

ARBITRON RATINGS
RADIO•TELEVISION•CABLE

1350 Avenue of the Americas
New York, New York 10019
(212) 887-1324

MADELEINE H. SCHREIBER
Manager
Radio Representative/Network Sales

April 10, 1986

To: Bruce Hoban - Republic Radio

Re: Arbitron Radio Weighting Presentation

Enclosed is a copy of the Arbitron presentation on Radio Weighting that was done at the March Radio Advisory Council meeting.

Please call if you have any questions about the presentation.

Sincerely,



MHS:eo
Enc.

GD CONTROL DATA PRIVATE

RADIO WEIGHTING

RADIO ADVISORY COUNCIL
MARCH 1986
CLAIRE KUMMER

ARBITRON RATINGS
RADIO

WHY WEIGHT THE IN-TAB SAMPLE?

- RETURNED SAMPLE NOT IN PERFECT PROPORTION TO THE UNIVERSE

AND

- DIFFERENT BEHAVIOR PATTERNS AMONG DIFFERENT SEGMENTS OF THE UNIVERSE

ARBITRON RATINGS
RADIO

RETURNED SAMPLE NOT IN PROPORTION TO UNIVERSE...

- SAMPLE FRAME
- DIFFERENTIAL USABILITY. CONSENT. RETURN THAT CAN'T BE PERFECTLY FORECASTED AND/OR CONTROLLED UP FRONT
- DISPROPORTIONAL SAMPLING

ARBITRON RATINGS
RADIO

- DIFFERENT BEHAVIOR PATTERNS AMONG DIFFERENT UNIVERSE SEGMENTS:

- GEOGRAPHY

- AGE

- SEX

- ETHNICITY

ARBITRON RATINGS
RADIO

WHAT IS SAMPLE BALANCING?

- A MEANS OF WEIGHTING SURVEY DATA TO A SET OF CONTROLS WHICH YIELDS THE LEAST EXTREME IN WEIGHTS FOR APPLICATION TO EACH INTERVIEW
- WEIGHTING IS PERFORMED "ON THE MARGIN." RATHER THAN TO EACH INDIVIDUAL CELL

ARBITRON RATINGS
RADIO

- WHY IS IT IMPORTANT TO KEEP THE WEIGHTING TO THE LOWEST LEVEL POSSIBLE?

BECAUSE WEIGHTING LOWERS THE EFFECTIVE SAMPLE BASE
-- THERE IS A TRADE-OFF BETWEEN REMOVAL OF BIAS
AND MAINTENANCE OF ESB. WEIGHTING CONTROLS THAT
ARE "TOO TIGHT" MAY PRODUCE SUCH EXTREME WEIGHTS
THAT THEY PUSH TOO MUCH "BOUNCE" INTO THE RESULTS
-- THE BIAS REMOVAL FUNCTION THEY PERFORM CAN
BECOME ACADEMIC.

ARBITRON RATINGS
RADIO

SOME SAMPLE BALANCING TERMS

MODEL = ONE COMPLETE SET OF DATA UPON WHICH SAMPLE
BALANCING IS PERFORMED

EXAMPLE:

MODEL 1
METRO
SURVEY
AREA

MODEL 2
NON-METRO
TOTAL
SURVEY AREA

ARBITRON RATINGS
RADIO

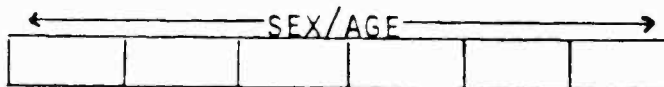
RAC/MARCH 86
C. KUMMER

TERMS

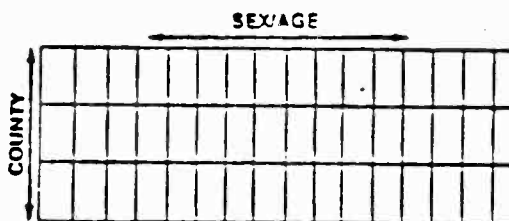
MARGINAL - A CHARACTERISTIC CHOSEN FOR USE IN WEIGHTING A MODEL; EACH WEIGHTING CHARACTERISTIC WITHIN A MODEL IS A DIMENSION

EXAMPLE:

