest were simulated. That is, the length of schedule was varied between 10 and 40 spots; the elapsed time between one and four weeks; the proportion of spots pre 6.30 pm ranged from 30 per cent to 100 per cent; the percentage of spots at weekends ranged from 0 per cent to 100 per cent. The schedules were spread over the four seasons and over four regions: London, Midlands, Lancashire and Yorkshire, and covered five audience groups: Housewives, Housewives with Children, Light-Viewing Housewives (defined as the lightest third of Housewives reporting over the analysis period), Men and Women (an average of the last two naturally gives Adults as well).

It was found during the course of this study that the duplication factor for a pair of spots was inversely related to the maximum rating. Intuitively this is reasonable for if one rating were 100 then D must equal unity in contrast to its average value of 1.8, found when the maximum rating is around, say 20. It follows that D is inversely proportional to the Total TVR of a schedule. Put differently, a schedule with say, 20 spots, and an average rating of 20 has a lower D than a similar length schedule with average rating 15, a result similar to that observed for pairs of programmes by Ehrenberg, Goodhardt and Haldane (Ref. 3).

The proportionality constant in this relationship was found to depend mainly on the season, being markedly smaller in the summer months. All audience groups were very similar in this respect, though for Light-Viewing Housewives the constant was much lower throughout the year, but like the other groups, lower still in the summer. Taking account of all the observed dependencies we formulated the equation

$$D = Audience\ factor\ x\ Area\ factor\ x\left(1 + \frac{Season\ factor}{TotalRating}\right)$$

though our final model also included non-linear terms taking account of the afternoon/evening mix and weekday/weekend mix. A graph demonstrating the good fit of this model is shown in Diagram 1. A further 270 schedules, both real and hypothetical, were used to test the predictive accuracy of the Guide.

**Frequency**

A study of existing models persuaded us to use the Negative Binomial Distribution for the prediction of frequency. It was first employed in Preface, though a significant downward bias in the higher frequencies was apparent in the results presented (see the table in Ref. 5). Our own investigation revealed that this bias was in itself highly predictable; and the effect on the 4 + cover is almost exactly 10 per cent (though different for other frequency groups). This correction was accordingly built into the model. The NBD naturally offers the useful ability of being able to predict all frequency levels, an improvement over AGB's own previous Guide.

We also examined the Beta Binomial Distribution as an alternative to the NBD for generating frequencies. This turned out to be biased in the same way, though by about half as much as the NBD, but no more precise in terms of sampling variation and in view of the much greater computational load we did not pursue the BBD any further.

**Format of the guide**

The Guide is available in five volumes, one per audience category, with seasons and regions in sequence within each volume. Each such combination covers six sides of tables, two sides corresponding to each of 8-12 spots, 13-24 spots and 25-50 spots. Each of the pair of sides contains two tables, the four tables covering the various proportions of afternoon vs. evening spots. Finally each table gives the 1 + and 4 + levels for the weekdays vs. weekend spot ratio (across the top) and a range of total TVRs (down the side). This format has allowed a considerably increased range of schedules to be encompassed within volumes little larger than those of the old AGB Guide.

**Table 1: Accuracy**

| | Estimates within : | | | 0 | ±1 | ±2 | ±3 | ±4 | ±5 | coverage points |
|---|---|---|---|---|---|---|---|---|---|---|
| 1+ | Fitted schedules | 320 | % | 11 | 44 | 60 | 79 | 86 | 93 | |
| 1+ | Test schedules | 135 | % | 11 | 40 | 64 | 74 | 82 | 89 | |
| 4+ | Fitted schedules | 320 | % | 19 | 46 | 75 | 85 | 91 | 96 | |
| 4+ | Test schedules | 135 | % | 16 | 48 | 61 | 71 | 83 | 95 | |

**Base:** Housewives – London, Midlands, Lancashire, Yorkshire

## Accuracy

While our basic aim was to develop a model and Guide of more general and topical applicability than existing Guides, an increase in accuracy on common territory was naturally sought. Table I demonstrates that the accuracy is certainly good. The results for other target groups are comparable. However, comparison of this table with similar tables in other research papers is not meaningful, as all are based on schedules whose inherent 'difficulty' is undoubtedly different. We would welcome a controlled comparison of this Guide to any other available Guide on an agreed common set of schedules.

## REFERENCES


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