A PROPOSAL FOR AUDIENCE MEASUREMENT IN PRINT MEDIA

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ABSTRACT

A major concern among advertisers and media managers is the measurement of net audience coverage achieved by an advertising campaign over time and across combinations of publications. Measures of audience exposure for combinations of publications have been shown to be more accurate when based on audience segments associated with each publication than when based on aggregate exposure to all the publications in the group. This thesis argues that the concept of duplication among audience segments associated with a combination of individual publications is equally applicable to the segments associated with the sections of a single publication. Accordingly, it is the objective of this thesis to demonstrate that audience measures based on audience segments associated with sections of a publication are superior to those measures based on aggregate exposure to that publication.

The fundamental measures of audience exposure are unduplicated audience or net reach, duplicated audience and average frequency of exposure. The relationships among these measures were developed in a theoretical model of intersection duplication. The model was then applied to data drawn from a recent study on a major Canadian newspaper. As any application of the segmented audience concept depends on a simple and accurate method of estimating net reach for a

combination of sections, considerable effort was expended to describe recent research concerning estimation of net reach for combinations of publications and to relate such research to the objectives of this thesis.

It was concluded that segmented audience data are superior to aggregate data as a basis for audience measurement, and therefore, an advertiser must evaluate, according to advertising objectives, the placement of his advertisements and the inherent trade-off between net reach and frequency for a given advertising campaign. The paper closes with some suggestions for further study.

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I am greatly indebted to Professor F. H. Siller for his direction and invaluable assistance in the preparation of this thesis.

CHAPTER I

INTRODUCTION

Purpose

The general objective of this thesis is to demonstrate the inadequacy of unduplicated reach and frequency of exposure calculations for print media, when these measures are based on aggregate audience data.* This thesis will show the superiority of measures based on segmented audience data while at the same time acknowledging the limitations of such measures when advertising campaigns cut across several audience segments. Finally, it will be illustrated that, by definition, unduplicated reach and frequency of exposure measures are inversely related and hence cannot be simultaneously maximized. The latter is an important but often overlooked consideration in the planning of campaign strategies.

Importance of the Study

In evaluating the readership level of print media the fundamental measures of performance are: the unduplicated audience or net reach, the duplicated audience and the average frequency of exposure. However, there has been some justified

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*The reader who is unfamiliar with the terminology of audience research may find a complete definition of terms used in this thesis beginning on page 27.

misgivings about the calculation of these measures and the uses to which they have been put. Dr. L. Bogart of the American Newspaper Publishers Association wrote an article in 1966, published in the Journal of Marketing, severely criticizing audience measurement techniques.[1] He states that total audience figures do not truly represent the market and provide misleading criteria for advertising decision-making. He goes on to state that research effort would be better concentrated in communications and learning theory but he also recognizes the value of studies which attempt to define audiences in more differentiated terms than is done presently. He cites as an example the studies done by Alfred Politz Research.

There has, in fact, been considerable research in recent years to make audience measures more realistic by experimenting with the data provided by Alfred Politz Research and similar studies in Europe. A major effort has been made to relate unduplicated audience and frequency of exposure variables with simplified and operational concepts. Most of the research in print media has been concentrated on magazines. This thesis is an extension of that research.

Generally, the importance of this thesis is to facilitate more efficient advertising decisions by providing more refined measures than the classicial aggregate indicators such as circulation and duplicate audience data. More specifically,

it is intended to relate recent research concerning duplication among magazine audiences to duplication among section audiences within an individual publication, in this case a newspaper. To the advertising decision-maker, this study will demonstrate that aggregate audience measures may not reflect the true nature of an audience's characteristics and will show that there is a trade-off between net reach and frequency of exposure for a campaign in an individual publication. Further, it will point out that to receive the highest return per advertising dollar, the decision-maker must evaluate this trade-off according to his advertising objectives.

Scope and Limitations

This paper will make extensive use of data collected during a recent newspaper readership study. Although these data provide a detailed record of longitudinal readership profiles, certain limitations should nevertheless be cited. First, the original study considered only a single newspaper over a limited period of time and was carried out only in a city having one major newspaper. As a result, although this thesis is intended to be characteristic of all forms of print media, such a generalization may be distorted due to the unique circumstances of the original investigation. Second, the original study was not intended to test the specific hypotheses of this thesis, and, as a result, there are some rather serious gaps in the data that necessitate a reduction

in the sample size. This problem will be discussed more fully in Chapter VI.*

Plan of the Study

Chapter II gives a detailed description of the study from which the data for this paper were drawn. It considers the objective of that project and the method of data collection including a description of the sample and the questionnaire. Chapter III surveys the literature related to the objective of the thesis. It is primarily concerned with net audience estimation and draws on research originated by J. M. Agostini concerning French magazines. Chapter IV states and discusses the research hypotheses. The indices of audience measurement, reach and frequency, are defined, as well as other variables fundamental to the hypotheses. These variables are then related in a theoretical model to demonstrate the logic of the research procedure and the generation of the hypotheses. Chapter V describes the method by which the available data were organized and then analyzed to test the hypotheses of Chapter IV. The method of analysis is the detailed exposition of the theoretical model applied to the data.

Chapter VI considers difficulties in data analysis and presents the research findings with explanation and some

*This problem is referred to again in Chapter II. Discussion is deferred to Chapter VI as familiarity with Method of Analysis (Ch. V) is necessary before the problem can be clarified.

discussion of those findings. Finally, Chapter VII presents conclusions derived from the results as well as from the chapter on related literature. This chapter also discusses implications for the advertising decision-maker and areas for further study.

CHAPTER II

RESEARCH SETTING

The research proposal and data base for this paper were derived from one of a series of ongoing studies being conducted by a newspapers' association. The overall project is intended to study reach, frequency and advertising effectiveness of daily newspapers in Canada. The data used in this paper are those collected in the fall of 1968 in co-operation with the leading newspaper of a major eastern city.

In response to competition from other media, newspapers have increasingly been collecting audience data and developing quantitative advertising effectiveness indicators. The fundamental unit of measurement is "opportunity for exposure," a standard made purposely analogous to those measures used by the broadcast media. For instance, if an individual has his television turned on, he is counted as having had an opportunity to be exposed to commercial messages in a given time period. Similarly, if an individual records having seen a newspaper or part of one, he has had an opportunity to be exposed to its advertising contents. Three levels of "opportunity for exposure" were designated in the study: exposure to the entire newspaper, exposure to the individual pages and exposure to individual quarter pages.

Method of Data Collection

Each Friday morning the respondents received a self-administered questionnaire which was collected later the same day. The questionnaire included an abridged miniaturized version of the previous night's newspaper. Each page of the miniaturized paper was divided into four quarters and the respondent recorded whether or not he had seen the paper, seen particular pages of it and seen particular quarter pages. Due to the different objectives of the source study and limitations on resources, the questionnaire reproduction was abridged. Not every page in the previous night's paper was included in the questionnaire. The resultant difficulties are discussed fully in Chapter VI. The miniaturized newspaper was one among other media questionnaires distributed once a week for six weeks. The reason for including other media questionnaires was to prevent the respondents becoming sensitized to the fact that they were part of a newspaper study.

The respondents to the questionnaire fitted into one of three panels organized on a geographical basis.* The city was divided into two sections. The respondents included in panel A were drawn entirely from one of these geographical sections, the respondents for panel B entirely from the other

*The geographical areas were matched as closely as possible according to demographic characteristics.

section. Both groups were selected randomly within the geographical limitations. Panel C was selected randomly from the entire city. The resulting sample size was 1,220 respondents: 402 in panel A, 404 in panel B and 414 in panel C. The purpose of having three groups of respondents was to test the effect of variations in advertisements. The effectiveness of certain advertising campaigns could be tested by varying their placement and content. Hence panels A, B and C would receive slightly different newspapers and the questionnaires distributed would also vary. This procedure has no relevance for thesis except for the tabulation problems it creates. This paper is not concerned with the effectiveness of campaign content and has no reason to intentionally distinguish among any of the 1,220 respondents. However, such a distinction becomes necessary and again the reader is referred to Chapter VI for further discussion of the problem.

The exposure results for the sample of respondents over the six weeks represent the data base for this thesis. From these, the measures of unduplicated and duplicated audiences and frequency of exposure for various combinations of sections of the newspaper will be derived.

CHAPTER III

RELATED LITERATURE

Considerable research has been conducted in the past few years concerning audience measurement in the print media. The primary objective has been to find a simple method for estimating the unduplicated audience of a combination of magazines. It has been known for some time that when an advertiser places a campaign in a number of publications, the exposure of the campaign will be duplicated due to the fact that there is overlapping readership of those publications. The problem this has created is to distinguish the net unduplicated reach of the campaign without the very extensive and costly tabulation of all the different possible combinations of print media readership. It is worth noting one or two examples which demonstrate the impossibility of actually calculating all the available print combinations. Referring to a German magazine readership study conducted in 1961, Walther Kuhn estimated that for the 44 magazines used in the study there were 17.6 billion combinations.[2] In a similar study in France by the Centre d'Etude des Supports de Publicité (CESP),[3] on which the original research discussed in this chapter was based, the 30 magazines provided 1,073,741,793 combinations.* Even computer assisted, the achievement of

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*The comparable figure for data used in this study (see Chapter VI), though severely limited, is 38,960 possible combinations.

complete results for large studies can be presumed unattainable.

Most of the research conducted in this area has depended upon the development of an empirical relationship between the unduplicated audience of a combination of magazines and the duplicated audience between pairs of magazines included in the combination. J. M. Agostini in the Journal of Advertising Research, March, 1961, was the first to present this estimating procedure.[4] Using actual measures of unduplicated reach and duplicated reach for all possible combinations of 15 of the 30 magazines used in the CESP study (32,767 combinations), Agostini developed empirically a formula for the simple estimation of unduplicated audience for any of the 30 magazines and then tested its generality on a study of leading American magazines. Agostini's method and results deserve careful consideration as they are fundamental to succeeding literature discussed in this chapter and provide interesting implications for the further development of the results to this thesis.

Let a,b,c,...,n represent the different media or vehicles* in a combination and A_a, A_b,..., A_n their respective audiences.

*Agostini uses the word "vehicle" to represent the unit in which an ad can be placed--for his study, each magazine represents a "vehicle"--later, this paper will refer to newspaper sections as vehicles.

$$(1) \qquad A = A_a + A_b + \ldots + A_n$$

Let C equal the net coverage of the combination of media. Because of the duplication among readers of the media C is usually smaller than A.

$$(2) \qquad C = zA \qquad \text{where} \quad 0 \leq z \leq 1$$

The method depends upon the calculation of z from a matrix showing the duplicated audience of all the possible pairs of vehicles in the media combination. D, the sum of these duplications, is the half-sum of the terms in the matrix, as it is symmetrical about the main diagonal. (Fig. 1).