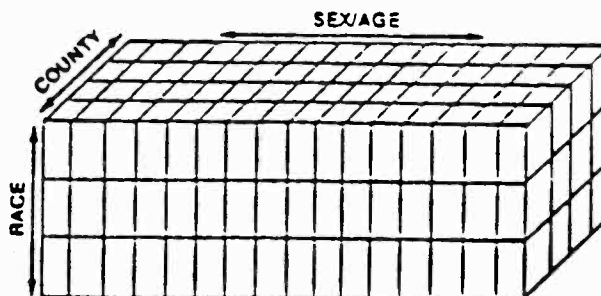
ONE
MARGINAL



TWO
MARGINALS



THREE
MARGINALS

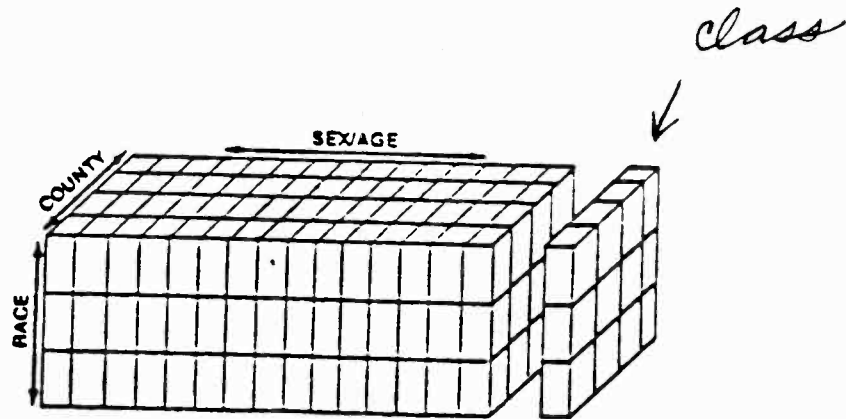
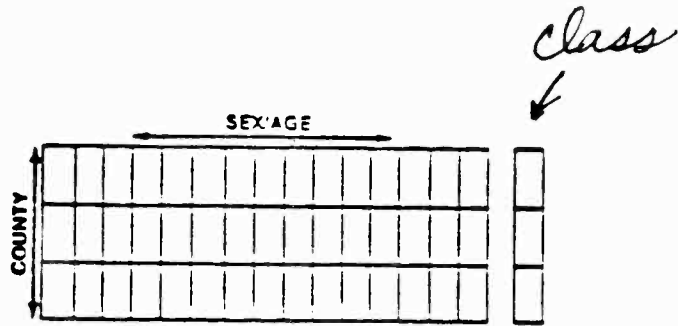


ARBITRON RATINGS
RADIO

TERMS

CLASS = A SPECIFIC, DEFINED SUBSET OF A GIVEN MARGINAL

EXAMPLE:

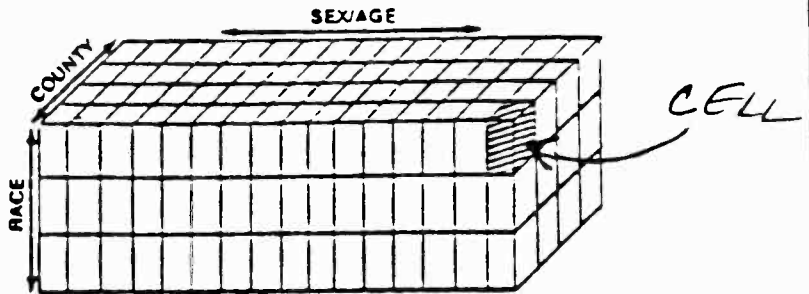
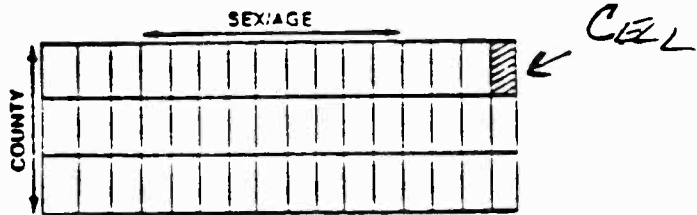


ARBITRON RATINGS
RADIO

TERMS

CELL = THE COMBINATION OF CLASSES FROM TWO OR MORE MARGINALS

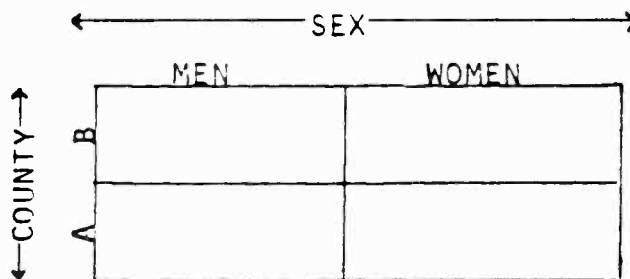
EXAMPLE:



ARBITRON RATINGS
RADIO

HOW DOES SAMPLE BALANCING WORK?

