THE PREDICTION OF READERSHIP FROM CIRCULATION AND CENSUS DATA

Neil Shepherd-Smith, Media Research Consultant, UK

1. Introduction

Before describing a project to predict readership from circulation and census data, it is worth giving the background as to why it was attempted at all. As so often happens in research, the project was driven by market needs and in this case it was the needs of the regional newspaper industry. In 1989, of all the major media in the United Kingdom, only the regional press had no industry research, although it accounted for about 25% of all advertising expenditure. With a few notable exceptions, no reliable readership information existed for the great majority of the 1,100 or so paid-for and free regional newspapers in Great Britain. Media planning, in terms of reach and frequency evaluations of schedules of several insertions in each of several newspapers in a given area, was impossible and that placed the regional press at a grave disadvantage in competing for a share of precious and carefully allocated advertising budgets.

JICREG (the Joint Industry Committee for Regional readership research) was formed, like all U.K. JICs, with representatives from all sides of the industry - including advertisers and agencies as well as publishers - to provide readership data for the regional press. However, there was one huge problem:- the economic and practical difficulty of carrying out readership surveys for over 1,100 titles. It has been calculated that to carry out a survey like the NRS for all regional newspapers, with an adequate sample size in each newspaper area, would cost over £15,000,000 and that might well be an under-estimate. The regional press simply could not afford that sort of money, yet could no longer survive without readership data.

JICREG was formed with two main objectives. The first was to bring together the various pieces of information that did exist and to present them in a standard form. The second objective was to see if it would be possible to generate readership estimates by modelling from existing circulation and demographic data, with a view to achieving sufficient data to enable media planners to carry out schedule reach and frequency analyses for all regional newspapers. At the outset, nobody really knew whether modelling from circulation and demographic data would be possible, simply because it had never been done before, anywhere, and indeed most people said firmly that it could not be done. Anyway, JICREG put that possibly insoluble problem out to tender and the company I was working for at the time, Telmar, got the job. It was not just a question of predicting average-issue readerships because, to enable the data to be used for schedule evaluation, it was vital to have cumulative readership figures and duplication figures as well. The brief from JICREG was to predict, if possible, from existing circulation and demographic data, (i) average-issue readerships, (ii) cumulative readerships and (iii) inter-publication duplications to a sufficient standard of accuracy to enable the results to be used for media planning purposes, in estimating the reach and frequency of specific regional newspaper schedules.

2. The 1990 project

It is not worth spending too much time on the details of the 1990 project, which was limited throughout by the paucity of data from which to carry out the modelling. It was possible to extract usable average-issue readership figures from 52 regional readership survey reports, covering 26 evening newspapers, 89 paid-for weeklies and 163 free weeklies, with slightly fewer cumulative readership figures (defined as those reading in the last year) because they were not available for some newspapers. Duplication data were also collected wherever possible. In retrospect, it would be reasonable to say that the input data were limited and it would have been much better to have had more. However, as the data did not exist in electronic form and every figure had to be extracted by hand from the printed reports, it seemed quite a lot at the time!

2.1 In addition to the readership and duplication data, it was also necessary to collect circulation data for each newspaper included in the surveys and also Census data, (such as population, households, social grade, employment, travel, economic activity etc.), for the area in which each survey had been conducted. The following demographic variables were obtained and used as input for the modelling.

2.1.1 Average-issue readership (Dependent variable)
2.1.2 Circulation of newspaper in the survey area
2.1.3 Total circulation of newspaper
2.1.4 Total area local evening newspaper circulation
2.1.5 Total area paid-for weekly newspaper circulation
2.1.6 Total area free weekly newspaper circulation
2.1.7 1981 Households
2.1.8 1981 Resident Population
2.1.9 Total Adults 16+ (the universe)
2.1.10 Total Males
2.1.11 Total 16+ in employment
2.1.12 Apprentices & Trainees
2.1.13 Self employed
2.1.14 Total households with car
2.1.15 Total households owner occupied
2.1.16 Total households with no children
2.1.17 Total travel to work - Public transport
2.1.18 Total travel to work - Private transport
2.1.19 Total households with 2+ economically active
2.1.20 Total households Social Class I
2.1.21 Total households Social Class II
2.1.22 Total households Social Class III
2.1.23 Total households economically inactive

For modelling cumulative (within last year) readership, input data as above plus:-

2.1.24 Those who read the newspaper within the last year (dependent variable)

For free weekly newspapers, input data as above for average-issue and cumulative readerships plus:-

2.1.25 Number of pages
2.1.26 Year of launch (19nn)
2.1.27 Percentage of paper devoted to advertising

For modelling duplications, input data as above plus:-

2.1.28 Observed duplication between each pair of newspapers (dependent variable)
2.1.29 Average-issue readership of 1st newspaper of pair
2.1.30 Area circulation of 1st newspaper of pair
2.1.31 Total circulation of 1st newspaper of pair
2.1.32 Publication type for 1st newspaper of pair (i.e evening, paid-for weekly or free weekly)
2.1.33 Average-issue readership of 2nd newspaper of pair
2.1.34 Area circulation of 2nd newspaper of pair
2.1.35 Total circulation of 2nd newspaper of pair
2.1.36 Publication type for 2nd newspaper of pair (i.e evening, paid-for weekly or free weekly)

2.2 1990 models

Seven models were devised and are summarised as follows:

2.2.1 Average-issue readership models

2.2.1.1 Evening newspapers (26 observations).

AIR = Exp [1.7246432 + 0.9197105 x Ln(Circulation)]

R-Squared = 0.972 Mean RPC = 2.6

Note: Ln() = Natural logarithm, i.e. Log base e.

2.2.1.2 Paid-for weekly newspapers (82 observations).

AIR= Adult universe x [0.0014576 x (Adults/Households) + 1.1646899 x (Circulation/Households)]

R-Squared= 0.867 Mean RPC = 2.6

2.2.1.3 Free weekly newspapers (163 observations).

AIR= Circulation x (1.6470435 - 0.00000126 x Total circulation Frees + 0.005422 x No. of pages)

R-Squared= 0.849 Mean RPC = 1.6

While, for accurate readership prediction, it was found necessary to devise separate models for each of the three newspaper types examined to take account of differences in average RPC, it will be seen that all the average issue readership models were based for the main part on circulation, although the number of adults-per-household was taken into account in predicting the readership of paid-for weekly newspapers. For free newspapers, (i) competitive circulation in the area and (ii) pagination also had a small effect, although it did not appear to matter whether the pagination contained advertising or editorial. However, none of the demographic variables seemed to contribute significantly to the predictive power of the models. At the time, that was attributed to the fact that the demographic data came from the 1981 Census and could therefore be out-of-date.