Figure 1[5]

Audience Duplication by Two Vehicles

	a	b	c	. . .	n
a	-	D_{ab}	D_{ac}	. . .	D_{an}
b	D_{ba}	-	D_{bc}	. . .	D_{bn}
c	D_{ca}	D_{cb}	-	. . .	D_{cn}
.	.	.	.	-	.
.	.	.	.	-	.
.	.	.	.	-	.
n	D_{na}	D_{nb}	D_{nc}	. . .	-

Let $x = D/A$

In order to generate x, then the sum of the media audiences (A) and the sum of the pair-wise duplications (D) must be known. Agostini's objective was to demonstrate a relationship between x and z..

(3) $z = f(x)$

> Obviously the greater the duplication between media the less will be the unduplicated audience. The higher the value of D the lower the value of C.
>
> Inasmuch as $x = D/A$ and $z = C/A$, when x increases, z decreases.
>
> When there is no duplication between media the unduplicated audience equals the sum of the audiences. In this case, when $D = 0$, $x = 0$, and when $C = A$, $z = 1$.
>
> Therefore when $x = 0$, $z = 1$.[6]

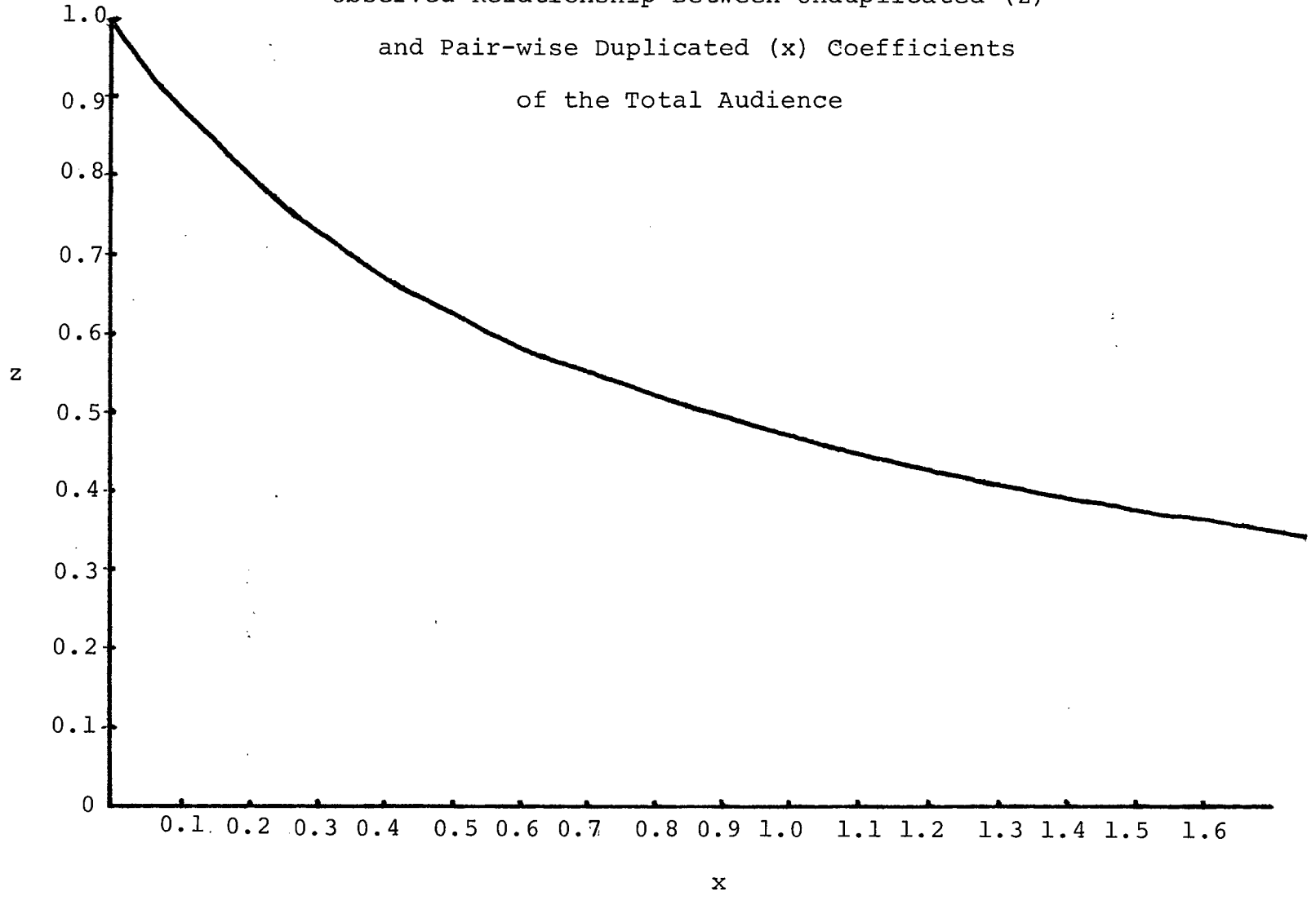
From the available pairs of combinations Agostini selected 98 at random and plotting x against z was able to describe the relationship with a continuous curve (Fig. 2). Actual co-ordinates of x and z were always within 2 percent of the curve. Deducing that the curve was asymptotic to the x-axis, the next step was to develop an equation to fit the relationship:

(4) $$z = \frac{1}{Kx + 1}$$

The curve was found to be accurate where the constant, K, was equal to 1.125.

Figure 2[7]

Observed Relationship Between Unduplicated (z)
and Pair-wise Duplicated (x) Coefficients
of the Total Audience



Having developed his equation, Agostini recognized it may not be useful for data other than the CESP study. Accordingly he used it in further tests of other French magazines finding his estimates of unduplicated audience using K = 1.125 were at the most 2.6 percent off the actual figure. Also, applying the technique to a study of five American magazines, it was found that in 96 testable combinations, 82 were within 1 percent error, 10 cases were between 1 and 2 percent error, and 4 cases were greater than 2 percent, the maximum being 2.7 percent. Hence, Agostini concludes that the estimate of unduplicated audience can be greatly simplified if one knows the total audience of the media and the two-by-two combinations.

The significance for this thesis of the above research, as well as the succeeding research done in the 'Agostini tradition,' is that the model Agostini developed using several publications as vehicles may be equally applicable using intra-publication sections as vehicles. In fact, if it is presumed that people read selectively within a publication and an audience segment can be identified with each 'section' of the publication, then sections would appear to be the exact parallel of Agostini's vehicles. Before any further discussion of this point, however, the generality of the Agostini equation should be examined.

The reaction to the publication was a series of attempts to test the applicability of both the formula and the constant, K. Although well-accepted, there were some general reservations about the Agostini equation. These were perhaps best summarized by John Bower in J.A.R., March 1963.

> The Agostini method is not the only way to estimate unduplicated audiences, but it is probably the least complicated. It is based on the assumption of random readership among homogeneous groups of vehicles. It was constructed and tested on such combinations, i.e., vehicles appealing to the same audience such as general circulation magazines or daily newspapers. There is thus some reason to believe that the technique may not be accurate when applied to combinations of non-homogeneous vehicles.
>
> Another possible source of inaccuracy is the relation between the number of vehicles in the combination and the error in the estimate. The larger the number of vehicles, the more tenuous becomes any relationship between duplications and net audiences.[8]

Using net audiences of American and Canadian magazines Bower conducted tests on seven different studies totalling 640 combinations using the Agostini formula. The weighted average error for the 640 cases was only 3.1 percent. Generally then he accepts the Agostini technique. The results however to some extent bear out Bower's reservations as outlined above. He did find that error was greater for combinations of heterogeneous vehicles, i.e., vehicles appealing to widely varying and hence less duplicated audiences. He admits that he could not prove this conclusively

within the limitations of his data. This may not be of great importance to any conclusions drawn from this thesis. The examples Bower uses are of an extremely heterogeneous character, one in fact involving a language barrier. It can probably be safely assumed that the homogeneity among readers of a newspaper would remove this effect from any application of the Agostini formula. Some of Bower's other results are more interesting. He found that the error increased substantially with the number of vehicles used in the combination. Perhaps more significant, Bower found that although the overall average error was small the formula overestimated the actual z/x relationship in 90 percent of the cases, suggesting that K = 1.125 is too small.

Bower's article is a useful criticism of the Agostini technique. However he is forced to admit that he was not able to carry his research to the extent of providing the appropriate modifications. In the same issue of the Journal of Advertising Research, Marcel Marc, a colleague of Agostini, demonstrated a positive modification to the original formula under circumstances which are to some extent similar to those existing within a publication.[9]

Marc bases his article on the fact that readers of the specialized press seem to be more highly duplicated than with mass magazines. He notes that Agostini's formula was derived empirically and hence should not necessarily be applied

to magazines with radically different types of audiences such as that associated with business or trade publications where reading is necessary rather than entertaining. On this point it appears that Marc supports Bower's hypothesis concerning the larger error where heterogeneous combinations are tested. Marc, however, carries the analysis further. While fully accepting the relationship which Agostini developed between x and z he repeats the analysis for a group of trade magazines testing for a more appropriate value for K. The result was that the exact relationship between x and z were found as that for Agostini's data. However, the appropriate value of K was found to be 1.6 rather than 1.125. To summarize Marc without a detailed report of his analysis, he accepts completely the Agostini technique while forwarding a method for modifying K using a frequency distribution of the population according to the number of magazines read.

The significance of Marc's research is that while recognizing much the same difficulties with Agostini's formula as Bower, he concludes not that K is incorrect at a value of 1.125 but that it may vary under certain circumstances. He works primarily with the varying characteristics of the media audience. At almost the same time J. M. Caffyn and M. Sagovsky, working with British newspapers, came to the same conclusion.[10] They concur that K may vary but on the basis of the number of publications rather than audience characteristics, which was of course the other observation of

John Bower. However their analysis seems weaker than that of Marc's. They do show fairly conclusively that K needs modification according to the changing value of x. However, they attribute the changing value of x to number of publications, as stated above, where it seems an equally logical explanation of the increasing ratio of D to A may be increased duplication of the same combination of media, in other words a highly homogeneous mixture of publications. This would have lead them more completely along the path pursued by Marcel Marc.

Walther Kuhn pursues more conclusively the effect of number of publications considered in a combination.[11] On tests of the Agostini formula on German magazines errors of up to 5 percent were reported. Re-estimating K, Kuhn found that a value of 1.162 gave a more accurate result. At this point Kuhn might well have written a conclusion similar to that of Marc, Bower or Caffyn and Sagovsky. Instead he went on to question the fundamental hyperbolic function independent of the value of K. From the German data, he developed as an alternative an exponential function $z = e^{-K_n x}$. It was of course derived empirically and fitted the data very well with less than 1.8 percent error. However no further tests were undertaken, and no further development of this alternative relationship appears to have taken place. Kuhn's formula then seems to be a dead end but is important as he

demonstrates fairly thoroughly that the simple relationship between net audience and pair-wise duplication may well be affected by the number of publications considered in the set of combinations.

