

inputs

contribution

ROI

impact

# Marketing Mix Modeling and Media Inputs

correlation

**Providing More Precise Media Inputs  
in Marketing Mix Modeling (MMM)  
is Critical for More Accurate  
Assessment of Marketing Impact**

efficiency

$$\widehat{BIX}_{it} = \frac{1}{\sum n} \sum_{\tau=0}^3$$

results

effectiveness

algorithms

value

$$(BIX_{i,t-\tau} * n) \forall \tau \in \mathbb{T}$$

yield

outcome

# Mediamark Research & Intelligence

is pleased to encourage best practices in modeling through our support of this guide and by improving the quality of magazine data for marketing mix modeling.

> > > *MRI's groundbreaking modeling tool will provide the granular magazine data needed to more precisely measure the ROI of print campaigns—in an easy-to-use syndicated online delivery.*

**Available only through MRI.  
Launching in Second Quarter 2010.**

For more information on how you can use MRI's new tool to develop the most accurate inputs for your marketing mix models, please contact

**Andrew Arthur**

Vice President, Marketing Solutions at MRI at:  
Andrew.arthur@mediamark.com  
or 212.884.9230.

# Marketing Mix Modeling and Media Inputs

“Improving marketing mix models is essential for enhancing integrated marketing effectiveness. As the media landscape proliferates, data precision is critical to insure the growth in marketing mix quality and reliability.”

— **Bob Liodice** President and Chief Executive Officer  
Association of National Advertisers (ANA)

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## RESEARCH SOURCES

*Better Representing Magazine Effects in Marketing Mix Modeling*, Mark Reggimenti, BrandScience; Judy Vogel, PHD; Jim Collins, Mediamark Research & Intelligence; Wayne Eadie, Magazine Publishers of America

*Magazines & Media Mix Models: Prescription for Success*, David Shiffman, Mediavest Worldwide; Britta C. Ware, Meredith Corporation; Julia Soukhareva, Ninah Consulting; David Dixon, Ninah Consulting America

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*Practical Guidelines & Best Practices for Magazines in Media Mix Models*, Craig Winters, Johnson & Johnson

*Representing Magazine Effects*, Doug Scott, Millward Brown

*Succeeding In the Marketing Mix Modeling World*, Jim Spaeth, Sequent Partners

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## Executive Summary

This paper reviews independent research that offers insights on the process of marketing mix modeling. The findings have important implications for advertisers looking to optimize the return on their marketing investments.

Learning across three separate studies shows the benefits of improving media inputs in marketing mix modeling:

- **More specific media inputs yielded a better match with marketing outcomes**
  - For magazines, the most significant fit between inputs and results occurred with audience accumulation data (i.e., weekly GRPs) compared to data based on spending or on GRPs allocated to a single month
  - GRPs gave a better picture of the level and duration of magazines' contribution to results than did dollars for both media and creative performance
- **Less precise inputs for a medium affected its contribution to results**
  - Magazine advertising's contribution varied as much as 18%, simply by using weekly and market-level data
  - Generating more precise magazine inputs has often been avoided due to labor and time constraints; a new product is available to facilitate providing weekly and market-level data for magazines

**Implementing best practices in the marketing mix modeling process will encourage better decision-making,** based on recommendations from key players in advertising agencies and modeling companies.

**Modeling will continue to evolve as new technology and products become available,** helping advertisers to isolate and measure the many elements that contribute to a campaign's success.

## Background

Marketing mix modeling (MMM) is a statistical technique that explains how marketing elements contribute to boosting marketing results beyond what would occur without these elements.

Models rely on pattern recognition in which fluctuations in marketing elements — advertising, promotion, distribution, pricing, etc., — are isolated and compared to fluctuations in sales and/or other marketing outcomes, such as buzz, willingness to recommend, etc. When the patterns match, the incremental effects are attributed to the marketing elements that drove results.

“A lot of otherwise excellent marketing mix models have to resort to media data that are not an optimal fit; this compromises the models’ read of media ROI.”