- ASSUME A MODEL MADE UP OF TWO MARGINALS WITH TWO CLASSES EACH



ARBITRON RATINGS RADIO

MARGINAL DATA

<u>MARGINAL</u>	<u>CLASS</u>	<u>IN-TAB</u>	<u>POPULATION</u>
SEX	MEN	25	50.000
	WOMEN	75	50.000
	TOTAL	100	100.000
COUNTY	B	60	90.000
	A	40	10.000
	TOTAL	100	100.000

CELL DATA

		POPULATION				IN-TAB			
		SEX				SEX			
		MEN	WOMEN			MEN	WOMEN		
COUNTY	B	49	41	90	COUNTY	B	15	45	60
	A	1	9	10		A	10	30	40
		50	50			25	75		

ARBITRON RATINGS
RADIO

RAC/MARCH 86
C. KUMMER

1. ADJUST FIRST MARGINAL TO CONTROL FIGURE BY CALCULATING A WEIGHT FOR EACH CLASS

$$\text{CLASS WEIGHT} = \frac{\text{CONTROL}}{\text{IN-TAB}}$$

		SEX	
		MEN	WOMEN
COUNTY	B	15	45
	A	10	30
	IN-TAB	25	75
	CONTROL	50	50
<i>CLASS</i>	WEIGHT	2.0	0.67

ARBITRON RATINGS
RADIO

2. NOW MULTIPLY THE IN-TAB IN EACH CELL BY ITS CLASS WEIGHT

		SEX	
		MEN	WOMEN
COUNTY	B	15 x 2.0	45 x .67
	A	10 x 2.0	30 x .67

=

		SEX	
		MEN	WOMEN
COUNTY	B	30	30
	A	20	20
IN-TAB		50	50
CONTROL		50	50

Percentages

ARBITRON RATINGS
RADIO

3. ADJUST SECOND MARGINAL TO CONTROL FIGURE BY
CALCULATING A WEIGHT FOR EACH CLASS

		SEX		IN-TAB	CONTROL	WEIGHT
		MEN	WOMEN			
COUNTY	B	30	30	60	90	1.5
	A	20	20	40	10	.25
IN-TAB		50	50			
CONTROL		50	50			

ARBITRON RATINGS
RADIO

4. NOW REPEAT STEP 2: MULTIPLY THE "IN-TAB" IN EACH CELL BY ITS CLASS WEIGHT

		SEX	
		MEN	WOMEN
COUNTY	B	30 x 1.5	30 x 1.5
	A	20 x .25	20 x .25

		SEX		IN-TAB CONTROL	
		MEN	WOMEN		
COUNTY	B	45	45	90	90
	A	5	5	10	10
IN-TAB		50	50		
CONTROL		50	50		

ARBITRON RATINGS RADIO

5. THE FIRST "PASS" IS COMPLETE. TEST FOR "CONVERGENCE" BY COMPARING ADJUSTED IN-TAB AND CONTROL MARGINAL VALUES FOR AGREEMENT.

IN THIS SIMPLE EXAMPLE, AGREEMENT WAS REACHED IN ONE PASS. THIS IS USUALLY NOT THE CASE.

ARBITRON RATINGS
RADIO

RESULTS

MARGINAL (RIM) WEIGHTS:

MEN 2.0
 WOMEN .67
 B 1.5
 A .25

CELL WEIGHTS ARE CALCULATED BY MULTIPLYING THE RIM WEIGHTS ASSOCIATED WITH EACH CELL:

$2.0 \times 1.5 = 3.0$

		← SEX →	
		MEN	WOMEN
COUNTY ↑ ↓	B	3.0	1.0
	A	.5	.17

SAMPLE BALANCING IS COMPLETE.