Before discussing further research into Agostini's function and the problems of K, the role of this literature should be considered within the context of the objectives of this thesis. It may prove disappointing to the reader that the hypotheses discussed in the next chapter make no mention of K and no attempt is made to test the "equilateral hyperbola asymptotic to the x-axis," to quote Agostini, using the data of this thesis. In fact, the following chapters are probably more analogous to the CESP study than to the techniques described in the above literature. The reason may already be clear. The 'Agostini research' is based on the already acquired knowledge of duplication among several publications. This thesis, as already noted, is attempting to establish the existence of a similar phenomenon within individual publications using newspaper sections as 'vehicles.' Limitations of data and time prevent further exploration of a relationship between net audience coverage and pair-wise duplication of pairs of newspaper sections. Hence the literature discussed in this chapter refers more to the potential of the proof of the hypotheses than to their justification in terms of present measurement techniques. This latter

aspect of the thesis is expected to be drawn from the logic of the theoretical model discussed in Chapter IV along with the method of analysis and would probably sound redundant if discussed in terms of other readership studies. Simply, then, the demonstration of a simple estimating procedure for net unduplicated audience among different magazines opens an area for speculation concerning intra-publication unduplicated audience.

Further discussion of more complicated research concerning Agostini's formula and the definition of K, then has an increasingly tenuous link to the purpose of the thesis. However it is worth reviewing, perhaps in less detail, if only to show that the Agostini tradition has not been refuted. Two major contributions were made by R. A. Metheringham and P. Hoffmans. Metheringham demonstrated a method for estimating net cumulative coverage and the frequency distribution of a print schedule from pairs of publications and pairs of issues.[12] His method is theoretical and uses a numerical example. The article is interesting in relation to this thesis as he considers duplication within a publication. However, it is only the duplication arising across successive issues of a publication with which he is concerned whereas this thesis also considers duplication across sections within the publication. To discuss in detail Metheringham's method would provide an unnecessary complication to this

chapter. The method is still a variation on Agostini. However, as an interesting by-product of his study, he was able to conclude that the error in estimating K is actually reduced with the number of media used in the combination.

Pierre Hofmans re-iterated the ability of the Agostini approach to provide accurate estimates of unduplicated audiences.[13] Although he calls for modification of the equation, he concludes that it is an accurate method for gathering immediate information. Hofmans, like Metheringham, is concerned about duplication across successive issues of publications. He uses the Agostini equation to develop the net reach for advertising schedules involving multiple insertions in several media.

Much of Metheringham's and Hofmans' work was included in an article by H. J. Claycamp and C. W. McClelland in 1968 which attempts to rationalize and consolidate the state of knowledge concerning K.[14] First, Claycamp and McClelland define K. They conclude is is a parameter, not a constant, describing how mean and variance of a readership distribution are related. In their analysis of data, they use a rather small readership study but their technique is to examine the effect of alternative definitions of readership on K. Their research includes not only alternative combination of publications but combinations over several issues. Their

readership level is calculated on the basis of percentage of available issues read. The authors found that as their definition of readership was relaxed the estimated value of K increased with increases in D/A and C/A. Further examination led them to observe that C/A was underestimated for small and overestimated for larger values of D/A. Finally, K was shown to be highly sensitive to D/A when there are few media in the combination, but as the number of publications and D/A became larger the variance in K decreases.

The authors then ask, according to their own results, "Why is it possible to ignore the variation in K and still obtain close estimates of net coverage...?" By calculating the partial derivate of C/A with respect to K, they state the effect of errors of K on net coverage can be determined. Their results show that errors in specifying K will always result in a less than proportionate error in C/A. Claycamp and McClelland go on to consider problems of cumulative audience which will not be discussed here. It is, however, worth noting the summary to their article as it stands as the conclusive statement to the Agostini research as discussed in this chapter:

> In the preceding sections we have shown that although K is not a universal constant, the empirical formula proposed by Agostini has a sound analytical base and can be used to simplify the problem of estimating reach for advertising campaigns.
>
> In addition we have shown the nature and extent of the biases which result from using the Agostini

> approach, and that simple procedures such as least squares regression can be used to obtain an estimate of K which is appropriate for a given body of data.
>
> In summary, it seems the only thing magical about K are:
>
> 1. It varies within a limited range.
> 2. It is relatively insensitive to specific media--especially if there are many issues and/or media in the combination.
> 3. Its variance decreases sharply as D/A and the number of media in the combination increase.
> 4. Estimates of reach statistics are quite insensitive to specification errors in K.
>
> Hence, if K is properly estimated for a given body of data, errors created by treating it as a constant can usually be ignored.[15]

The above literature can be related to intra-publication audience measurement in three distinct but interdependent ways. First, it must be established that the same measures of duplicated audience and unduplicated audience are equally applicable to intra-publication data as inter-publication data. This was discussed previously and is fundamental to the relationship between the literature of this chapter and the objectives of the thesis. Second, it must be shown that there is a simple relationship between net unduplicated audience and some easily calculable measure of audience duplication such as two-by-two audience combinations. This, in effect, means finding some relationship between newspaper sections which is the same as Agostini's "equilateral hyperbolic curve."

The above review of the "Agostini tradition" is intended to give at least a strong disposition toward the

existence of such a relationship. Third, it must be demonstrated that the calculation of K, as described above, is equally applicable to intra-publication newspaper data. The article of Marcel Marc calling for revision of K upwards for homogeneous combinations of magazines possibly has relevance for newspaper readership. Also Metheringham and Hofmans' concentration on duplication across several issues has probable implications for newspapers where repetitive and cumulative advertising effects are important. In short, once the relevance of Agostini's technique to intra-publication data is established, the establishment of 'special K' for newspaper audiences and audience segments should provide similar problems as those discovered above.

As noted before, this thesis will attempt to establish the first of the above relationships, in effect, all but proving the applicability of the Agostini research. The general objective of this thesis is to show the superiority of segmented audience measures over aggregate audience measures. To the extent that it is possible to demonstrate such a measure of unduplicated audience yet not provide a simple and workable method of calculation other than the rather laborious method of Chapter V or such studies as CESP, the proof of the hypotheses would have little practical significance. Hence the above literature is an important justification of the thesis' objectives.

CHAPTER IV

HYPOTHESES AND THEORETICAL MODEL

As stated in the purpose of this study, general aggregate audience figures can be refined by the use of segmented audience measurement. The weakness of aggregate audience figures is that they are only reliable if each reader reads the newspaper exhaustively from cover to cover. Exhaustive readership, it can be argued, is not a realistic description of most individuals' newspaper reading habits if for no other reason than the reader's lack of time. Therefore the need for segmented audience measures.*

For the advertiser who wishes to place a campaign in a number of magazines, it is necessary to recognize that there may be multiple magazine readership among the total audience he is trying to reach and hence a source of duplication of exposure to the campaign. Using this, the advertiser may wish to maximize his reach by spreading his campaign through widely differentiated magazines or he may wish to maximize frequency for a smaller audience segment by

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*As an interesting extension it is worth noting that there are only three possible ways to read a newspaper: (1) exhaustively--a method discounted above, (2) randomly, or (3) selectively. While for this thesis either random or selective readership would show the desired numerical results, only selective readership would attach any meaning to those results. Fortunately, random behaviour is not considered to be a human characteristic and further, the theory of selective apperception provides an intuitive bias in favour of selective readership.

concentrating and repeating his campaign in only one or two magazines. He cannot maximize both. This essentially is the logic behind the research done in the Agostini tradition. The hypotheses stated below will attempt to expand this research by applying the same trade-off concept to the sections within an individual publication.

Hypotheses

The hypotheses for this thesis are best stated in terms of an advertising campaign to be placed in a newspaper:

(1) for a given advertising campaign,

(a) reach and frequency of exposure figures based on aggregate audience data will not represent the true measures of reach and frequency for the campaign.

$$DA_{agg} \neq DA_{c}$$

$$UDA_{agg} \neq UDA_{c}$$

$$F_{agg} \neq F_{c}$$

DA = duplicated audience

UDA = unduplicated audience

F = frequency of exposure.

(b) segmented audience measures of reach and frequency will be accurate if and only if

the campaign does not cut across segmentation boundaries.

$$DA_{secx} = DA_c \quad \text{where } c \in x$$

$$UDA_{secx} = UDA_c$$

$$F_{secx} = F_c$$

(2) the reach and frequency of exposure for any given campaign cannot be simultaneously maximized.

$$f(F_{c_{max}}, UDA_{c_{max}}) = 0$$

$$\text{as } F = f\left(\frac{1}{UDA}\right)$$

Description of the Relevant Variables

Sections: An advertiser, when placing an advertising campaign in print media, can distinguish several different magazines or newspapers. Similarly, if he so wished, he could distinguish different sections within a magazine or newspaper. This study defines three types of sections. First, there are physical sections, the number of physical units into which the paper can be divided. Each of these units is begun with a new front page, that is, the first page of the second section is labelled in the paper as the 'second front page.' Next, there are indexed sections which are listed in the index at the front of the paper such as sports and finance. There are often two

or three indexed sections in each physical section. Finally, there are content sections which, although they can occur anywhere in the paper are identified according to carefully defined categories of subject material.

The model below and the research procedure call for defining one of the above as sections for the purpose of this study. It was decided to select indexed sections. Consider for a moment the role that a 'section' plays in relation to the study's objectives and procedure. First, as will be discussed shortly, it serves as a mechanism for identifying audience segments. It is the unit by which the reader selects what he shall read. Second, it also serves as the 'vehicle' for the placement of an advertising campaign. Indexed sections, it can be argued, represent the appropriate balance between these roles. Physical sections, though easily distinguishable as vehicles, may not represent very distinct audience segments because of their variety of content. Content sections, though representing the most appropriate unit for reading selectivity and audience segmentation, lack easy physical identification for campaign placement. Indexed sections, on the other hand, are easily identified physically and their content is sufficiently restricted to distinguish among them while in themselves remaining highly homogeneous. Indexed sections, then intuitively seem the most appropriate although the analysis could be performed using any of the three definitions.

Readers: The advertiser is of course concerned with the number of people who read the individual sections of the paper and as a result have the opportunity to be exposed to his campaign. The readership associated with a section is an audience segment. Hence a reader must be defined. A decision on the degree of readership within a section has to be made in order to designate a respondent as a reader or non-reader. For instance, if an individual reports having read 50 percent or more of a section, he could be designated as a reader. Similarly, the level could be set at 10 percent or 90 percent. There is no *a priori* way to choose what this level should be independent of in an investigation of the data. If 90 percent were designated, the number of qualifying respondents might be too small to form a reliable sample. If 10 percent were chosen, the number of qualifying respondents might be too large to effectively distinguish one section readership from another. An appropriate balance is needed and hence the designation of readership level must await an investigation of the results in Chapter VI.*

Duplicated audience: The duplicate audience figure measures the aggregate of all readers for a combination of sections

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*Because the data used in this thesis were previously collected in another study, the analysis is constrained by a pre-determined sample size. Hence it is necessary to consider what effect varying readership level will have on the data in order to select one which will provide significant results.

across a number of weeks. To the advertiser it is the total number of exposures his advertisements receive. Each time a reader reads a section he contributes to the duplicate audience figure, no matter if he has read other sections during the same week or the same section the week before.

Unduplicated audience: The unduplicated audience or net reach figure measures the aggregate of all readers for a combination of sections or the whole paper across a number of weeks who have looked at the section or paper one or more times but are only counted once. To the advertiser this is the total number of people who have been exposed to his campaign at least once.