— Jim Spaeth  
Partner, Sequent Partners

**As advertisers and their agencies look for clear evidence of ad effectiveness, tools that measure accountability by medium, such as marketing mix modeling, have found wide acceptance.** According to a 2008 ANA Accountability Study, 60-70% of advertisers use marketing mix models.

Advertisers use models to guide fundamental media investment decisions and forecast the impact of future marketing activities. However, **discussions with modeling companies and the advertising community have indicated a wide range of practices are employed in marketing mix modeling, including how media inputs are used, which affects the accuracy of results.** In some cases the labor-intensity of generating optimal inputs is a barrier to implementing best practices.

## Looking at Modeling Inputs

**Given that the goal of modeling is to compare the patterns of advertising and marketing elements to results, it is advantageous for media inputs to be reported weekly and by market,** as that is the usual format for reporting results (especially sales).

Some media fare better in modeling because their inputs are more closely aligned to the format used to measure results:

- Broadcast media (TV and radio) can easily report weekly GRP data by local markets
- The internet can provide weekly data, but the numbers are not readily available by market
- For magazines the most commonly used inputs are either national GRPs by month or spending data, i.e., weekly and market-level inputs are not often employed
- Out-of-home and newspapers have market-level data more readily available than weekly data

Broadcast media, therefore, tend to perform better in models than other media because their inputs usually conform more closely to results.

**The implication for marketers is significant: improper media inputs can underestimate a medium’s impact and overstate the impact of other channels, which can lead to a less-than-optimal allocation of advertising budgets.**

## Focusing on Magazine Inputs

Because the most commonly used inputs for magazines are spending data or national monthly GRPs, there is an opportunity to incorporate more precise magazine inputs in the modeling process. In some cases weekly and/or market-level data are incorporated for magazines in modeling, but this is the exception rather than the rule.

Recent efforts by three groups examined the issue of using optimal inputs for magazines in MMM utilizing different approaches:

- Millward Brown, a research company used by many major clients for MMMs
- Media agency PHD with their associated modeling company BrandScience; Mediamark Research & Intelligence (MRI) and Magazine Publishers of America (MPA)
- The agency MediaVest and Meredith Corporation in collaboration with Publicis Groupe-owned modeling company Ninah Consulting

### Millward Brown

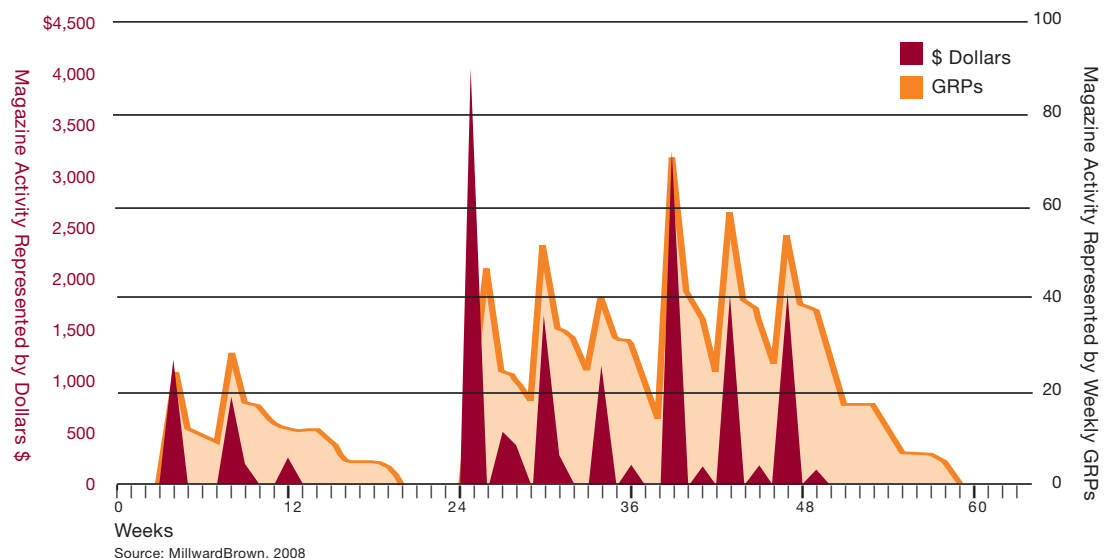
As a first step, Millward Brown reanalyzed a series of existing studies to see if results might be influenced depending on whether dollars or GRPs were employed to represent magazine activity. The studies covered a number of years, categories and brands.