2.2.2 Cumulative (1 year) readership models

2.2.2.1 **Evening newspapers** (20 observations).

CUME% = Exp[(0.68 - 0.37959335 x AIR%) x Ln(AIR%)] R-Squared = 0.983

2.2.2.2 **Paid-for weekly newspapers** (71 observations).

CUME% = Exp[(0.87 - 0.62749045 x AIR%) x Ln(AIR%)] R-Squared = 0.964

2.2.2.3 **Free weekly newspapers** (151 observations).

CUME% = Exp[(1 - 0.62317516 x AIR%) x Ln(AIR%)] R-Squared = 0.985

From the given input data, the cumulative readerships could be predicted from the average issue readership alone.

2.2.3 Inter-publication average issue readership duplication model (396 observations).

Duplication = Exp [0.09531012 + Ln(AIRa) + Ln(AIRb) - Ln(UNIV)] R-Squared = 0.950

where AIRa and AIRb are readerships of A and B respectively and UNIV is the population base.

To some surprise at the time, it was found that readership duplication was apparently determined by geographic rather than demographic factors. It was not even affected by the type of newspaper, as average issue readerships were. For any pair of regional newspapers, the readership duplication depended on whether the two newspapers circulated in the same area; if so, then the duplication could be predicted from the average issue readerships.

3. Reaction to the 1990 modelling project

From a technical viewpoint, the 1990 project could be considered to be disappointing, in that the demographic input data, so painstakingly collected, were not found to have any significant effect on the prediction of readership. However, in the market-place the reaction was very favourable. Firstly, the models produced results that were credible and were thus speedily adopted as an industry currency by which advertising in regional newspapers could be bought and sold. Credibility is always crucial and the acceptability of new models launched into a market place depends on how well the results conform to the views of the practitioners concerned. In this case, the modelled results were validated by comparison with surveyed results not used in the modelling. Fortunately for the credibility of the JICREG models, in most cases the two results were acceptably close, which was taken as confirming the acceptability of the models. Where there were significant differences, in every case the modelled results (with a relatively small deviation from the mean) provided the more credible readership figures, while the surveyed results had readers-per-copy that were regarded as unacceptably high or low. The reasons for unexpected surveyed results (such as readers-per-copy for paid-for newspapers of below 1, or readers-per-copy for free newspapers greater than the observed adults-per-household) were not always obvious, although often it appeared to be title confusion or just random sampling variation.

Secondly, the very availability of acceptable and usable readership figures for the great majority of regional newspapers, where none had existed before, also had the result that JICREG figures became fully established and provided a universal currency. A database was set up to hold regional newspaper readership and duplication at the level of mutually exclusive postcode sectors, of which there are about 8,900 in Great Britain. The sectors could then be used as "building blocks" to assemble any other geographical definition that might be needed, such as counties, marketing areas, television areas, radio areas and so on. Readership figures were generated for every regional newspaper subscribing to JICREG. Modelled figures were used where no survey results were available but, when approved readership figures were received, they were immediately loaded on to the database to supersede the modelled estimates. The models were designed to provide readership estimates where none existed, but were never intended to replace readership research. The combination of the modelled readership estimates and the database meant that it was possible for users to request details of the regional newspapers in a given area and using any of the available media planning packages, to carry out schedule reach and frequency evaluations on regional newspapers in the same way as they could using NRS or TGI data for nationals. Next came the release of the JICREG database on PCs, so that users could carry out all JICREG analyses on their desks. I am very sorry to have to tell you that this development was called "JIC-in-a-Box", and perhaps even sorrier to tell you that the subsequent WINDOWS version, released in 1994, was known as "JIC-in-a-WINDOW-Box"!

4. Lessons learnt from the 1990 modelling project

Although the modelled results quickly achieved universal and enthusiastic acceptance, with hindsight it could be said that insufficient thought had been given to the implications of using the models in practice. The models had all been devised based on readership in relatively large areas dictated by the various surveys used, selected in each case to suit the circulation area of the newspaper (usually with a high circulation) for which the readership survey had been carried out, even though competitive titles had been included. In practice, it was necessary to apply the respective models (evening, paid-for or free) to generate an average-issue readership estimate for every newspaper held on the database for subsequent retrieval and analysis at the level of postcode sectors, i.e areas with an average size of about 5,000 adults. The models therefore had to be applied to areas that were considerably smaller than the areas on which the surveys were based and from which the model input data originated. It was important therefore to compensate for any inherent tendency of any of the models to produce results that may vary as a result of the size of the area with all other input parameters unchanged. In other words, if a model were to give an estimate of

2.5 readers-per-copy to a newspaper with a circulation of 50,000 in a given area then, if the area were to be split into 5 equal-sized sub-areas with identical demographic and media profiles and with 10,000 circulation in each, it was important that the model should give a similar estimate of 2.5 readers-per-copy in each sub-area. If the sub-area readerships were to be summed, the resulting total readership should be the same as calculating the figure by applying the model to input data for the whole area.

In their unmodified form, one or more of the readership models in fact did have a tendency to produce results that could vary if the total area were fragmented. It was therefore necessary to carry out further post-modelling adjustment in the form of a "Fragmentation Compensation Factor" (FCF) to the unmodified estimates when modelling on any sub-area. The results (once the FCF had been applied) for each sub-area would then sum to the total, providing consistency in any use of the database. The recommended FCF to be applied to the unmodified AIR result from each model was as follows:

Evenings: FCF = (Circ/Totcirc)^(.0802895)
where Circ = circulation of newspaper in sub-area, Totcirc = total circulation of newspaper.

Paid-for weeklies: No FCF necessary.

Free weekly newspapers
For free weekly newspapers, the FCF (75125/households) was applied to the coefficient of the "Total frees circulation" (0.00000126), since the other variable (number of pages) was not affected by area size.

A further problem in practice turned out to be the inclusion in the readership model for free newspapers of the "total frees circulation" parameter. It made very little difference to the readership of any given free newspaper but a great deal of difference to the day-to-day maintenance of the database because an update or a change to the circulation of any free newspaper resulted in an amendment, albeit small, to the modelled readership of all free newspapers, not just the one with a change to its circulation. These problems were noted, to be borne in mind when new JICREG models were devised.