Frequency of exposure: This is the average number of times a reader is exposed to a combination of sections or the whole paper. This figure can be found by dividing the total number of exposures by the number of readers.

In the above definitions what determines the sections or combinations of sections for which the measures are calculated is the combination of sections into which the advertiser places his messages. Hence when this paper refers to a combination of sections for the purpose of determining duplicate audience, unduplicated audience and frequency it is in effect referring to the measurement of exposure for a mix of certain advertising locations within the newspaper.*

*Note that measures calculated for entire paper represent one of the possible placement combination.

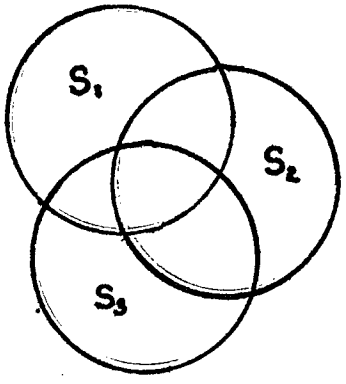
The Model

The three variables described above, duplicated audience, unduplicated audience and frequency of exposure are the fundamental tools of media audience measurement. The proof of the research hypotheses depends primarily on the derivation of these figures. The purpose of developing the following model is to delineate the theoretical relationships between the variables.

For the purposes of the model definitions of sections and readership will be assumed. In effect, then, there will exist a number of sections and a set of readers (audience segment) associated with each. Also, for reasons of simplicity, the procedure will be demonstrated for only one week or issue, a restriction which later must be relaxed.

Suppose an advertiser decides to place identical advertisements in each section of a three section newspaper. Suppose further, that the readership pattern of that newspaper can be characterized as follows (Fig. 3):

Figure 3



S_1 = set of readers associated with section 1.

Certain readers read section 1 and nothing else, some only section 2, some only section 3, but some read two of the sections and others all three. To calculate the duplicate audience for the entire paper, the readerships of the sections are merely aggregated. Hence the total number of exposures to the advertising campaign is derived. However this figure obviously overestimates the net reach of the newspaper as some people who read more than one section are double or triple counted. Therefore the calculation of the net unduplicated audience must delete this source of error.

Let DA = duplicated audience

UDA = unduplicated audience

S_1, S_2, S_3 = readership of sections 1, 2 and 3,

then,

$$(1) \quad DA_{S_1,S_2,S_3} = S_1 + S_2 + S_3$$

$$(2) \quad UDA_{S_1,S_2,S_3} = S_1 + S_2 + S_3 - (S_1 \cap S_2) - (S_2 \cap S_3) - (S_1 \cap S_3) + (S_1 \cap S_2 \cap S_3)$$

Frequency of exposure, as stated, is the average number of times readers are exposed to the advertisement which in this model was placed in each section of the paper.

$$(3)\quad F_{S_1,S_2,S_3} = \frac{(\text{total number of exposures})_{S_1,S_2,S_3}}{(\text{number of readers})_{S_1,S_2,S_3}}$$

$$= \frac{DA_{S_1,S_2,S_3}}{UDA_{S_1,S_2,S_3}}$$

The purpose of the above model is only to demonstrate the concept of audience measurement on a section basis. The actual computation is complicated by the fact that duplication over several weeks must be netted out of the duplicate reach figure before the above model can be applied, that there may be more than three sections and that the advertiser has the ability to place his advertisements in a widely varying pattern. Consider the cumulation of readers over the weeks. Each time a reader reports reading a section in which an advertisement is placed, he adds to the duplicate audience and frequency figures but not to the net unduplicated audience. The theoretical procedure for subtracting this source of duplication is identical to the model described above except that S_1, S_2 and S_3 would represent the readership of the same section over three successive weeks. Some people only read the section once over the three weeks, some twice, some all three times.*

*In the actual method of analysis in Ch. VI this procedure is carried out before calculating inter-section duplication--thus the original model pp. 31-33 still applies.

The fact that the actual analysis may involve more than three sections necessitates generalization of the model and later the method of analysis to n sections. The generalized model follows the same format as above:

$$(1) \quad DA_{S_1,S_2,S_3,\ldots,S_n} = \sum_{x=1}^{n} S_x$$

$$(2) \quad UDA_{S_1,S_2,S_3,\ldots,S_n}$$

$$= S_1 \cup S_2 \cup S_3,\ldots,S_n$$

$$= \sum_{x=1}^{n} S_x$$

$$- \left[\sum_{x=1}^{n-1} \sum_{y=x+1}^{n} (S_x \cap S_y) \right]$$

$$+ \left[\sum_{x=1}^{n-2} \sum_{y=x+1}^{n-1} \sum_{z=y+1}^{n} (S_x \cap S_y \cap S_z) \right]$$

$$\vdots$$

$$- (-1)^n \left[\sum_{x=1}^{n-(n-1)} \sum_{y=x+1}^{n-(n-2)} \sum_{z=y+1}^{n-(n-3)} \cdots \right.$$

$$\left. \cdots \sum_{k=n}^{n} (S_x \cap S_y \cap S_z \cdots \cap S_k) \right]$$

$$(3) \quad F_{S_1,S_2,S_3,\ldots,S_n} = \frac{DA_{S_1,S_2,S_3,\ldots,S_n}}{UDA_{S_1,S_2,S_3,\ldots,S_n}}$$

Referring again to the three section model, suppose now that there is a second time period. Assume further that an advertiser places two advertisements in the first two sections for week 1 and an advertisement in each of the first and third sections for week 2. First, calculate the duplicate audience of the campaign in week 1:

$$(5) \quad DA_{c_1} = DA_{sec1,wk1} + DA_{sec2,wk1}$$

where $c \in 1+2$ in week 1

Next, calculate the duplicate audience of the campaign in week 2:

$$(6) \quad DA_{c_2} = DA_{sec1,wk2} + DA_{sec3,wk2}$$

where $c \in 1+3$ in week 2

The duplicate audience of the campaign is:

$$(7) \quad DA_c = DA_{c_1} + DA_{c_2}$$

$$= DA_{sec1,wk1} + DA_{sec1,wk2} + DA_{sec2,wk1} + DA_{sec3,wk2}$$

By contrast, calculate the aggregate duplicate audience of the paper, regardless of the campaign placement:

$$(8) \quad DA_{agg} = DA_{sec1,wk1} + DA_{sec2,wk1} + DA_{sec3,wk1} + DA_{sec1,wk2} + DA_{sec2,wk2} + DA_{sec3,wk2}$$

Although present audience measurement techniques recognize the concept of duplication, the procedures tend to aggregate and average data over sections and over time thus, in a sense, hiding what could be significant data for better campaign design. Hence hypothesis 1(A) tests whether or not a less than exhaustive campaign placement (Eq.7) will provide the same reach and frequency as would an exhaustive placement over that combination of sections and weeks designated in the campaign (Eq.8).*

As the objective of this thesis is to demonstrate that segmented audience data provide a superior basis for campaign measurement than aggregate audience data, the inference is clearly that the exposure results to the above campaign should be calculated on the basis of the audience segments associated with each section. This method of calculation would obviously be superior if the campaign consisted of two advertisements placed successively in section 1; however, it consists of four advertisements and cuts across three sections. Clearly then, the exposure results for section 1 do not represent the actual exposure to the campaign. Furthermore, the exposure results for section 2 do not reflect the exposure of campaign in that sections because only one of the available weeks is used. Hence hypothesis 1(B) reflects the limitations of the segmented audience concept. However, the proof of hypothesis 1(B) does not negate the use of audience segments as will be demonstrated in the findings of this study.

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*Equations 7 and 8 refer to only duplicated audience--the results will be demonstrated for unduplicated audience and frequency as well.

As a corollary to the above analysis, it is obvious that if the concept of segmented audiences describes readership patterns correctly, the advertiser has a decision to make concerning the net reach of the campaign and the frequency of exposure of the audience to it. He can maximize unduplicated audience by spreading his campaign through the different sections. Alternatively, he can maximize frequency by concentrating the campaign in a single section. Hence hypothesis 2.*

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*The appropriate trade-off between reach and frequency is a function of the objectives of an advertising campaign. For example, suppose an advertiser designs a campaign with the objective of reaching a limited audience segment. His strategy may be to stimulate learning by repeated exposure of his advertising messages to that audience. In placing the campaign he would be concerned with selecting that section of the newspaper most heavily read by the relevant audience segment. He could then concentrate his campaign in that section and thereby maximize the average frequency of target audience exposure.

Alternatively, an advertiser may design a campaign which does not differentiate among particular audience segments. The strategy would be to expose as broad a percentage of the total newspaper audience as possible to the campaign. By placing advertisements across many sections, especially those with low overlapping readership, he would be attempting to maximize reach while sacrificing duplication of exposure to the campaign.

In these or similar situations, the net reach and frequency of exposure of alternative campaign placements will obviously have significance for the design of an overall advertising strategy. It is the purpose of hypothesis 2 to show that a trade-off between reach and frequency does exist and does bear upon the advertisement placement decision process. However it is beyond the scope of this paper to link placement strategies to specific advertising objectives other than to demonstrate that such a link exists.

CHAPTER V

METHOD OF ANALYSIS

This chapter will describe in practical terms the procedure for drawing the necessary information from the data base and a method of analysis consistent with the theoretical model outlined in Chapter IV.

There were 1,220 respondents to the questionnaire and 35 computer source cards associated with each respondent. Cards 25 to 35 contain demographic and psychological data which are not of direct relevance to this study. Cards 1 to 24 are arranged in six groups of four, each group representing answers to questionnaires on the broadcast, as well as the print media, for a specific week. Only the last two cards of each group contain newspaper data, for instance cards 3 and 4 of group (week) 1, 7 and 8 of group (week) 2, etc.

In raw form the data were arranged by type of card rather than by person. As it is necessary for this study to aggregate the total readership by section, the cards first had to be sorted. The resulting arrangement grouped the data for respondent 1 together and in order, followed by the data for respondent 2 and so forth. It was noted before that the respondents were to indicate whether or not they read or saw the paper, individual pages and individual quarter pages. Their responses: yes, no or no response, are indicated on the appropriate data card.

It was also noted before that this study will designate indexed sections as the appropriate definition of section. Each such section is represented on the data cards by a group of quarter page responses. By aggregating the positive questionnaire responses within a 'section' and comparing the percentage to the designated readership-nonreadership level, it can be determined whether or not a respondent can be classified as a reader:

$$C_{ij} = \emptyset \text{ if } \frac{\Sigma q}{Q} < R_{ij}$$

$$C_{ij} = 1 \text{ if } \frac{\Sigma q}{Q} \geq R_{ij}$$

where Q = total quarter page responses for a section

q = positive responses

R_{ij} = readership level.

The data tabulation procedure can now be clarified by the use of a matrix. The cells in the matrix (C_{ij}) are filled with a 1 or $\emptyset$ depending respectively on whether or not the reader is above the required readership level. Note that the matrix (Fig. 4) compares sections and people for a single time period. Later the results will be aggregated over the weeks.