**Millward Brown found that the use of weekly GRPs versus dollars as inputs gave a very different picture of the level and duration of magazine activity, which can have a major impact on how magazines contribute to results.** Spending inputs are typically concentrated around the issue dates of magazines, whereas GRPs can reflect weekly exposure levels. Millward Brown's analyses illuminated this showing that dollars:

- Captured only one-third of the real weeks of magazine support
- Caused wide-ranging variations in the activity attributed to specific weeks (up to 30 times over GRP-levels)

Millward Brown concluded that weekly GRPs, therefore, are a better input for models than dollars.

### Magazine Activity Represented by Dollars vs. Weekly GRPs for Sample Brand



In addition, Millward Brown took a variety of magazine creative executions and examined the impact of using GRPs versus dollars on results. They found that **dollars vs. GRPs produced widely different findings in 43 percent of cases, undervaluing the quality of the creative and thereby misrepresenting the contribution of magazines.**

## PHD, BrandScience, MRI & MPA

This research probed whether more precise magazine inputs lead to more accurate MMM results by looking at the impact on results of using five different magazine metrics:

- Rate card spending
- MRI average issue audience GRPs concentrated in the month or week of the issue date
- MRI issue-specific audience GRPs concentrated in the month or week of the issue date
- MRI average issue audience GRPs reported by week using audience accumulation data
- MRI issue-specific audience GRPs reported by week using audience accumulation data

“We now have evidence that properly converting magazine activity to GRPs is worth the effort.”

— **Douglas Scott**  
Senior Vice President, Millward Brown

The order in the list above reflects the increasing ability of magazine data to correspond with weekly performance data. For this analysis, positive impressions, buzz and a willingness to recommend a brand represented results.

The research found that across six product categories **more precise inputs for magazines generally aligned better with performance data**, based on examining the relationship between specific inputs (e.g., spending, average issue GRPs, etc.) relative to the three outcomes being measured.

**The most significant improvement in modeling performance occurred with the incorporation of audience accumulation data.** Issue-specific audience data also fit better with performance data, although to a lesser degree.

## Assessments of How Different Modeling Inputs Correlate to Results

### Magazine Inputs Relative to Positive Buzz

*Note: Higher number equals better match*

	spend	<u>no audience accumulation</u>		<u>audience accumulation</u>	
		average issue GRP	issue specific GRP	average issue GRP	issue specific GRP
Household Products	1.55	1.82	2.23	2.45	<b>3.02</b>
Batteries	2.53	1.59	3.06	4.05	<b>4.12</b>
Hotels	<b>.55</b>	.41	.42	.50	.52
DTC Pharmaceuticals	2.40	2.61	2.58	<b>2.89</b>	2.75
Food	1.02	1.04	1.09	1.59	<b>1.64</b>
Financial Services	2.60	2.69	2.74	3.23	<b>3.28</b>

Source: Better Representing Magazine Effects in Media Mix Modeling, 2009



## Magazine Inputs Relative to Positive Impression

Note: Higher number equals better match

	spend	<u>no audience accumulation</u>		<u>audience accumulation</u>	
		average issue GRP	issue specific GRP	average issue GRP	issue specific GRP
Household Products	.43	.67	.78	.61	<b>.86</b>
Batteries	2.27	2.29	2.28	<b>2.35</b>	2.32
Hotels	1.34	<b>1.59</b>	1.41	.82	.71
DTC Pharmaceuticals	1.98	2.01	2.03	2.61	<b>2.65</b>
Food	2.29	2.54	2.55	<b>4.89</b>	<b>4.89</b>
Financial Services	1.83	1.87	2.05	2.18	<b>2.43</b>