5. The 1995 JICREG modelling project

The provision of readership figures for all regional newspapers had a dramatic effect on the market place and changed the trading currency from circulation to readership. There was also the result, unexpected in some quarters, of a significant increase in surveyed readership data. At the time of the JICREG launch in 1991, under 30% of regional newspapers had surveyed data and it was forecast that the credibility and general acceptance of the modelled figures would result in fewer regional newspapers spending money on readership research in the future. Interestingly, the reverse has happened; the increased awareness of readership as a currency has resulted in more research, not less, by newspapers that have understood and accepted the significance of readership, rather than circulation, as the measure of media value and are anxious to provide quantitative justification for percieved advantages for their products rather than have to rely on the credible but inevitably smoothed modelled readership figures. It will be appreciated that, within any given area with given demographic characteristics, the only variable to distinguish between unsurveyed newspapers of the same type is circulation. A readership model inevitably allocates the same readers-per-copy value to each newspaper of a given type in the same area although, for example, paid-for newspapers are likely to be credited with much higher readers-per-copy values than free newspapers. The modelled readership figures, although credible, cannot reflect any differences between similar newspapers in the same area that might affect readers-per-copy values; the models do not have the data to provide such sensitivity and only a readership survey can reveal any differences between newspapers that may exist. Many more regional newspaper readership surveys have been commissioned since the JICREG launch and now over 40% of the regional newspapers on JICREG have surveyed, as opposed to modelled, readership figures. Quite apart from the intrinsic value of all the extra data, the new surveys provided a valuable data source from which to carry out further modelling.

JICREG had promised the industry at the time of the launch that the models would be updated as soon as sufficient data became available and the JICREG Board approved the Technical Sub-Committee's recommendation in November 1994 that re-modelling should be done. The task was eased to some extent because readership and duplication data could be collected steadily as new readership surveys were issued, rather than having to repeat the 1990 labour of extracting the data manually from any available survey reports just before modelling. From 1992 to 1994, it had been possible to collect readership and duplication data from 216 readership surveys, instead of the 52 surveys used in the 1990 project. That increase was reflected in the number of newspaper readership observations to model from:- Morning newspapers (78), Evening newspapers (157), Sunday newspapers (28), Paid-for weeklies (205), Free weeklies (527) making a total of 995 observations. It was encouraging that there appeared to be sufficient observations to produce models for regional morning and Sunday newspapers as well as the evening, paid-for weekly and free weekly newspapers modelled before.

Another benefit was that a new national Census had been carried out in 1991 that not only provided up-to-date population figures but also yielded many more demographic variables that it was felt might have had some effect on readership; there were 80 variables in 1995, as opposed to only 25 in 1990. The Census data included such information as population, class, education, age profile, work and mode of travel, race, household composition and economic activity. All the Census information was captured in each case for the precise sub-area within the survey area in which each individual newspaper circulated. As well as the Census data, the characteristics of each newspaper were recorded that might affect its readership:- the publication day, whether it was a broadsheet or a tabloid, the pagination and the percentage of advertising carried and the strength of the competition in the area. A complete list of variables is given in Appendix 1.

6. Results of the 1995 JICREG modelling project

In view of the enormous amount of work done to collect the readership data from 216 surveys and assemble demographic Census data, carefully matched in each case to the survey area for each of the 995 newspapers, the results of the modelling project could again, in one sense, be regarded as disappointing. In all cases, none of the demographic variables had any significant effect on the prediction of readership. Offsetting the disappointment was the discovery that the readership for all five regional newspaper types could be predicted, with sufficient accuracy for media planning purposes, from the circulation expressed as a percentage of the total households in the area.

6.1 Average issue readership models

6.1.1 **Morning newspapers** (78 observations)
AIR = Universe x 1.4073046 x CPH R-squared = .988 Mean RPC = 2.9

6.1.2 **Evening newspapers** (157 observations)
AIR = Universe x 1.4317396 x CPH R-squared = .969 Mean RPC = 2.9

6.1.3 **Sunday newspapers** (28 observations)
AIR = Universe x 1.3402894 x CPH R-squared = .923 Mean RPC = 2.8

6.1.4 **Paid-for weekly newspapers** (205 observations)
AIR = Universe x 1.3334138 x CPH R-squared = .905 Mean RPC = 2.7

6.1.5 **Free weekly newspapers** (527 observations)
AIR = Universe x (0.7293591 x CPH + 0.0014919 x pages x CPH)
R-squared = .902 Mean RPC = 1.6

Note: CPH = Circulation / Households

With the exception of the model for free newspapers, where the inclusion of the pagination (though again not the advertising/editorial ratio) had a small effect, the prediction of readership depended entirely on the circulation penetration of households in the area. It will perhaps be easier to accept the surprising simplicity of these models if we look at the data in more detail. Let us take, as an example, the case of regional evening newspapers where there were 157 observations. Neither the physical size of the newspaper nor the competitive circulation was significant. In Appendix 2, I show the correlation coefficients of average issue readership percentage with other input variables, ranked in ascending order of absolute coefficient value. Thus the correlation of the percentage of the paper devoted to advertising is virtually random; on the other hand, note the correlation (coefficient = 0.7912901) of circulation per household with AIR% and it becomes clear why such simple models could achieve such a good fit. The models are expressed above in the form AIR% = K x CPH, where K is a constant and CPH is the circulation per household. However, that relationship may also be expressed in the form:- RPC = K x APH, where RPC = readers-per-copy and APH = adults-per-household; it is perfectly logical that the readers-per-copy should vary in proportion to the adults-per-household in any given area.

Compensating for any feeling of disappointment at the simplicity of the models is the encouraging fit shown by the R-squared values and the robustness in practice of the models, that could be applied to circulation figures in any size of area without the post-modelling adjustment needed for two of the original JICREG models. In Appendix 3, I give the modelled and surveyed results for each of the evening newspapers used. Following the columns identifying each observation and the predicted and surveyed average issue percentage and RPC values, I show the circulation expressed as a percentage of the households in the area and also as a percentage of the total circulation, i.e. including any circulation outside the survey area. As before, where there is any significant difference between the predicted and surveyed values, it is the surveyed values that tend to look "odd". It should be remembered that in most cases each survey was commissioned by a single title, in an area in which that newspaper was known to circulate but including other newspapers whose main circulation may have been elsewhere. Thus, in many cases, the unexpected survey results may be explained by the fact that they are based on only a very small part of the total circulation of the newspapers, spilling over into a survey area that had in fact been selected for another newspaper. In no case does the modelled RPC fall below 2.8 or exceed 3.1. Where the surveyed RPC is unusually low, e.g. 1.9 (observation 18), 1.7 (observation 26), 1.4 (observation 59) and 1.6 (observation 152), in each case the newspaper area circulation was only a small proportion of its total circulation (6.4%, 1.8%, 8.1% and 5.2% respectively). Similarly where the surveyed RPC was unexpectedly large, say greater than 4.0 (see observations 79, 83, 84, 95, 98, 108, 110,111, 124, and 131), again in each case the circulation was only a small proportion of the total. For cases like observation 104, members of the JICREG Technical Sub-Committee, who controlled and approved all aspects of the modelling, simply could not believe a surveyed result in which 98% of the total adult population in the area could apparently be reached by a newspaper whose circulation penetrated below 50% of the households. As in all such cases, the modelled figure was more credible.