Figure 4

Individual Section Readership

sections / respondents	1	2	. . . . .	N-1	N
person 1	C_{ij}	C_{ij}	. . . . .	C_{ij}	C_{ij}
person 2	C_{ij}	"	. . . . .	"	"
	.	.	. . . . .	.	.
	.	.		.	.
	.	.		.	.
	.	.		.	.
person T-1	"	"	. . . . .	"	"
person T	"	"	. . . . .	"	"
	S_1	S_2	. . . . .	S_{N-1}	S_N

By totalling the columns the number of respondents who read section 1 can be determined (S_1), the number of respondents who read section 2 (S_2), and so forth.

Referring back to the theoretical model in Chapter IV it will be remembered that the research method called for deleting duplication caused by multiple section readership. Hence, matrices similar to the above can be developed for multiple section readers:

Figure 5

Multiple Section Readership

sections / respondents	1&2	1&3	. . .	1&N	2&3	. . .	N-1,N
person 1	C_{ij}	C_{ij}	. . .	C_{ij}	C_{ij}	. . .	C_{ij}
person 2	C_{ij}	"	. . .	"	"	. . .	"
	.	.		.	.		.
	.	.		.	.		.
	.	.		.	.		.
person T-1	"	"	. . .	"	"	. . .	"
person T	"	"	. . .	"	"	. . .	"
	$S_{1,2}$	$S_{1,3}$	. . .	$S_{1,N}$	$S_{2,3}$	. . .	$S_{N-1,N}$

By totalling the columns the following information can be derived:

$S_{1,2}$ respondents read both sections 1 and 2

$S_{1,3}$ respondents read both sections 1 and 3

.

.

.

$S_{N-1,N}$ respondents read both sections N-1 and N

Similarly, matrices for 3,4,...,N section readership can be tabulated.

First, then, the duplicated audience must be calculated over w = 6 weeks. For a single section (#1 in Fig. 4) the audience was S_1. The duplicate audience for that same section over "w" weeks is:

$$DA_{sec1} = \sum_{w} S_1$$

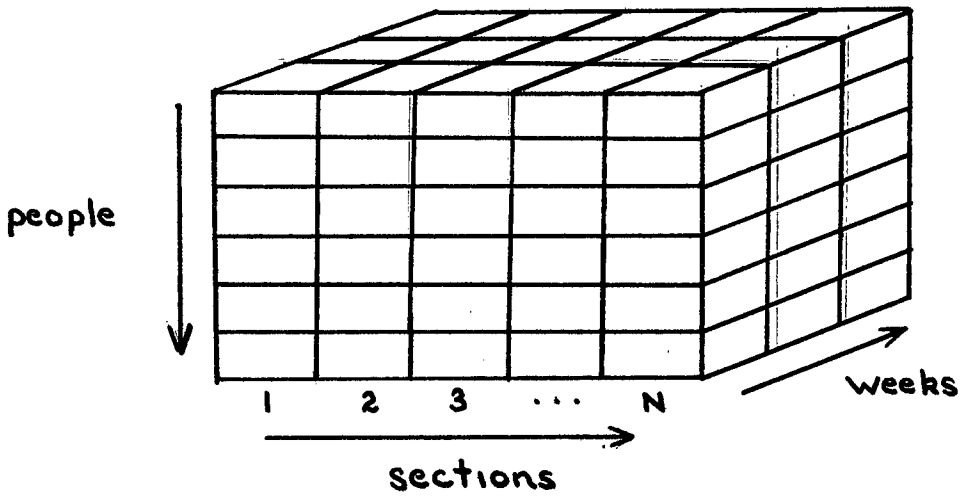
Similarly the duplicate audience may be calculated for any combination of sections or all the sections in the newspaper over "w" weeks:

$$DA_{sec1,\ sec2,\ldots,secN} = \sum_{w} S_1 + \sum_{w} S_2 + \ldots + \sum_{w} S_N$$

Now, the calculation of the unduplicated audience is more complex. It involves calculating the net reach of a section over the weeks and then the net reach of a combination of sections. The net reach of a combination of sections will not simply be equal to the sum of the net reach of the sections due to inter-section duplication. Thus, the following two step procedure is designed to get rid of both sources of duplication, that which occurs across the weeks and that which occurs across sections.

The block of data now appears as in Figure 6:

Figure 6



Consider first, single sections over 'w' weeks. Each cell in the block will have been filled with either 1 or ∅ it will be recalled indicating readership or non-readership.

$(C_{ij} = 1 \text{ or } \emptyset)$

$$X_{ij} = \emptyset \quad \text{if} \quad \sum_{w} C_{ij} = \emptyset$$

$$X_{ij} = 1 \quad \text{if} \quad \sum_{w} C_{ij} \neq \emptyset$$

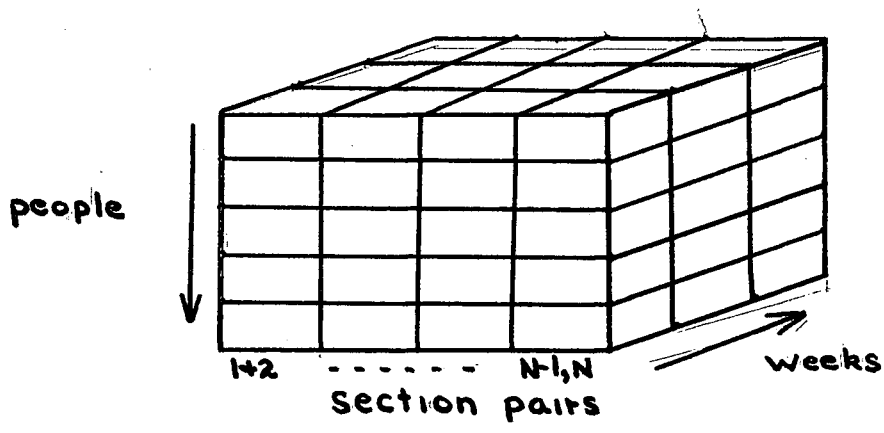
This procedure compiles the results over the 'w' weeks and eliminates that source of duplication. Once completed, the result is simply a section/people matrix indicating whether or not each person read a section at least once.

In order to calculate the total net readership of the sections, it is only necessary to sum X_{ij} over T (the number of readers)

$$NR_N = \sum_{i=1}^{T} X_{ij}$$

However as noted above, merely aggregating the net reach of the sections will not produce the unduplicated reach of the paper. Respondents who read multiple sections are still double counted. Therefore it is necessary to calculate multiple section readership by going through a similar procedure as before:

Figure 7



$$X_{ij} = \emptyset \text{ if } \sum_{w} C_{ij} = \emptyset$$

$$X_{ij} = 1 \text{ if } \sum_{w} C_{ij} \neq \emptyset$$

$$NR_{pairs} = \sum_{i=1}^{T} X_{ij}$$

The process is similar for all combinations of sections.

The computation of the joint reach of a combination of sections yields the duplicate exposure and hence the intersection described in the theoretical model. For any combination of sections or for the whole paper it is then possible to compute the unduplicated audience. Assuming a three section newspaper:

$$UDA_{1,2,3} = NR_1 + NR_2 + NR_3 - NR_{1+2} - NR_{1+3} - NR_{2+3} + NR_{1+2+3}^{*}$$

The frequency of exposure is then simply calculated from duplicated and unduplicated audience

$$F = \frac{DA_{1,2,3}}{UDA_{1,2,3}} = \frac{\sum_w S_1 + \sum_w S_2 + \sum_w S_3}{NR_1+NR_2+NR_3-NR_{1+2}-NR_{1+3}-NR_{2+3}+NR_{1+2+3}}$$

This figure can be calculated for individual sections as well as for any combination of sections. Hence the derivation of the indices fundamental to the research hypotheses. It remains only to demonstrate the relationships set out in the hypothesis.

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*Some confusion may result when comparing this equation with equation (2) of the model in Chapter IV. In the model S was substituted for NR above. The model, it will be remembered, was concerned with only one time period. The method of analysis derived S on page 34 but it is only equal to NR in a single time period. NR differs from S because it has eliminated duplication over the weeks.

Appendix

A logical question concerning the above method of analysis is how does one isolate the exposure results of a campaign which uses only certain sections and issues of the newspaper. The method appears to allow only the results of large combinations of sections and weeks. The answer is simply that the computer programming is adjusted for each campaign so that only the exposure results of the relevant sections are read by the computer. The program proceeds to compile the exposure results as it would do if all the sections and issues were included. The effect given at the end is that none of the respondents read any of the section/week cells in which there was no campaign placement. This enables the recording of the exact exposure results for the cells in which the campaign was placed.

CHAPTER VI

SUMMARY OF RESULTS

This chapter presents and discusses the exposure results to a series of hypothetically placed advertising campaigns. However, before relating the actual findings, two problems must be considered which were left unresolved because of the need to examine the data before drawing conclusions: the missing data and the readership level.

The Problem of the Missing Data

As outlined in Chapter II, the data used in this study were not collected with the exact objectives of this thesis in mind. The vehicles of campaign placement as described previously are the sections and issues of the newspaper. Unfortunately, the abridged questionnaire did not reproduce every quarter page in every week. Frequently, in fact, there was no representation of a section in a particular week. Hence the questionnaire did not always provide an opportunity for the respondent to indicate whether or not he had been exposed to particular indexed sections. Consider again for a moment Fig. 6 in the method of analysis. It is possible to draw from that block a section/week matrix describing the available placement opportunities for an advertising campaign. If there were, for example, no pages from the sports section in week 3

reproduced in the questionnaire, there would be a blank in the section/week decision matrix. The problem is further complicated by the fact that panels A, B and C received slightly different newspapers and hence the missing section/week cells were not the same in each panel.

This does not seriously alter the logic of the research procedure. The aggregate exposure results for the newspaper could be redefined as the aggregate for the sections and issues which were available and campaign exposure would still be correct as long as the campaigns were placed in the section/week cells for which results are available. However this constraint proved to be an awkward limitation. When the three panels were merged the resulting decision matrix appeared as in Fig. 8. Where 'S_iW_j' appears results could be tabulated across all three panels for that cell. Where 'X' appears the questionnaire was lacking in at least one of the three panels.

Figure 8

		Sections			
		Sports	Finance	Women	Entertainment
Weeks (Issues)	1	S_1W_1	X	X	S_4W_1
	2	S_1W_2	X	S_3W_2	X
	3	S_1W_3	X	X	X
	4	S_1W_4	S_2W_4	S_3W_4	X
	5	S_1W_5	S_2W_5	S_3W_5	X
	6	S_1W_6	X	S_3W_6	X

The choice of the four sections: sports, finance, women's and entertainment appeared to provide the most complete results of the available indexed sections. The above matrix obviously limits seriously the ability to develop hypothetical advertising campaigns which an advertiser might logically place in a newspaper.

It was decided then to conduct the analysis on a segment of the available data. While providing more complete exposure results this decision had to be made at some sacrifice to sample size. Panel A was chosen and is depicted in Fig. 9.