Source: Better Representing Magazine Effects in Media Mix Modeling, 2009

## Magazine Inputs Relative to Willingness to Recommend

Note: Higher number equals better match

	spend	<u>no audience accumulation</u>		<u>audience accumulation</u>	
		average issue GRP	issue specific GRP	average issue GRP	issue specific GRP
Household Products	.73	.75	.78	1.07	<b>1.10</b>
Batteries	1.77	<b>1.92</b>	1.90	1.79	1.76
Hotels	.29	.41	.38	.49	<b>.50</b>
DTC Pharmaceuticals	2.10	2.07	2.01	<b>3.14</b>	3.13
Food	1.75	1.87	1.96	1.97	<b>2.00</b>
Financial Services	2.23	2.41	2.45	2.89	<b>2.95</b>

Source: Better Representing Magazine Effects in Media Mix Modeling, 2009

## MediaVest, Meredith Corporation, Ninah Consulting

This study also aimed to determine whether improving the quality and consistency of magazine data inputs in MMM would result in different—and more accurate—results and recommendations by comparing six variations for magazine inputs:

- Weekly GRPs by market
- Monthly GRPs by market distributed evenly across each week of the issue month
- Weekly national GRPs
- Monthly spending distributed evenly across each week of the issue month
- Monthly GRPs by market concentrated in the first week of the issue month
- Monthly spending concentrated in the first week of the issue month

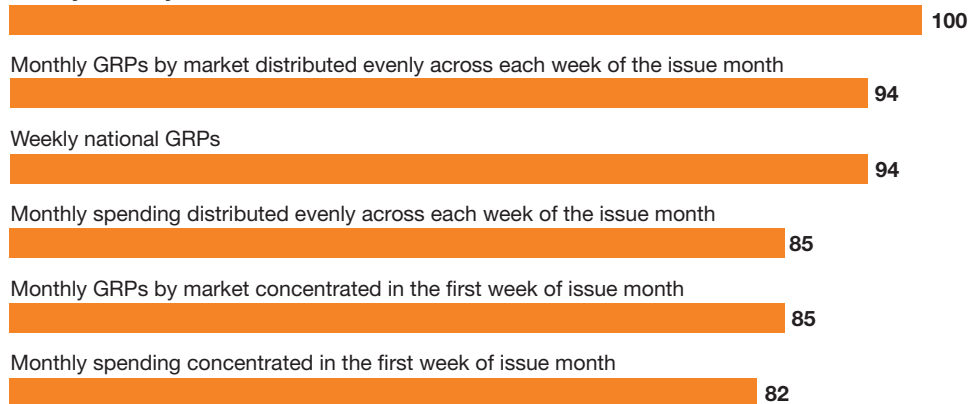
**Once again the research found that the strongest correlation between inputs and results was achieved with more precise data,** with weekly GRPs by market being optimal:

- Weekly GRPs by market outperformed monthly GRPs by market and weekly national GRPs by 6%
- All three of these inputs outperformed monthly dollars (spread evenly across weeks), monthly GRPs by market, and monthly dollars allocated to the first week of the issue month by as much as 18%

**The value attributed to magazine advertising can vary by as much as 18%**

Index based on model results based on contribution

**Weekly GRPs by market**



Source: *Magazines and Media Mix Models: Prescription for Success*, 2009

**What's more, more accurate magazine inputs also affected other media:** the contribution and ROI of other media channels decreased proportionately with the improvement in magazines' performance. The research attributed this to the fact that weekly GRPs by market better reflected actual readership and better aligned with sales.

## Removing the Barriers to Better Magazine Inputs

Discussions with modeling companies, agencies and clients indicate that the use of audience accumulation and issue-specific data pose a challenge, because generating inputs is labor-intensive and time consuming. Therefore, modeling is often done with less than optimal magazine data.