6.2 Cumulative (1 year) readership models

6.2.1 **Morning newspapers** (66 observations)
CUME = Universe x EXP (0.328286 + 0.672727 x Log(AIR%)) R-squared = .980

6.2.2 **Evening newspapers** (145 observations)
CUME = Universe x EXP (0.152913 + 0.526803 x Log(AIR%)) R-squared = .939

6.2.3 **Sunday newspapers** (28 observations)
CUME = Universe x EXP (0.346434 + 0.940591 x Log(AIR%)) R-squared = .992

6.2.4 **Paid-for weekly newspapers** (173 observations)
CUME = Universe x EXP (0.106830 + 0.654759 x Log(AIR%)) R-squared = .972

6.2.5 **Free weekly newspapers** (527 observations)
CUME = Universe x EXP (0.065289 + 0.722170 x Log(AIR%)) R-squared = .990

As before, it was found that the cumulative readership for each type of newspaper could be predicted from the average issue readerships, although the parameters of the curve varied. The R-squared values speak for themselves. Calculated cumulative readership values for each model for a range of AIR% values are given in Appendix 4.

6.3. Duplication model (1551 observations)

Duplication % = 1.0386664 x AIRa% x AIRb% R-squared = .924

As before, it was found that the duplication for regional newspaper readership depends on geography, rather than demography. Thus the simple model above achieved a remarkably good fit when predicting the duplication between any two regional newspapers of any type in any area at the postcode sector level.

The general robustness and credibility of the new JICREG readership models led the Technical Sub-Committee to give their full approval on 28th March, 1995. No problems were experienced in the implementation and practical application of any of the models and once incorporated in the JICREG system, they were used from then on. In practice the JICREG database may have to apply any of the models in circumstances ranging from 100% circulation penetration of a free newspaper in a given postcode sector, down to just a few copies in a user-defined area circulation area but the formulae are very stable; if there is no circulation in an area then there is no readership. None of the models have ever given an unacceptable result.

7. 1996 Model refreshment

The success of the JICREG 2 re-modelling project consolidated the move towards readership rather than circulation being the currency by which advertising in regional newspapers was bought and sold. As a result, more readership surveys were commissioned, providing further regional newspaper readership data. It was felt by the JICREG Technical SubCommittee that the JICREG average issue readership models should be refreshed, using the most recent readership survey data to reflect any changes in readers-per-copy in a comparatively volatile market place, while preserving the input parameters and formulae of the existing JICREG 2 models (based on circulation-per-household), that were approved in March 1995. The input data for the model refreshment were taken from 182 surveys appraised from January 1995 until October 1996 inclusive; no survey data from the previous JICREG modelling were used, so the refreshment was carried out with completely new survey data, although there were too few observations to update the model for Sunday newspapers. The results of the refreshment modelling are given below, with a comparison with the existing JICREG 2 models in each case.

7.1. JICREG 2 models, approved in March 1995.

7.1.1 **Morning newspapers** (78 observations)
AIR = Universe x 1.4073046 x CPH R-squared = .988 Mean RPC = 2.88

7.1.2 **Evening newspapers** (157 observations)
AIR = Universe x 1.4317396 x CPH R-squared = .969 Mean RPC = 2.94

7.1.3 **Paid-for weekly newspapers** (205 observations)
AIR = Universe x 1.3334138 x CPH R-squared = .905 Mean RPC = 2.74

7.1.4 **Free weekly newspapers** (527 observations)
AIR = Universe x (0.7293591 x CPH + 0.0014919 x pages x CPH)
R-squared = .902 Mean RPC = 1.63

Note: CPH = Circulation / Households

7.2. JICREG 3 models, devised in October 1996.

7.2.1 **Morning newspapers** (56 observations)
AIR = Universe x 1.3473778 x CPH R-squared = .988 Mean RPC = 2.77

7.2.2 **Evening newspapers** (135 observations)
AIR = Universe x 1.2655763 x CPH R-squared = .963 Mean RPC = 2.60

7.2.3 **Paid-for weekly newspapers** (209 observations)
AIR = Universe x 1.2347270 x CPH R-squared = .878 Mean RPC = 2.55

7.2.4 **Free weekly newspapers** (413 observations)
AIR = Universe x (0.6881409 x CPH + 0.0011692 x pages x CPH)
R-squared = .913 Mean RPC =1.53

Note that the refreshed models have lower mean RPC values in every case, reflecting the observed fall in RPCs throughout the regional press in recent months. The refreshed models were approved by the JICREG Technical SubCommittee on 26th November 1996, were implemented in place of the existing JICREG 2 models in December 1996 and have been in use ever since. Further refreshment, and ultimately re-modelling, will take place when more data are available.

8. Further developments

8.1 Population standards

Predicting readerships at postcode sector level has inevitably resulted in attention being paid to the consistency and reliability of population totals at a detailed geographical level. Not only must they be internally consistent within each postcode sector, in the sense that demographic breakdowns must always sum to the adult total, but the population figures must always be vertically consistent in that figures for postcode sectors must sum to accepted national standards. The detailed JICREG work revealed several anomalies in this area and it became clear that, apart from official national figures based on the 10-yearly Census and issued by the Government annually, more detailed figures depend on which geo-demographic practitioner might be employed. JICREG persuaded the two largest UK data suppliers to work closely together to (i) define an agreed list of postcode sectors and (ii) decide what was the agreed population of each of several demographic subgroups in each sector. It will be appreciated that achieving agreement on a matter of such complexity was inevitably time-consuming and I must pay tribute to everybody involved for all their hard work. There was an unexpected and valuable spin-off. The exercise led, at the suggestion of JICREG, to the foundation of JICPOPS (Joint Industry Committee for Population Standards) to co-ordinate agreed population standards across the whole of the advertising and marketing industry. The concept of JICPOPS was universally and enthusiastically received. NRS Ltd. and POSTAR Ltd. have given their active support; JICPOPS was established as a limited company in August 1997 and the venture is progressing well.