ARBITRON RATINGS
RADIO

RAC/MARCH 86
 C. KUMMER

TO CALCULATE THE PPDV FOR EACH CELL:

1. CALCULATE THE AVERAGE PPDV:

$$\frac{\text{TOTAL POPULATION}}{\text{TOTAL IN-TAB}} = \text{AVERAGE PPDV}$$

$$\frac{100,000}{100} = 1,000$$

2. CALCULATE CELL PPDV:

AVERAGE PPDV X CELL WEIGHT = CELL PPDV

$$1000 \times 3.0 = 3,000$$

		← SEX →	
		MEN	WOMEN
← COUNTY →	B	3,000	1,000
	A	500	170

EACH USABLE DIARY TAKES ON THE CALCULATED PPDV FOR ITS CELL.

ARBITRON RATINGS RADIO

COMPARISON OF CELLS FOR THE POPULATION AND THE WEIGHTED IN-TAB:

POPULATION

← SEX →

		MEN	WOMEN	
← COUNTY →	B	49,000	41,000	90,000
	A	1,000	9,000	10,000
		50,000	50,000	

WEIGHTED IN-TAB

← SEX →

		MEN	WOMEN	
← COUNTY →	B	45,000	45,000	90,000
	A	5,000	5,000	10,000
		50,000	50,000	

MARGINALS AGREE...CELLS DO NOT BECAUSE WE DID NOT WEIGHT ON THEM.

ARBITRON RATINGS
RADIO

RAC/MARCH 86
C. KUMMER

HOW DOES ARBITRON APPLY SAMPLE BALANCING?

1. GEOGRAPHIC WEIGHTING UNIT:
USUALLY INDIVIDUAL COUNTIES

2. SEX AND AGE IN 16 GROUPS:

<u>MEN</u>	<u>WOMEN</u>
12-17	12-17
18-24	18-24
25-34	25-34
35-44	35-44
45-49	45-49
50-54	50-54
55-64	55-64
65+	65+

3. RACE/NATIONALITY:

BLACK/OTHER
HISPANIC/OTHER
BLACK/HISPANIC/OTHER

ARBITRON RATINGS
RADIO

HOW DOES ARBITRON APPLY SAMPLE BALANCING?

- MODELS ARE USUALLY MAJOR GEOGRAPHIC REPORTING AREAS:

METRO

NON-METRO/NON-TSA ADI

NON-METRO/NON-ADI TSA

- OTHER USES OF MODELS:

RACE/NATIONALITY (WHERE SAMPLE SIZE IS LARGE ENOUGH)

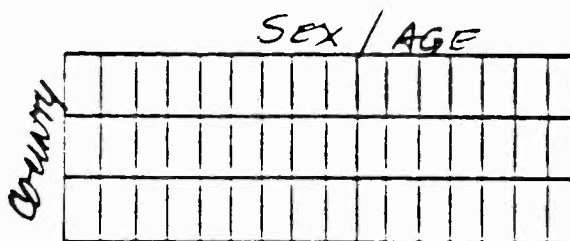
"EMBEDDED" METROS

ARBITRON RATINGS
RADIO

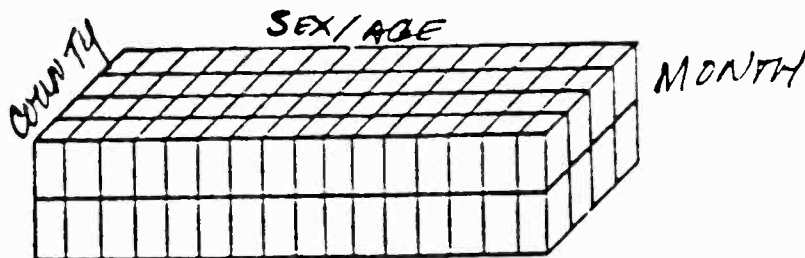
CALENDAR WEIGHTING -- CONTROLLING FOR DIFFERENTIAL RETURNS BY MONTH

- EACH 4-WEEK PERIOD OF A 12-WEEK SURVEY PERIOD WILL BE CONTROLLED TO REPRESENT ITS FAIR ONE-THIRD SHARE OF THE TOTAL
- CALENDAR WEIGHTING WILL BE ANOTHER MARGINAL AND WILL ADD ANOTHER DIMENSION TO EACH MODEL:

TWO DIMENSIONS



THREE DIMENSIONS



ARBITRON RATINGS
RADIO

WEIGHTING LOWERS ESB...HOW MUCH WILL THIS ADDED
WEIGHTING FOR CALENDAR TIME LOWER ESB?