To this end, Mediamark Research & Intelligence (MRI) has developed a product to provide marketers with a higher degree of granularity and variability for their magazine modeling data with far less effort than currently required. This online tool imports print insertion schedules provided by an agency and generates more precise inputs for MMMs using:

- Weekly data based on audience accumulation curves
- Issue-specific audiences
- Market-by-market audience estimates

This new tool has the potential to foster wider use of weekly and market-specific data that can improve the accuracy of generating results in MMM.

## Looking at Best Practices

**Employing best practices will improve the marketing mix modeling process and encourage more accurate results.** To this end, key players from agencies, clients and modeling companies contributed the following guidelines for both setting up a model and then interpreting modeling results:

### Setting Up a Model

- **Involve key stakeholders** (such as agency creative, media, research, account planning and account management, client brand manager, client research, etc.) in the set-up process to be sure that all elements of the marketing plan are understood and incorporated
- Work with the modeling company and stakeholders to **confirm that the objectives for the effort align with the analyses being performed.** For example, if the model can only read sales, but the goal is to understand the role of the brand's website in the sales process, the outcome may not meet expectations
- **Ensure that there are sufficient data available and that minimum spending levels are met** to enable statistically reliable outputs. When data are not available, consider:
  - Whether and how you can compensate for missing data with estimates (e.g., prototyping unmeasured websites or magazines)
  - How you can make other adjustments to increase accurate output (e.g., access outcomes to reflect data only from measured media)
- **Align inputs to data being reported for results** as much as possible, looking at factors such as:
  - **Interval of reporting:** Media inputs should reflect the interval in which results are measured, usually weekly
  - **Number of years:** Media inputs should correspond to the period being measured, typically three years
  - **Geography:** When the model evaluates sales by market, market-level data inputs enhance accuracy
  - **Time period used:** When looking at data for a specific period be sure to pull the data for that period (e.g., broadcast weeks and the weeks in a calendar period may not correspond, and adjustments may be needed)

- **Try to achieve consistency of inputs across media** and adjust when this cannot be done
  - GRPs or impressions are preferred versus spending data, as they better reflect consumer exposure levels. Because it may be difficult to generate GRPs for non-media elements, it may be important to conduct two separate analyses with one analysis using spending to allow for assessment of non-media elements and the other focusing only on media using GRPs (or other exposure data)
  - It is preferable to use target GRPs rather than household GRPs since all media can report on target GRPs or impressions, while only some offer household GRPs
  - While the model may require homogenizing media to the broadest demographic available (e.g., age and gender), some media are purchased based on other criteria, such as purchase behavior, psychographics, etc. Consider how the impact of more targeted media may be marginalized when forced to conform to a broad demographic target
  
- **Consider assessing factors that may affect marketing results** and incorporate this thinking into the model
  - **Saturation:** Advertisers may want to evaluate the point at which advertising no longer drives sales or does so at a minimal rate. When saturation is measured, money can be reallocated to an unsaturated medium when a medium exceeds the point of diminishing returns
  - **Creative:** The strength of the creative can be factored into the model using syndicated data (such as IAG for TV and Affinity VISTA or MRI/Starch for magazines) or proprietary research (e.g., creative testing data) to quantify creative quality. This can allow the model to measure the effect of different executions on results and can provide learning for further creative development or rotation
  - **Halo Effect:** Marketers can study the effects of “sister” brands in a corporate portfolio on the particular brand being studied to measure how multiple campaigns in the same period for related brands affect results. The findings can aid in corporate decision making
  - **Synergy/Scheduling Overlap:** Analysis can examine the impact of running media simultaneously versus in isolation. The individual effectiveness of each medium may be highest when there is a substantial overlap in weekly scheduling across media—or not
  - **Short-Term Effects:** Consider whether the analyses are so focused on short-term effects that they fail to show the true contributions of various marketing elements. For example, cumulative effects of a medium on promotional events can be missed when each promotion is measured individually versus across a more comprehensive analysis period
  - **Variation:** Since some models are more sensitive to “on/off” patterns than continuity, review analyses to see how they handle media in which weekly GRPs tend to be more continuous (for example, with the internet or with magazines when accumulated GRPs are used) vs. concentrated (e.g., with broadcast media) to ensure that media impact is accurately measured
  - **Trends:** Understand whether models are updated to reflect changes in consumer media usage, e.g., lower TV ratings, growth of social media, etc.