8.2 Demographic subgroups

Following the successful implementation of the JICREG 3 models, attention has recently been devoted to the improvement of the method used to predict readerships by demographic subgroups within each postcode sector. That is not a trivial problem. The demographic profiles for any given type of regional newspaper tend to be reasonably constant; if they were not then the demographic variables would affect the readership, which I have already shown does not happen. However, the demographic profiles of the individual postcode sectors are not nearly so similar. Until recently, the demographic breakdowns (e.g. sex, age, socio-economic groups) of JICREG modelled readerships by demographic sector have been calculated by the application of demographic indices obtained from the total newspaper readership in each case. While providing consistent results, (which should always be the paramount necessity for any database to be used as a currency!), that method has failed to take account of profile differences between one postcode sector and another.

Consistency could be achieved by applying the same average issue readership to every postcode sector but that simplistic approach would sacrifice sensitivity and accuracy. In other words, a newspaper appealing to younger rather than older people could be expected to have a higher readership in postcode sectors with a greater than average proportion of younger people and a lower readership in sectors with an older age profile. It was therefore important to be able to model average issue and cumulative readerships for each included regional publication for each population sub-group within each postcode sector, while ensuring (a) that the sum of such readerships across all included sectors within a given newspaper circulation area for each of the demographic sub-groups matches the appropriate surveyed or modelled readership figures for that newspaper and (b) that within each postcode sector, the readership figures by demographic sub-group are internally consistent with the total adult readership in each case.

The consistency requirements were stringent:

8.2.1. Within any given survey area, the sum of the readerships over all component postcode sectors had to match the area total for each of the included demographic groups.

8.2.2. Within each sector, the readerships had to be consistent:- the sum of Men and Women had to equal Adults, all mutually exclusive age groups had to sum to Adults and so on.

8.2.3. The readership penetration of each newspaper in each sector had to reflect the demographic profile of that sector, while retaining the horizontal and vertical consistency of all demographic subgroups.

A modelling technique has now been devised that satisfies all those requirements and provides the facility to generate readership figures, for any specified publications, by demographic groups, within the 8,900 or so postcode sectors. The results are not only internally consistent and reflect the demographic characteristics of each sector for as many dimensions as there are data available but they can also be calibrated to fit any external data source. The modelling technique that has been developed could be used for generating consistent exposure data by postcode sector for any other media such as the national press or radio; it is simply a matter of there being acceptable data to which the modelled estimates could be calibrated.

9. Conclusion

One of the most encouraging features of the JICREG project is the support it has received from the whole industry, with the universal backing of media owners, advertising agencies and advertisers alike. The future of JICREG, like its past, will be driven by the demands of the market. Re-modelling will be carried out as more data become available. In the meantime, it can be confirmed that, in Great Britain, for regional newspapers of five different types, it is possible to model, from circulation household and population data alone, credible average issue readerships, cumulative readerships and duplication data to any level of geographic detail for which acceptable population data exist, to a sufficient standard of accuracy for geographic level for media planning purposes , to provide data where none existed before. The modelled figures are not intended to be a replacement for surveyed figures and indeed the use of readership, rather than circulation as the currency for planning and buying advertising in regional newspapers has resulted in more readership research rather than less. JICREG continually encourages such research and has published guidelines describing best research practice with a view to achieving high industry standards and also to try to ensure the inclusion of certain vital statistics such as average issue readership to an agreed definition. As soon as surveyed readership figures are collected, conforming to the JICREG guidelines, they are loaded on to the JICREG database, superseding the modelled data.

It should be emphasised that the JICREG modelling methodology was developed for and is used for the schedule planning of the regional press. The fact that such surprisingly simple models have been shown to produce credible and consistent results for regional newspapers should not lead us to assume that the readership of other media like magazines, for example, could be accurately predicted from circulation penetration. Magazines have widely differing demographic and psychographic profiles; so do national newspapers. It cannot even be stated with certainty that the JICREG experience could be repeated with equal success for regional newspapers in other countries, although if the expense of research in any way prevents the commissioning of surveys then modelling would certainly be worth trying. Any further work can be carried out with the knowledge that, in Great Britain, the demographic profiles of regional newspapers of each given type are similar enough to permit the estimation of readerships from circulation. That useful fact has supplied a media planning currency for an entire industry that could not have afforded it otherwise and has provided a practical, universally accepted, solution to a potentially difficult problem.

Appendix 1 JICREG readership modelling input data

For each newspaper in its own circulation area ....

Field	Description
1.	All adults (15+) = universe.
2.	All adults (16+) as % of universe.
	Class
3.	Class 1 Professional (16+) as % of universe.
4.	Class 2 Intermediate (16+) as % of universe.
5.	Class 3NSkilled non-manual (16+) as % of univ.
6.	Class 3MSkilled manual (16+) as % of universe.
7.	Class 4 Semi-skilled (16+) as % of universe.
8.	Class 5 Unskilled (16+) as % of universe.
9.	Armed forces (16+) as % of universe.
10.	Government scheme (16+) as % of universe.
11.	Retired (16+) as % of universe.
	Education
12.	Degree or better (18+) as % of universe.
13.	Students (16+) as % of universe.
14.	Economically active persons (16+) as % of univ.
15.	Employed (16+) as % of universe.
16.	Self-employed (16+) as % of universe.
17.	Government scheme and unemp. (16+) as % of univ.
	Work
18.	Work 41+ hours per week (16+) as % of universe.
19.	Car to work (16+) as % of universe.
20.	Bus to work (16+) as % of universe.
21.	Train to work (16+) as % of universe.
22.	Bike or motor-bike to work (16+) as % of universe.
23.	Walk to work (16+) as % of universe.
24.	Work at home (16+) as % of universe.
25.	Moved in last year (16+) as % of universe.
	Age
26.	Aged 15-19 as % of universe.
27.	Aged 20-24 as % of universe.
28.	Aged 25-29 as % of universe.
29.	Aged 30-34 as % of universe.
30.	Aged 35-39 as % of universe.
31.	Aged 40-44 as % of universe.
32.	Aged 45-49 as % of universe.
33.	Aged 50-54 as % of universe.
34.	Aged 55-59 as % of universe.
35.	Aged 60-64 as % of universe.
36.	Aged 65-69 as % of universe.
37.	Aged 70-74 as % of universe.
38.	Aged 75-79 as % of universe.
39.	Aged 80-84 as % of universe.
40.	Aged 85-89 as % of universe.
41.	Aged 90+ as % of universe.