Figure 9

		Sections			
		Sports	Finance	Women	Entertainment
Weeks (Issues)	1	S_1W_1	S_2W_1	S_3W_1	S_4W_1
	2	S_1W_2	S_2W_2	S_3W_2	S_4W_2
	3	S_1W_3	S_2W_3	S_3W_3	X
	4	S_1W_4	S_2W_4	S_3W_4	X
	5	S_1W_5	S_2W_5	S_3W_5	X
	6	S_1W_6	S_2W_6	S_3W_6	X

The sections sports, finance and women's over the six weeks provide the largest complete block of data available. The entertainment section was included to demonstrate the

validity of the procedure even though there are gaps existing in the data. The fourth section also provides more variety in the placement of advertising campaigns. Panel A provides 20 section/week alternatives for placement of advertisements as compared to 24 if the data were complete. The comparison of campaign results will remain legitimate as long as none of the campaigns make use of the entertainment sections in weeks three to six. The matrix in Fig. 8 for all three panels provides only 13 placement alternatives for advertisements. As noted before there were 1,220 respondents to the questionnaire for panels A, B and C combined. For panel A the sample size is 402.

Readership Level

The exposure results of all the hypothetical campaigns used in this thesis, as well as the aggregate exposure for panel A were calculated on the basis of four different readership levels: .1, .25, .5, .75. The reasons for this were discussed in Chapter IV. The hypotheses were tested primarily upon the basis of 16 campaigns representing alternative placements of six advertisements. To select the most appropriate readership level the net reach results for the 16 campaigns were used. The table below (Table I) indicates the range within which the net reach of most of the campaigns fell as a percentage of sample size.

TABLE I

Readership Level	Net Reach as Percent of Panel A for six-ad Campaigns
.1	78 - 86 Percent
.25	68 - 82 Percent
.5	47 - 74 Percent
.75	36 - 59 Percent

At a readership level of .1, then, at least 78 percent and not more than 86 percent of panel A was exposed to each campaign. The difficulty with such a high level of exposure is that because of the extensive duplication of readers across the newspaper, it would not allow the identification of audience segments that were significantly different from each other. From another point of view, it would be difficult to justify a respondent who reported having been exposed to 10 percent of a section as a reader of that section. The placement of an advertisement in a section could hardly guarantee results. A readership level of .25 suffers the same kind of difficulties but of course to a lesser degree. At levels of .5 and .75, the identification of distinct audience segments becomes more realistic. Also, at these levels the advertiser can be sure that those people who are exposed to the section are in fact actual readers of that section. Another input into the selection of the most appropriate readership level

is, of course, the quality of the advertisement. To the extent that it is a large, eye-catching advertisement a readership level of .25 or perhaps .1 may be enough as far as the advertiser is concerned.

As this thesis depends upon hypothetical advertising campaigns, the factors discussed above have no identifiable influence. Hence, all things equal, it was most appropriate to select .5 as the readership level. All results presented in the remainder of this chapter are thus calculated at the .5 level. The results obtained at other readership levels are presented in the appendices to the thesis.

Presentation of Results

Hypothesis 1(A) stated that reach and frequency of exposure figures based on aggregate audience will not represent the true measures of reach and frequency for the campaign. The calculation of measures based on aggregate data assumes that the campaign has achieved complete audience coverage. The proof of the hypothesis lies in demonstrating that a less than exhaustive campaign placement will not provide the same reach and frequency as would an exhaustive placement over that combination of sections and issues designated in the campaign. Thus a campaign consisting of twelve advertisements placed in some logical pattern across four sections and six weeks would not provide the same results as a campaign placed in each section every week.

Six hypothetical advertising campaigns of sizes six, twelve and eighteen advertisements were selected from the array of placement possibilities in panel A. They are described below and use the same notation as in Fig. 9:

Campaign 1(A): Six successive advertisements placed for six issues in one section (sports)

S_1W_1, S_1W_2, S_1W_3, S_1W_4, S_1W_5, S_1W_6

Campaign 1(B): Two advertisements placed in each of three sections, one in the first issue and one in the sixth issue

S_1W_1, S_1W_6

S_2W_1, S_2W_6

S_3W_1, S_3W_6

Campaign 2(A): Four advertisements placed in each of three sections, two in the first two issues and two in the last two issues

S_1W_1, S_1W_2, S_1W_5, S_1W_6

S_2W_2, S_2W_2, S_2W_5, S_2W_6

S_3W_1, S_3W_2, S_3W_5, S_3W_6

Campaign 2(B): Two advertisements placed in each of three sections in the first two issues and six advertisements placed in the remaining section for six successive issues.

S_1W_1, S_1W_2

S_2W_1, S_2W_2

S_3W_1, S_3W_2, S_3W_3, S_3W_4, S_3W_5, S_3W_6

S_4W_1, S_4W_2

Campaign 3(A): Six advertisements placed in each of three sections for six successive issues

S_1W_1, S_1W_2, S_1W_3, S_1W_4, S_1W_5, S_1W_6

S_2W_1, S_2W_2, S_2W_3, S_2W_4, S_2W_5, S_2W_6

S_3W_1, S_3W_2, S_3W_3, S_3W_4, S_3W_5, S_3W_6

Campaign 3(B): Six successive advertisements placed for six successive issues in one section, five advertisements placed in each of two sections excepting issue 3, two advertisements in the fourth section for the first two issues.

S_1W_1, S_1W_2, S_1W_3, S_1W_4, S_1W_5, S_1W_6

S_2W_1, S_2W_2, S_2W_4, S_3W_5, S_3W_6

S_3W_1, S_3W_2, S_3W_4, S_3W_5, S_3W_6

S_4W_1, S_4W_2

Aggregate: Exhaustive placement of advertisements in each available section and issue of the newspaper.

S_1W_1, S_1W_2, S_1W_3, S_1W_4, S_1W_5, S_1W_6

S_2W_1, S_2W_2, S_2W_3, S_2W_4, S_2W_5, S_2W_6

S_3W_1, S_3W_2, S_3W_3, S_3W_4, S_3W_5, S_3W_6

S_4W_1, S_4W_2

Comparison of the exposure results (Table II) demonstrates conclusively that the use of aggregate data overestimates exposure results for actual advertising campaigns. The aggregate based measure of duplicated audience is almost four times as great as actual duplicated audience for campaigns of six advertisements. [1(A) and 1(B)]. The aggregate measure of unduplicated audience exceeds those for campaigns 1(A) and 1(B) by at least 30 percent and a similar camparison for frequency yields a discrepancy of at least 125 percent. As the campaign size increases to twelve and then eighteen advertisements the error caused by using aggregate data decreases accordingly. This is to be expected as the campaign size approaches an exhaustive placement of advertisements in each available section and issue. However the degree of error resulting from the adjustment of the campaign size is of secondary importance. The fundamental conclusion to be drawn from Table II is that aggregate audience based measures of duplicated reach, unduplicated reach and frequency of exposure clearly overestimate the exposure to actual advertising campaigns. Hence according to the criteria outlined on page 52, hypothesis 1(A) has been

proven. However consider for a moment a campaign which consists of twenty advertisements and is placed exhaustively through the available section/issue combination.

TABLE II

	Campaigns						
	1(A)	1(B)	2(A)	2(B)	3(A)	3(B)	Aggregate
Duplicated Audience	508	596	1121	1398	1680	1831	2018
Unduplicated Audience	193	256	290	320	306	330	331
Frequency of Exposure	2.64	2.33	3.87	4.37	5.49	5.55	6.10

In what manner would measures based on aggregate data not reflect the true measures for this specific campaign? The answer lies not in what the aggregate measures state but in what they do not state. In fact they are accurate but they imply equitable exposure to the different sections of the newspaper which is not the case. Table III gives a breakdown of the newspaper exposure into the audience segments associated with each section. At this point all that need be said is that the aggregate based figures are misleading in the sense that they average out the rather considerable discrepancies among the audience segments. Some of the implications of Table III will be discussed at a later point. Extending this analysis to the results given in Table II, there is further support to

hypothesis 1(A). Audience measurement based on aggregate data, then, do not represent the true measures of an advertising campaign. It has been implied that measures based on segmented audience data give better results but clearly there is a limitation involved in such a conclusion. This is the subject of the next hypothesis.

TABLE III

	Sports	Finance	Women's	Entertmt.*	Aggregate
Duplicated Audience	508	439	733	338	2018
Unduplicated Audience	193	170	213	222	331
Frequency of Exposure	2.64	2.58	3.44	1.52	6.10

Hypothesis 1(B) stated that segmented audience measures of reach and frequency will be accurate if the campaign does not cut across segmentation boundaries. It is necessary then to demonstrate the exposure results of campaigns which are placed exclusively for particular audience segments as well as campaigns placed to reach several audience segments. The following set of hypothetical campaigns is designed to provide comparable results. Again the same notation as in Fig. 9 is used to describe the campaigns:

---

*It will be remembered that results for the entertainment section can only be based on two issues.

Campaign 1: S_1W_1, S_1W_2, S_1W_3, S_1W_4, S_1W_5, S_1W_6

Campaign 2: S_2W_1, S_2W_2, S_2W_3, S_2W_4, S_2W_5, S_2W_6

Campaign 3: S_3W_1, S_3W_2, S_3W_3, S_3W_4, S_3W_5, S_3W_6

Campgign 4: S_1W_1, S_1W_2, S_1W_3, S_2W_1, S_2W_2, S_2W_3

Campaign 5: S_1W_1, S_1W_2, S_2W_1, S_3W_1, S_3W_2, S_4W_1

Note that each campaign consists of six advertisements and that numbers 1, 2 and 3 are placed exclusively in a particular section and hence appeal to the respective individual audience segments while numbers 4 and 5 are placed across sections and appeal to more than one audience segment.

To prove that measures based on segmented audience data are not accurate for campaigns placed across audience segments, it is only necessary to compare exposure results for all five campaigns, as in Table IV.

TABLE IV

	Campaigns				
	1	2	3	4	5
Duplicated Audience	508	439	733	473	662
Unduplicated Audience	193	170	213	188	267
Frequency of Exposure	2.64	2.59	3.44	2.52	2.48

The fact that audience segment based exposure results provide accurate estimates for campaigns 1, 2 and 3 is of course a tautology as they are the same thing (compare Tables III and IV).* Segmented audience based data would however be useful in obtaining results for campaigns of less than six advertisements placed in a single section once adjusted for the number of placements. To the extent that the exposure results for campaigns 1, 2 and 3 do not provide any identifiable estimate for the results of campaigns 4 and 5, the fact that segmented audience data will not provide accurate results for campaigns placed across segments is proven. This is the significance of hypothesis 1(B).

Application of the segmented audience concept obviously then has no meaning in terms of the total exposure to campaigns 4 and 5. Hence hypothesis 1(B) is proven. However it is still a highly relevant concept and its application is the genesis of the proof of hypotheses 1(A) and 1(B). Consider a comparison of campaigns 1 through 5 over the four audience segments that have been identified. Some rather considerable variation can be identified:

---

*Campaigns 1, 2 and 3 are placed exclusively in the sports, finance and women's sections respectively--hence the exposure to those campaigns (Table IV) must be the same as the exposure results of the respective sections (Table III).