A VERY SMALL AMOUNT -- WE ESTIMATE LESS
THAN 5% FOR MOST REPORTING AREAS

ARBITRON RATINGS
RADIO

WHAT IMPACT WILL THIS HAVE ON REPORTED ESTIMATES?

MINIMAL...

- SAMPLES FAIRLY WELL-DISTRIBUTED MOST OF THE TIME.
SO LITTLE WEIGHTING TO BE DONE
- ON PERSONS 12+. WE EXPECT NO DIFFERENCE IN AQH
RATING 95% OF THE TIME. \pm .1 RATING POINT 5% OF THE
TIME
- ANY IMPACT WILL HAVE NO SYSTEMATIC EFFECT BY
STATION TYPE OR FORMAT. BECAUSE SAMPLE IMBALANCE BY
MONTH IS NOT SYSTEMATIC

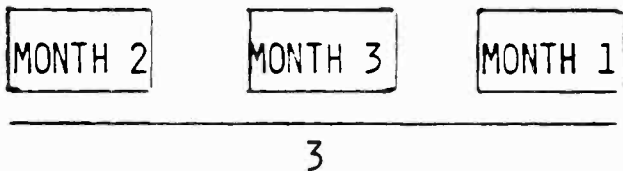
...NO DISRUPTIVE EFFECT ON TRENDS

ARBITRON RATINGS
RADIO

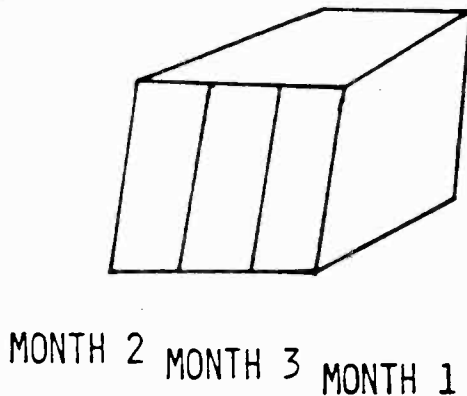
WHAT ABOUT ARBITRENDS?

- THE INTRODUCTION OF CALENDAR TIME WEIGHTING ON THE MARGIN ALLOWS US TO ALIGN THE METHODOLOGY FOR PRODUCING ARBITRENDS ROLLING AVERAGES WITH THAT OF THE QUARTERLY REPORTS

CURRENTLY:



AFTER THE CHANGE:



ARBITRON RATINGS
RADIO

RAC/MARCH 86
C. KUMMER

WHY CAN'T ARBITRON PROCESS ARBITRENDS ROLLING
AVERAGES "LIKE THE QUARTERLY" NOW?

- BECAUSE SAMPLE SIZES CAN AND DO CHANGE BY DESIGN
ACROSS SURVEY PERIODS:
 - MARKET DEFINITION CHANGES
 - EMBEDDED METROS WITH DIFFERENT REPORTING
FREQUENCY THAN PARENT
- SOME FORM OF MONTHLY CONTROL NEEDED TO ADJUST
- SAMPLE SIZE CHANGES ACROSS MONTHS WITHIN SURVEY
PERIODS OCCUR BY CHANCE. NOT BY DESIGN AND ARE
RARELY EXTREME

ARBITRON RATINGS
RADIO

RAC/MARCH 86
C. KUMMER

WHAT IMPACT WILL THIS HAVE ON THE ARBITRENDS
ROLLING AVERAGES ESTIMATES?

MINIMAL...

- DIFFERENCE BETWEEN CURRENT MARKET REPORT (NO WEIGHTING ON CALENDAR MONTH) AND CURRENT ARBITRENDS (RIGOROUS MODEL CONTROL ON MONTH) PRODUCES NO DIFFERENCE 80% OF THE TIME AND $\pm .1$ 20% OF THE TIME
- THIS WILL ADD SOME WEIGHTING TO THE MARKET REPORT AND REDUCE SOME OF THE WEIGHTING ON THE ARBITRENDS ROLLING AVERAGE ESTIMATES SO THAT BOTH ARE TREATED CONSISTENTLY
- THERE WILL BE LITTLE IMPACT ON EITHER

ARBITRON RATINGS
RADIO

RAC/MARCH 86
C. KUMMER