- **Consider how modeling outcomes may fit with results from other analytic tools**
  - Proprietary studies such as awareness tracking may provide added perspective on the relationship between media delivery and marketing outcomes
  - Purchase funnel analytics may offer a fuller picture of how each medium affects consumer behavior in the various stages of consumers' decision-making process

## Interpreting Model Results

- As in setting up a model, **involve all the key players** to discuss the learning and provide the most comprehensive insights regarding modeling results and implications
- **Allow for multiple opportunities for data interpretation.** Presentation of the initial results will likely raise questions that additional analyses can help to answer. For example, if one medium is not performing as well during one period of analysis compared to other periods, additional analyses that examine specific factors such as creative, economic conditions, competitive activity, etc. may help to explain the situation

“Inputs for each medium should reflect consumer exposure as accurately as possible, recognizing each medium’s unique characteristics.”

— **Judy Vogel**  
Senior Vice President,  
Director of Research, PHD

- **Consider modeling as a tool to understand the cause and effect of marketing, not an answer in itself.** Seeking to understand *why* the results came out the way they did can be the key to making the most effective decisions going forward
- **Assess the role of each medium relative to results.** If a medium is not performing, it may be due to the fact that it is being used differently than others in the mix. For example, if the goal of the advertising is to drive store visits and some media more directly encourage this behavior than others, differences in outcomes may be due to how each medium is being used rather than the ability of the medium to perform
- **Consider how the analyses handle media with relatively low spending** so their impact is not lost or overshadowed by media with larger budgets (i.e., threshold effect)
- Because models look at historical data, **re-examine findings in terms of current market conditions.** For example, changes in creative, competitive activity levels, etc. may alter how learning is applied going forward
- **Look beyond your inputs when results do not pass the “smell test.”** If analyses do not align with other learning from your knowledge base, examine other factors. Competitors' behavior, weather, distribution changes, retailer behavior, etc., may be at play

## An Eye to the Future

**As advertisers look at new and different ways to isolate and measure the many elements that contribute to a campaign's success, marketing mix modeling will continue to evolve.** The following trends provide insight into the future of MMM:

- More tools are emerging to measure creative execution, such as IAG for TV and MRI/Starch's AdMeasure for magazines. These services provide metrics for creative quality beyond simply an "opportunity to see." Adjusted GRPs, based on such tools, could be used to reflect creative strength. If measures of creative quality cannot be incorporated directly into the modeling process, assessing the impact of creative can still be considered in the back-end diagnostic phase
- Some modelers are exploring using new factors for inputs, such as employing reach versus GRPs. Using reach as an input may prove to offer advantages, as it measures the number of people exposed to the medium (or to the advertising in the medium) better than GRPs or impressions
- Given the ability for multiple exposures to a property, such as repeated viewing of TV programs on DVR's or multiple pickups of a magazine, marketing mix models may begin to incorporate the full number of media exposures in analysis
- Emerging data may allow for the inclusion of non-traditional media, such as social media, that currently do not have standard GRP measures

### MPA WOULD LIKE TO THANK THESE CONTRIBUTORS:

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Jim Collins, Mediamark Research & Intelligence

David Shiffman, Mediavest

Britta C. Ware, Meredith Corporation

Doug Scott, Millward Brown

Julia Soukhareva, David Dixon, Ninah Consulting, A Publicis Groupe Company

Judy Vogel, PHD

Jim Spaeth, Sequent Partners

“We must have accurate and comprehensive measures of ad exposure. There is a lot on the line, as inaccurate measurement can lead to totally the wrong judgment about what parts of the marketing mix are, in fact, working.”

— **Joel Robinson** Chief Research Officer, Advertising Research Foundation