TABLE V

Sports

	1	2	3	4	5
DA	508	-	-	284	205
UDA	193	-	-	164	151
F	2.64	-	-	1.75	1.36

Finance

	1	2	3	4	5
DA	-	439	-	189	64
UDA	-	170	-	107	64
F	-	2.58	-	1.77	1.00

Women

	1	2	3	4	5
DA	-	-	733	-	229
UDA	-	-	213	-	152
F	-	-	3.44	-	1.51

Entertainment

	1	2	3	4	5
DA	-	-	-	-	164
UDA	-	-	-	-	164
F	-	-	-	-	1.00

The above table depicts the exact effect each campaign would have in each audience segment. Despite the obvious differences among then, measures based on aggregate data, as can be seen in Table III, would have indicated the same results for each campaign.

To summarize, the advantage of exposure measurement on a segmented audience basis is that while providing accurate overall campaign measurement, the method also allows identification of the net reach and frequency of exposure for each section into which the campaign is placed. As a by-product the method also generates the duplication of exposure among audience segments. It is perhaps useful to trace this process through for campaign 4 before going on to hypothesis 2.

TABLE VI

Campaign 4

Duplicated audience

DA (sports) = 284
DA (finance) = 189
DA (campaign) = 473

Net reach

UDA (sports) = 164
UDA (finance) = 107

duplication of readers between sports and finance = 83

UDA (campaign) = (164 + 107)- 83
= 188

Frequency of exposure

F (sports) = $\frac{284}{164}$ = 1.75

F (finance) = $\frac{189}{107}$ = 1.77

F (campaign) = $\frac{473}{188}$ = 2.52

Hypothesis (2) stated that reach and frequency of exposure for any given campaign cannot be simultaneously maximized. To test this beyond question it would be necessary to develop the complete set of placement alternatives for an advertising campaign of a given size. However considering a six advertisement campaign and the twenty possible placement positions given in Fig. 9 the number of combinations becomes unmanageable:

$$\frac{20!}{6!(20 - 6)!} = 38,760$$

As a substitute, it is realistic to develop a set of campaign placements which reflects extremes of concentration and dispersion of advertisements while remaining logical alternatives for an advertiser. They are presented below, again using the notation of Fig. 9.

1. S_1W_1, S_1W_2, S_1W_3, S_1W_4, S_1W_5, S_1W_6
2. S_2W_1, S_2W_2, S_2W_3, S_2W_4, S_2W_5, S_2W_6
3. S_3W_1, S_3W_2, S_3W_3, S_3W_4, S_3W_5, S_3W_6
4. S_1W_1, S_1W_2, S_1W_3, S_2W_1, S_2W_2, S_2W_3
5. S_1W_1, S_1W_2, S_2W_1, S_2W_2, S_3W_1, S_3W_2
6. S_1W_5, S_1W_6, S_2W_5, S_2W_6, S_3W_5, S_3W_6
7. S_1W_1, S_1W_4, S_2W_1, S_2W_4, S_3W_1, S_3W_4
8. S_2W_1, S_2W_2, S_3W_1, S_3W_2, S_4W_1, S_4W_2

	9.	S_2W_1, S_2W_2, S_2W_3, S_3W_1, S_3W_2, S_3W_3
	10.	S_2W_4, S_2W_5, S_2W_6, S_3W_4, S_3W_5, S_3W_6
	11.	S_1W_1, S_1W_2, S_2W_1, S_3W_1, S_3W_2, S_4W_1
	12.	S_1W_1, S_2W_1, S_2W_2, S_3W_1, S_4W_1, S_4W_2
Random	*13.	S_1W_3, S_1W_5, S_2W_4, S_3W_1, S_3W_3, S_3W_6
Random	*14.	S_1W_2, S_1W_5, S_2W_1, S_2W_3, S_2W_4, S_4W_1
	15.	S_1W_1, S_2W_1, S_3W_1, S_3W_2, S_3W_3, S_4W_1
	16.	S_1W_1, S_1W_2, S_1W_3, S_2W_2, S_3W_2, S_4W_2

If the above campaigns are examined it will be noted that some concentrate heavily in one section, some in certain combinations of sections. Others have been placed so as to be widely dispersed as possible, some have been placed with no regard to concentration of advertisements in audience segments, two campaigns were selected randomly. The results for each of these campaigns are given in Table VII. Note that the results indicate that certain campaigns are superior to others both on the basis of net reach and frequency. However where frequency is maximized at campaign 3, reach is not. Any attempt to increase the reach of this campaign without increasing the number of advertisements cannot be accomplished except at expense to the frequency of exposure. Similarly campaign 12 maximizes net reach but not frequency.*

*See Table VIII: campaigns of Table VII re-arranged according to increasing net reach.

TABLE VII

Campaigns	Duplicated Audience	Net Reach	Frequency of Exposure
1.	508	193	2.64
2.	439	170	2.59
3.	733	213	3.44 **
4.	473	188	2.52
5.	556	248	2.24
6.	565	240	2.35
7.	596	256	2.33
8.	689	269	2.56
9.	538	216	2.49
10.	634	238	2.66
11.	662	267	2.48
12.	699	281 *	2.49
13.	624	241	2.59
14.	540	239	2.26
15.	713	276	2.58
16.	642	274	2.34

Hypothesis (2) is a corollary to hypothesis (1) and hence is true by definition. However it is important in that it distinguishes another difficulty in the use of aggregate data. Aggregate data based measures do not allow the identification of a trade-off between the reach and frequency of a set of advertising campaigns. The selection of the appropriate

trade-off is of course a function of the advertiser's objectives.* He may not wish to maximize either reach or frequency but he should be aware that his selection of an advertising campaign involves some degree of sacrifice of one or both of these exposure variables.

TABLE VIII

Campaigns	Duplicated Audience	Net Reach	Frequency of Exposure
2.	439	170	2.59
4.	473	188	2.52
1.	508	193	2.64
3.	733	213	3.44 **
9.	538	216	2.49
10.	634	238	2.66
14.	540	239	2.26
6.	565	240	2.35
13.	624	241	2.59
5.	556	248	2.24
7.	596	256	2.33
11.	662	267	2.48
8.	689	269	2.56
16.	642	274	2.34
15.	713	276	2.58
12.	699	281*	2.49

*Re: footnote page 37.

CHAPTER VII

CONCLUSIONS

The conclusions to this study, in the simplest sense, coincide exactly with the objectives of Chapter I. The proof of hypothesis 1 demonstrates that measures of duplicated audience, unduplicated audience and frequency of exposure based on segmented audience data are superior to those same measures based on aggregate audience data. At the same time, the limitations of segmented audience measures are acknowledged for advertising campaigns which cut across audience segments. However, the results of Chapter VI demonstrate the applicability of the segmented audience concept even within the constraints of those limitations. Hypothesis 2 demonstrates that for a set of alternative placements of an advertising campaign, the reach and frequency measures cannot be simultaneously maximized. However it is not the intention of this chapter to merely summarize the last one. Its objective is to draw the paper together by discussing the logical extension of the results: to describe a means by which the concept of segmented audience based measurement could be incorporated into the decision process concerning the placement of advertisements.

An advertiser who plans a newspaper campaign is clearly not in a position to tabulate the source data used in this

thesis nor to conduct an analysis such as was done in Chapters V and VI. Unless, he were an extremely heavy advertiser, it is doubtful whether he would have the resources or the inclination to do so. However, if he were interested in rational decision-making he would no doubt be interested in the information if it were available. The conclusion to this study, then, is directed at the managers of the print media, the people who sell the newspaper as an advertising medium. It was in the interests of these people that the source study was conducted from which this thesis drew its data. The newspapers as an industry have the necessary resources for more sophisticated audience measurement and it is strongly in their competitive interests with other media to provide accurate information for economic decision-making.

Obviously, the print media managers cannot provide exposure results by section for every conceivable campaign placement open to their advertising clients. However it would not be difficulty, through a simple extension over Chapter VI, to develop the average expected exposure to the various newspaper sections in a single issue. For example, the exposure results for each of the six issues could be calculated and then averaged. Then, through simple statistical inference, the expected exposure to the entire population could be found. Similarly, it would be possible to calculate the expected net increment to duplicated and unduplicated audience

of successive issues of the newspaper. Furthermore, the newspaper could provide the average expected duplication among audience segments. The result would be a highly sophisticated breakdown of the newspaper's expected audience on an audience segment basis.

The advertiser would then have at his disposal a set of data which is highly relevant to his campaign objectives. He could test his campaign against the exposure data and have a reasonably sure estimate of the exposure results he can expect to achieve. Of course, exposure does not guarantee advertising effectiveness. As noted before, the effectiveness of an advertising campaign is very much a result of other factors as well as campaign placement. These other factors, such as the quality of the advertisement or the product, are not identifiable a priori by media managers. However the newspapers can still provide considerable decision flexibility in dealing with these externalities. Data developed on the basis of different definitions of sections and, more particularly, different levels of readership enable the advertiser to co-ordinate the placement decision with the campaign objective.

In short, the advertiser's knowledge concerning the exposure results of his campaign is enhanced considerably. By incorporating expected audience segment exposure into his decision, he is better able to plan the placement of a campaign

according to his advertising objectives. This sophistication in information should encourage the advertiser to use the newspaper more often, to use it more efficiently and to compare it favourably with other media. If the newspaper today is less competitive and increasingly less important as an advertising medium, it is perhaps because the information presently generated is lagging behind the modern advertiser's decision needs. In the future, better information should provide better results.

There are two problems in the direct application of the segmented audience concept which, although they were left out of the above discussion were considered at length elsewhere in the paper. First, there is the problem of calculating the unduplicated audience of combinations of newspaper sections and specific advertising compaigns. Obviously the method used in Chapter V is not manageable for either the newspaper or the advertiser considering the increased number of sections with complete data and the constant updating and proliferation of possible combinations of issues and sections.* A simple estimating procedure for unduplicated audience is needed and was discussed in Chapter III on related literature. This method, unfortunately, has not been tested on inter-section duplication for newspaper data. Nevertheless, any practical

*Re: Method used in Chapter V is the theoretical procedure for N sections outlined in equation (2), Chapter IV, p. 34.

application of the segmented audience concept for newspapers will succeed or fail over the ability to apply this or some closely related net audience estimation procedure.

The second problem concerns the trade-off between reach and frequency for a set of advertising campaigns. This trade-off represents the fundamental relationship for the placement decision. However, it can only be evaluated at this point by developing a set of campaign alternatives and testing for reach and frequency. There is no means for deriving the relationship between reach and frequency and incorporating it into the planning decision before the campaigns are designed. The data on exposure to each section do however provide a sound basis for a limited evaluation of this trade-off. The advertiser will be aware that the exposure to certain sections is of no significance to him and will probably be concerned with reach/frequency trade-off for only a restricted set of alternatives.