Field	Description
	Race
42.	White (0+) as % of total 0+
43.	Black (0+) as % of total 0+.
44.	Indian, Pakistani, Bangladeshi (0+) as % of 0+.
45.	Chinese and others (0+) as % of total 0+.
	Households
46.	Households.
47.	Universe/households. (Adults-per-household).
	Children
48.	Households with no children as % of households.
49.	Households with 1 child as % of households.
50.	Households with 2+ children as % of households.
	Economic activity
51.	Households with 0 adults econ. active as % of hhls.
52.	Households with 1 adults econ. active as % of hhls.
53.	Households with 2+ adults econ. active as % of hhls.
	Details
54.	Circulation.
55.	Circulation per household.
56.	Circulation in survey area as % of total circulation.
57.	Size indicator (Broadsheet = 1, Tabloid = 0).
58.	Monday publication (1 or 0).
59.	Tuesday publication (1 or 0).
60.	Wednesday publication (1 or 0).
61.	Thursday publication (1 or 0).
62.	Friday publication (1 or 0).
63.	Saturday publication (1 or 0).
64.	Sunday publication (1 or 0).
65.	Monday-Friday publication (1 or 0).
66.	Monday-Saturday publication (1 or 0).
67.	Number of pages.
68.	Percentage of paper devoted to advertising.
69.	London newspaper (1 or 0).
70.	Manchester newspaper (1 or 0).
71.	Birmingham newspaper (1 or 0).
	Competition
72.	(Competitive circ. of local morning papers) / hhlds.
73.	(Competitive circ. of local evening papers) / hhlds.
74.	(Competitive circ. of local Sunday papers) / hhlds.
75.	(Competitive circ. of paid-for weekly papers) / hhlds
76.	(Competitive circ. of free weekly papers) / hhlds.
	Readership
77.	Average issue readership as % of universe.
78.	Readership/circulation. (Readers-per-copy).
79.	Cumulative (1 year) readership as % of universe.
80.	Cumulative (1year) readership/circ. (Cume R.P.C.)

Appendix 2. Correlation with AIR% of regional evening newspapers

Input variable	Correlation
Percentage of paper devoted to advertising.	-0.0030355
Students (16+) as % of universe.	-0.0157497
Moved in last year (16+) as % of universe.	0.0238647
Self-employed (16+) as % of universe.	0.0298188
Aged 30-34 as % of universe.	-0.0325080
Work at home (16+) as % of universe.	0.0372371
Aged 25-29 as % of universe.	0.0402928
Class 5 Unskilled (16+) as % of universe.	-0.0423608
Aged 90+ as % of universe.	0.0502068
Number of pages.	-0.0542249
Degree or better (18+) as % of universe.	-0.0542823
Class 3M Skilled manual (16+) as % of universe.	0.0658876
Class 4 Semi-skilled (16+) as % of universe.	0.0680795
Work 41+ hours per week (16+) as % of universe.	-0.0706603
Households with 1 adults econ. active as % of households.	0.0708213
Aged 75-79 as % of universe.	0.0761567
Aged 15-19 as % of universe.	-0.0831797
Aged 80-84 as % of universe.	0.0840530
Aged 55-59 as % of universe.	0.0861695
Walk to work (16+) as % of universe.	0.0868562
Aged 20-24 as % of universe.	0.0886516
Bike or motor-bike to work (16+) as % of universe.	-0.0889763
Armed forces (16+) as % of universe.	-0.0903624
Aged 85-89 as % of universe.	0.0921610
Economically active persons (16+) as % of universe.	-0.0968705
Aged 70-74 as % of universe.	0.0997972
Class 1 Professional (16+) as % of universe.	-0.1005676
Class 3N Skilled non-manual (16+) as % of universe.	-0.1091631
Government scheme and unemp. (16+) as % of universe.	0.1122142
Households with 1 child as % of households.	-0.1188027
Class 2 Intermediate (16+) as % of universe.	-0.1234306
Households with 2+ children as % of households.	-0.1312324
Households with 0 adults econ. active as % of households.	0.1319806
Households with no children as % of households.	0.1333847
Government scheme (16+) as % of universe.	0.1411197
Aged 35-39 as % of universe.	-0.1427039
Aged 50-54 as % of universe.	-0.1430024
Employed (16+) as % of universe.	-0.1452361
Aged 65-69 as % of universe.	0.1574238
Retired (16+) as % of universe.	0.1597070
Households with 2+ adults econ. active as % of households.	-0.1625106
Bus to work (16+) as % of universe.	0.1738096
Train to work (16+) as % of universe.	-0.1771033
Aged 60-64 as % of universe.	0.1818900
Car to work (16+) as % of universe.	-0.1932290
Aged 45-49 as % of universe.	-0.2621557
Aged 40-44 as % of universe.	-0.2698799
Circulation per household.	0.7912901

Appendix 3.
Comparison of predicted and modelled readerships for evening newspapers.

Regional Obsrvtn no.	Evening Survey no.	newspapers Pred. AIR%	(JICREG 2 model) Survey AIR%	Pred. RPC	Survey RPC	Circ. % hshold	Circ. % total
1	.1	36.8%	39.5%	2.9	3.1	25.7	93.9%
2	1	34.3%	29.7%	3.0	2.6	24.0%	69.9%
3	2	55.7%	56.8%	2.9	3.0	38.9%	98.6%
4	3	33.0%	29.5%	2.9	2.6	23.0%	93.9%
5	5	39.5%	42.3%	2.9	3.1	27.6%	83.2%
6	6	39.0%	36.3%	2.9	2.7	27.2%	92.7%
7	10	34.7%	31.1%	2.9	2.6	24.3%	10.0%
8	11	32.2%	36.5%	3.0	3.3	22.5%	100.0%
9	12	16.4%	17.9%	2.9	3.2	11.5%	3.6%
10	13	29.0%	35.8%	2.9	3.5	20.3%	29.2%
11	14	42.1%	29.5%	3.0	2.1	29.4%	93.1%
12	17	38.5%	42.4%	3.0	3.3	26.9%	51.0%
13	17	12.6%	10.7%	3.0	2.5	8.8%	38.0%
14	18	13.3%	14.4%	2.9	3.2	9.3%	9.5%
15	19	29.1%	22.4%	2.8	2.2	20.3%	7.9%
16	20	43.2%	41.8%	2.9	2.8	30.1%	94.6%
17	22	61.9%	61.1%	2.9	2.9	43.2%	94.3%
18	22	8.6%	5.5%	2.9	1.9	6.0%	6.4%
19	23	47.8%	45.0%	2.9	2.7	33.4%	20.6%
20	25	58.1%	55.2%	2.9	2.7	40.6%	14.6%
21	25	40.9%	42.6%	2.8	2.9	28.5%	8.3%
22	26	66.1%	69.1%	3.0	3.1	46.2%	10.8%
23	26	13.7%	18.0%	2.9	3.8	9.6%	3.2%
24	28	21.9%	27.2%	2.9	3.6	15.3%	12.9%
25	29	7.2%	9.6%	3.0	4.0	5.0%	1.8%
26	30	10.8%	6.0%	3.0	1.7	7.6%	1.8%
27	31	17.4%	14.5%	2.9	2.5	12.1%	7.4%
28	32	40.5%	41.7%	3.0	3.1	28.3%	93.0%
29	33	40.2%	32.6%	2.9	2.4	28.1%	93.9%
30	34	54.6%	47.5%	2.9	2.6	38.2%	98.1%
31	35	46.6%	37.9%	2.9	2.4	32.6%	93.4%
32	36	6.6%	6.7%	3.0	3.0	4.6%	7.4%
33	37	54.0%	52.9%	2.9	2.9	37.7%	91.1%
34	39	12.8%	15.5%	3.0	3.6	8.9%	5.4%
35	40	48.9%	49.0%	3.0	3.0	34.2%	49.5%
36	42	68.3%	55.9%	2.9	2.4	47.7%	97.1%
37	43	37.5%	45.9%	2.8	3.4	26.2%	13.4%
38	44	20.7%	26.4%	2.9	3.7	14.5%	8.6%
39	45	57.0%	61.0%	2.8	3.0	39.8%	99.1%
40	45	30.7%	33.6%	2.9	3.2	21.4%	3.3%
41	45	21.6%	27.5%	2.8	3.6	15.1%	4.9%
42	46	27.3%	25.0%	2.9	2.7	19.1%	6.6%
43	46	21.8%	28.0%	2.9	3.8	15.2%	2.7%
44	47	33.2%	35.6%	2.9	3.1	23.2%	92.4%
45	48	45.0%	40.5%	2.9	2.6	31.4%	92.6%
46	49	46.4%	46.2%	2.9	2.9	32.4%	97.5%
47	50	52.1%	53.0%	2.8	2.9	36.4%	92.7%
48	51	58.6%	52.8%	2.9	2.6	40.9%	97.7%
49	53	6.2%	8.3%	2.8	3.8	4.4%	3.3%
50	54	29.8%	29.4%	3.0	3.0	20.8%	16.0%
51	54	17.8%	17.5%	3.0	3.0	12.4%	12.2%
52	59	18.0%	24.0%	2.8	3.7	12.6%	6.0%
53	64	23.6%	25.4%	3.0	3.2	16.5%	13.7%
54	65	8.1%	9.5%	3.0	3.6	5.7%	2.4%
55	68	54.0%	52.9%	2.9	2.9	37.7%	91.1%
56	70	7.8%	7.5%	3.1	3.0	5.4%	1.2%

Regional Obsrvtn no.	Evening Survey no.	newspapers Pred. AIR%	(JICREG 2 model) Survey AIR%	Pred. RPC	Survey RPC	Circ. % hshold	Circ. % total
57	72	65.8%	71.3%	3.0	3.3	45.9%	28.7%
58	72	51.5%	43.2%	3.0	2.5	36.0%	19.7%
59	73	17.6%	8.0%	3.0	1.4	12.3%	8.1%
60	74	64.9%	58.2%	3.0	2.7	45.3%	60.9%
61	76	25.9%	29.3%	3.0	3.4	18.1%	7.8%
62	77	65.5%	55.8%	3.0	2.5	45.7%	97.0%
63	78	52.7%	55.1%	2.9	3.0	36.8%	85.0%
64	79	64.5%	52.5%	2.9	2.4	45.0%	99.8%
65	79	5.0%	5.5%	2.9	3.2	3.5%	1.7%
66	80	32.4%	38.1%	2.9	3.5	22.6%	14.3%
67	80	20.6%	23.1%	2.9	3.3	14.4%	3.9%
68	83	49.5%	47.0%	3.0	2.9	34.6%	32.6%
69	85	29.4%	34.5%	2.8	3.3	20.6%	78.7%
70	86	27.6%	27.0%	2.8	2.7	19.3%	6.0%
71	87	17.6%	23.0%	3.0	3.9	12.3%	6.1%
72	89	34.6%	46.6%	3.0	4.0	24.2%	18.9%
73	91	29.8%	34.2%	3.0	3.4	20.8%	12.8%
74	93	18.5%	14.1%	3.0	2.3	12.9%	18.2%
75	94	31.2%	29.8%	3.1	2.9	21.8%	11.2%
76	96	24.0%	19.0%	3.0	2.4	16.7%	3.0%
77	96	18.4%	17.2%	3.0	2.8	12.8%	5.4%
78	97	20.2%	20.9%	3.0	3.1	14.1%	2.9%
79	98	7.4%	11.2%	3.0	4.5	5.2%	1.7%
80	99	56.3%	62.1%	3.0	3.3	39.4%	77.6%
81	102	48.0%	46.4%	2.9	2.8	33.5%	84.6%
82	107	32.9%	30.7%	2.9	2.7	23.0%	11.2%
83	108	36.9%	52.5%	3.1	4.4	25.8%	7.0%
84	109	20.1%	27.8%	3.1	4.2	14.1%	2.5%
85	110	5.7%	8.0%	2.8	4.0	4.0%	2.6%
86	111	14.3%	14.0%	2.9	2.9	10.0%	1.6%
87	112	21.7%	22.0%	3.0	3.0	15.2%	1.2%
88	113	36.9%	39.8%	2.9	3.1	25.8%	7.2%
89	114	47.4%	44.0%	2.9	2.7	33.1%	4.2%
90	116	13.6%	12.4%	2.9	2.7	9.5%	7.4%
91	117	33.2%	22.8%	3.0	2.1	23.2%	6.0%
92	118	11.8%	13.3%	3.0	3.4	8.3%	3.5%
93	125	36.2%	33.9%	2.8	2.7	25.3%	85.5%
94	126	46.6%	48.7%	3.0	3.1	32.5%	98.1%
95	126	10.4%	14.2%	3.0	4.1	7.3%	6.5%
96	128	17.9%	19.9%	3.0	3.3	12.5%	15.6%
97	130	49.8%	51.0%	2.9	2.9	34.8%	99.3%
98	133	16.5%	24.6%	2.9	4.3	11.5%	22.0%
99	134	9.6%	10.8%	3.0	3.4	6.7%	4.3%
100	137	14.9%	15.0%	3.1	3.1	10.4%	3.0%
101	138	10.3%	9.7%	2.8	2.7	7.2%	4.3%
102	141	34.4%	35.8%	2.9	3.0	24.1%	99.9%
103	146	62.5%	55.7%	2.9	2.6	43.6%	95.9%
104	148	70.0%	98.0%	2.8	3.9	48.9%	4.2%
105	148	26.1%	20.8%	2.9	2.3	18.2%	6.4%
106	151	14.5%	14.0%	2.9	2.8	10.2%	4.7%
107	152	26.6%	25.0%	3.0	2.8	18.6%	52.0%
108	154	8.4%	11.5%	3.0	4.1	5.9%	9.6%
109	155	11.7%	15.0%	3.0	3.8	8.2%	5.7%
110	156	7.4%	11.0%	3.0	4.5	5.2%	13.9%
111	157	4.4%	6.2%	2.9	4.1	3.1%	6.3%
112	161	7.9%	7.9%	2.9	2.9	5.5%	4.9%
113	163	51.7%	48.2%	2.9	2.7	36.1%	97.0%
114	165	41.9%	38.1%	2.8	2.6	29.2%	99.9%