Problems aside, it is the conclusion of this thesis that the segmented audience concept provides a superior means of audience measurement. It is easily foreseeable that all manner of supplementary data can be added to the information system once audience segments are established as the appropriate targets of newspaper advertising campaigns. These might include audience characteristics, effectiveness of campaign content and patterns of readership. The only serious

obstacle to an immediate application to the advertising decision process is a simple method of net audience estimation. However the research of the Agostini tradition is strongly disposed to the solution of that difficulty.

Areas for Further Study

1. The first area for further study obviously is a duplication of this study with a stronger orientation to developing a set of data on which advertising decisions can be based. Now that the applicability of segmented audience has been verified, the objective should be a complete and workable data base for further research.

2. An interesting but not necessary area for further study would be to examine the overlap or duplication between specific audience segments. For instance, how many readers of the finance section would be duplicated by the sports section as opposed to the women's section?

3. An extremely important area for examination is to test the Agostini relationship for inter-section duplication within a publication. If the relationship is found to hold then a means of deriving K for newspaper sections must be developed. If the Agostini relationship is found not to hold true, then further research should be done to discover a workable relationship between duplicated and unduplicated audience probably still using two-by-two section duplication.

4. Finally, a method must be derived to predict, if possible, a reliable relationship between reach and frequency for combinations of sections. It has been demonstrated that both cannot be simultaneously maximized, but is there a means of estimating the effect a change in one will have on the other? Such a method would depend upon observation of the relationship between the variables over a period of time for specific combinations of sections and developing data upon expected trade-offs as was described for expected section exposure.

Footnotes

[1]Bogart, L., "Is it Time to Discard the Audience Concept?" in Journal of Marketing, Vol. 30 (January, 1966), p. 47.

[2]Kuhn, W., "Net Audience of Vehicle Combinations--in Germany: A New Formula," in Journal of Advertising Research, Vol. 3 (March, 1963), p. 30.

[3]Agostini, J. M., "How to Estimate Unduplicated Audiences," in Journal of Advertising Research, Vol. 1 (March, 1961), p. 11.

[4]Ibid., p. 11.

[5]Ibid., p. 12.

[6]Ibid., p. 12.

[7]Ibid., p. 13.

[8]Bower, J., "Net Audiences of Vehicle Combinations--in the U.S. and Canada," in Journal of Advertising Research, Vol. 3, (March, 1963), p. 14.

[9]Marc, M., "Net Audiences of Vehicle Combinations--in France," in Journal of Advertising Research, Vol. 3 (March, 1963), p. 26.

[10]Caffyn, J. M. and Sagovsky, M., "Net Audiences of Vehicle Combinations--in Britain," in Journal of Advertising Research, Vol. 3 (March, 1963), p. 21.

[11]Kuhn, W., "Net Audiences of Vehicle Combinations," p. 30.

[12]Metheringham, R. A., "Measuring the Net Cumulative Coverage of a Print Campaign," in Journal of Advertising Research, Vol. 4 (December, 1964), p. 23.

[13]Hofmans, P., "Measuring the Cumulative Net Coverage of Any Combination of Media," in Journal of Marketing Research, Vol. 3 (August, 1966), p. 269.

[14]Claycamp, J. H. and McClelland, C. W., "Estimating Reach and the Magic of K," in Journal of Advertising Research, Vol. 8 (June, 1968), p. 44.

[15]Ibid., p. 49.

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Metheringham, R. A. "Measuring the Net Cumulative Coverage of a Print Campaign," Journal of Advertising Research. Vol. 4, (December, 1964), pp. 23-28.

A P P E N D I C E S

APPENDIX A

Table II

Readership level = .1

	Campaigns						
	1(A)	1(B)	2(A)	2(B)	3(A)	3(B)	Aggregate
Duplicated Audience	1194	1030	2140	2439	3225	3422	3758
Unduplicated Audience	333	325	358	396	373	373	374
Frequency of Exposure	3.59	3.17	5.98	6.61	8.65	9.17	10.05

Readership level = .25

	Campaigns						
	1(A)	1(B)	2(A)	2(B)	3(A)	3(B)	Aggregate
Duplicated Audience	908	867	1771	2085	2618	2825	3096
Unduplicated Audience	274	305	344	360	356	362	364
Frequency of Exposure	3.32	2.84	5.15	5.79	7.35	7.80	8.51

Readership level = .75

	Campaigns						
	1(A)	1(B)	2(A)	2(B)	3(A)	3(B)	Aggregate
Duplicated Audience	291	396	693	878	1029	1114	1233
Unduplicated Audience	144	203	239	259	252	269	272
Frequency of Exposure	2.02	1.95	2.90	3.39	4.08	4.14	4.53

APPENDIX B

Table III

Readership level = .1

	Sports	Finance	Women's	Entertmt.	Aggregate
Duplicated Audience	1194	831	1200	533	3758
Unduplicated Audience	333	278	318	316	374
Frequency of Exposure	3.59	2.99	3.78	1.69	10.05

Readership level = .25

	Sports	Finance	Women's	Entertmt.	Aggregate
Duplicated Audience	908	687	1023	478	3096
Unduplicated Audience	274	238	280	294	364
Frequency of Exposure	3.32	2.89	5.66	1.63	8.51

Readership level = .75

	Sports	Finance	Women's	Entertmt.	Aggregate
Duplicated Audience	291	268	470	204	1233
Unduplicated Audience	144	114	158	141	272
Frequency of Exposure	2.02	2.35	2.97	1.45	4.53

APPENDIX C

Table IV

Readership level = .1

	Campaigns				
	1	2	3	4	5
Duplicated Audience	1194	831	1200	1057	1170
Unduplicated Audience	333	278	318	327	345
Frequency of Exposure	3.59	2.99	3.78	3.23	3.39

Readership level = .25

	Campaigns				
	1	2	3	4	5
Duplicated Audience	908	687	1023	839	1014
Unduplicated Audience	274	238	280	283	331
Frequency of Exposure	3.32	2.89	3.66	2.97	3.06

Readership level = .75

	Campaigns				
	1	2	3	4	5
Duplicated Audience	291	268	470	285	409
Unduplicated Audience	144	114	158	144	207
Frequency of Exposure	2.02	2.35	2.97	1.98	1.98

APPENDIX D

Table V

Readership level = .1

Sports

	1	2	3	4	5
DA	1194	-	-	609	394
UDA	333	-	-	300	259
F	3.59	-	-	2.03	1.52

Finance

	1	2	3	4	5
DA	-	831	-	448	132
UDA	-	278	-	236	132
F	-	2.99	-	1.90	1.00

Women's

	1	2	3	4	5
DA	-	-	1200	-	383
UDA	-	-	318	-	240
F	-	-	3.78	-	1.59

Entertainment

	1	2	3	4	5
DA	-	-	-	-	261
UDA	-	-	-	-	261
F	-	-	-	-	1.00

Readership level = .25

Sports

	1	2	3	4	5
DA	908	-	-	496	346
UDA	274	-	-	248	224
F	3.32	-	-	2.00	1.54

Finance

	1	2	3	4	5
DA	-	687	-	343	107
UDA	-	238	-	181	107
F	-	2.89	-	1.89	1.00

Women's

	1	2	3	4	5
DA	-	-	1023	-	328
UDA	-	-	280	-	204
F	-	-	3.66	-	1.61

Entertainment

	1	2	3	4	5
DA	-	-	-	-	233
UDA	-	-	-	-	233
F	-	-	-	-	1.00

Readership level = .75

Sports

	1	2	3	4	5
DA	291	-	-	179	140
UDA	144	-	-	126	118
F	2.02	-	-	1.42	1.19

Finance

	1	2	3	4	5
DA	-	268	-	106	35
UDA	-	114	-	63	35
F	-	2.35	-	1.68	1.00

Women's

	1	2	3	4	5
DA	-	-	470	-	138
UDA	-	-	158	-	98
F	-	-	2.97	-	1.41

Entertainment

	1	2	3	4	5
DA	-	-	-	-	96
UDA	-	-	-	-	96
F	-	-	-	-	1.00

APPENDIX E

Table VI

Readership level = .1

Duplicated audience

DA (sports) = 609

DA (finance) = 448

DA (campaign) = 1057

Net Reach

UDA (sports) = 300

UDA (finance) = 236

Duplication of readers between sports and finance = 209

UDA (campaign) = (300 + 236)-209

= 327

Frequency of Exposure

F (sports) = $\frac{609}{300}$ = 2.03

F (finance) = $\frac{448}{236}$ = 1.90

F (campaign) = $\frac{1057}{327}$ = 3.23

Readership level = .25

Duplicated Audience

DA (sports) = 496

DA (finance) = 343

DA (campaign) = 839

Net Reach

UDA (sports) = 248

UDA (finance) = 181

Duplication of readers between sports and finance = 146

UDA (campaign) = (248 + 181)- 146

= 283

Frequency of Exposure

$$F \text{ (sports)} = \frac{496}{248} = 2.00$$

$$F \text{ (finance)} = \frac{343}{181} = 2.89$$

$$F \text{ (campaign)} = \frac{839}{283} = 2.97$$

Readership level = .75

Duplicated Audience

DA (sports) = 179

DA (finance) = 106

DA (campaign) = 285

Net Reach

UDA (sports) = 126

UDA (finance) = 63

Duplication of readers between sports and finance = 45

UDA (campaign) = (126 + 63)- 45

= 144

Frequency of Exposure

$$F \text{ (sports)} = \frac{179}{126} = 1.42$$

$$F \text{ (finance)} = \frac{106}{63} = 1.68$$

$$F \text{ (campaign)} = \frac{285}{144} = 1.98$$

APPENDIX F

Table VII

Readership level = .1

Campaigns	Duplicated Audience	Net Reach	Frequency of Exposure
1.	1194	333	3.59
2.	831	378	2.99
3.	1200	318	3.78
4.	1057	327	3.23
5.	1089	335	3.25
6.	1051	325	3.23
7.	1016	329	3.08
8.	1228	337	3.64
9.	1031	318	3.24
10.	1000	315	3.18
11.	1170	345	3.39
12.	1195	338	3.54
13.	1087	339	3.20
14.	1019	339	3.01
15.	1140	339	3.36
16.	1258	347 *	3.63

Readership level = .25

Campaigns	Duplicated Audience	Net Reach	Frequency of Exposure
1.	908	274	3.32
2.	687	238	2.89
3.	1023	280	3.66
4.	839	283	2.97 *
5.	912	316	2.89
6.	859	299	2.87
7.	856	309	2.77
8.	1044	328	3.18
9.	837	281	2.98
10.	873	293	2.98
11.	1014	331 *	3.06
12.	1039	331 *	3.14
13.	912	308	2.96
14.	371	318	2.74
15.	998	325	3.07
16.	1041	329	3.16

Readership level = .75

Campaigns	Duplicated Audience	Net Reach	Frequency of Exposure
1.	291	144	2.02
2.	268	114	2.35
3.	470	158	2.97 *
4.	285	144	1.98
5.	342	190	1.80
6.	351	165	2.13
7.	383	199	1.93
8.	406	180	2.26
9.	321	150	2.14
10.	417	174	2.40
11.	409	207	1.98
12.	438	210	2.09
13.	358	156	2.30
14.	288	145	1.99
15.	461	218 *	2.12
16.	399	210	1.90