Regional Obsrvtn no.	Evening Survey no.	newspapers Pred. AIR%	(JICREG 2 model) Survey AIR%	Pred. RPC	Survey RPC	Circ. % hshold	Circ. % total
115	165	35.9%	35.0%	2.8	2.7	25.1%	89.4%
116	166	32.8%	32.3%	2.8	2.8	22.9%	75.2%
117	168	49.3%	51.3%	2.9	3.1	34.4%	93.3%
118	168	32.8%	34.1%	2.9	3.1	22.9%	98.4%
119	168	23.7%	23.4%	2.9	2.9	16.6%	99.9%
120	170	42.5%	41.6%	2.8	2.7	29.7%	95.5%
121	172	23.4%	21.5%	2.8	2.6	16.3%	99.2%
122	172	19.2%	25.1%	2.9	3.8	13.4%	100.0%
123	175	16.5%	17.9%	3.0	3.3	11.5%	7.1%
124	176	11.3%	17.0%	2.9	4.4	7.9%	2.4%
125	178	9.3%	12.0%	2.9	3.7	6.5%	3.1%
126	179	8.0%	11.0%	2.9	4.0	5.6%	1.6%
127	180	14.3%	17.1%	3.0	3.6	10.0%	6.4%
128	181	20.8%	18.1%	3.0	2.6	14.5%	10.0%
129	182	49.1%	45.0%	3.0	2.7	34.3%	22.5%
130	183	57.7%	51.5%	2.9	2.6	40.3%	63.5%
131	184	13.4%	18.2%	3.0	4.1	9.4%	5.9%
132	185	49.7%	43.9%	2.9	2.6	34.7%	68.9%
133	186	9.8%	13.0%	3.0	4.0	6.8%	0.9%
134	187	15.2%	16.1%	3.0	3.2	10.6%	2.1%
135	190	8.7%	12.1%	2.9	4.0	6.0%	1.5%
136	191	35.6%	31.5%	3.1	2.7	24.9%	100.0%
137	192	65.2%	62.1%	2.9	2.8	45.5%	5.9%
138	193	49.5%	36.3%	2.9	2.1	34.6%	99.1%
139	194	25.2%	28.8%	3.0	3.4	17.6%	48.1%
140	195	58.4%	45.8%	2.9	2.3	40.8%	87.9%
141	195	18.8%	18.0%	2.9	2.8	13.1%	10.4%
142	196	78.6%	76.4%	3.0	2.9	54.9%	100.0%
143	197	35.0%	46.4%	3.0	3.9	24.4%	87.2%
144	197	17.5%	18.1%	3.0	3.1	12.2%	4.9%
145	198	49.1%	56.3%	3.0	3.5	34.3%	99.2%
146	199	40.2%	54.1%	3.0	4.0	28.1%	93.8%
147	199	13.1%	14.0%	3.0	3.2	9.1%	3.5%
148	202	21.3%	17.0%	2.9	2.3	14.9%	3.5%
149	203	42.6%	54.3%	3.0	3.9	29.8%	63.0%
150	206	20.1%	16.2%	3.1	2.5	14.1%	2.5%
151	207	51.2%	45.0%	2.8	2.5	35.8%	5.4%
152	208	54.7%	31.0%	2.8	1.6	38.2%	5.2%
153	210	74.7%	66.3%	3.0	2.7	52.2%	99.9%
154	215	69.3%	62.0%	3.0	2.7	48.4%	9.5%
155	216	52.9%	50.6%	3.0	2.9	36.9%	8.2%
156	217	44.6%	49.8%	3.0	3.4	31.1%	93.1%
157	218	50.0%	44.9%	2.8	2.5	34.9%	83.1%
Average		32.6%	32.6%	2.9	3.1	22.8%	40.0%
Stnd. deviation		18.4%	17.7%	0.1	0.6		
Maximum		78.6%	98.0%	3.1	4.5		
Minimum		4.4%	5.5%	2.8	1.4		

Model: AIR = Universe x 1.4317396 x circulation per household
R-squared = 0.969

Appendix 4. Modelled cumulative readership from a range of A.I.R. percentages.

JICIREG 2 cumulative readership models

A.I.R. %.	Morning model cume %	Evening model. cume %	Sunday model cume %	Paid-for weekly cume %	Free weekly cume %
5	18.5	24.0	8.4	15.6	12.3
10	29.5	34.6	16.2	24.6	20.2
15	38.8	42.9	23.7	32.1	27.1
20	47.0	49.9	31.1	38.8	33.4
25	54.6	56.1	38.4	44.9	39.2
30	61.8	61.8	45.6	50.6	44.7
35	68.5	67.0	52.7	55.9	50.0
40	75.0	71.9	59.7	61.0	55.1
45	81.1	76.5	66.7	65.9	60.0
50	87.1	80.9	73.7	70.6	64.7
55	92.9	85.0	80.6	75.2	69.3
60	98.5	89.0	87.5	79.6	73.8
65	100.0	92.9	94.3	83.9	78.2
70	100.0	96.6	100.0	88.1	82.5
75	100.0	100.0	100.0	92.1	86.7
80	100.0	100.0	100.0	96.1	90.9
85	100.0	100.0	100.0	100.0	94.9
90	100.0	100.0	100.0	100.0	98.9
95	100.0	100.0	100.0	100.0	100.0