Training Session II

OPTIMIZE

Training Session II Agenda

1 ½ - 2 hrs

Introduction to Constrained Optimization

Discussion based on prior review of the deck "Introduction to Constrained Optimization"

- What is Constrained Optimization
- Key Terms
- Optimization Examples
- Optimize Overview
- Uses
- Output
- Setup Scenarios
  - Objective
  - Additional Data Rules
  - Constraints
- Setup Metadata
- Simple Example

Constrained Optimization in Action

Optional Short walk-through of some example LityxIQ case studies. Any of:

- Optimizing Casino Patron Loyalty
- Optimizing Print Channel Acquisition

FYI - Marketing Optimization using LityxIQ – Webinar

Published on Mar 3, 2014

- https://www.youtube.com/watch?v=j8vYnaLTmo0
- LityxIQ can be used to solve complex marketing and business optimization problems using only business language. This webinar walks through live case studies of how it works.

Live Demo Optimize

A solution embedded into LityxIQ used to solve constrained optimization problems

- Define Scenarios
  - Create New Scenario
    - Objective
    - Constraints
  - Run Scenario
  - Scenario Analysis
    - Summary
    - Compare
    - Detailed Output
  - Implement
- Manage Metadata
  - Terminology and Problem Definition
  - Dimensions and Levels
  - Attributes
  - Data Elements
  - Summary Metrics and Objective Functions
- Results Catalogs
  - Create New Catalog
  - Browse Results

Analysis Example I

Sales Rep Optimization: Client has to determine the optimal use of their sales reps over the next two months with many options available including what product to sell, customer segments to target and how to allocate calls across months.

Dataset: Toy Problem.csv

Type: Rolled-up

Records: 12

Dimensions:

- Products (3)
- Periods (2)
- Segments (2)

Attributes:

- Sales Rep (2)

Metrics:

- Response Rate
- Avg Sale Size

Sales Rep Optimization Data

Products	Periods	Segments	Sales Rep	Response Rate	Avg Sale Size
Product A	Month 1	Segment 1	Jane	0.0250	146
Product A	Month 1	Segment 2	Jane	0.0430	77
Product A	Month 2	Segment 1	Joe	0.0110	143
Product A	Month 2	Segment 2	Jane	0.0250	29
Product B	Month 1	Segment 1	Joe	0.0260	102
Product B	Month 1	Segment 2	Jane	0.0470	44
Product B	Month 2	Segment 1	Josh	0.0330	93
Product B	Month 2	Segment 2	Jane	0.0220	68
Product C	Month 1	Segment 1	Josh	0.0440	106
Product C	Month 1	Segment 2	Joe	0.0230	75
Product C	Month 2	Segment 1	Joe	0.0740	84
Product C	Month 2	Segment 2	Josh	0.0040	36

Scenarios

Scenario	Objective	Constraints	Additional Data Rules
1	Optimize Response Rate	○ Limit total # of calls <= 5,000 ○ Min # calls each sales rep >= 50 ○ Focus on segment 1; pct calls >= 65% ○ Set minimum total sales >= 1,000 ○ Distribute effort over each month; pct calls >= 45%	None
2	Optimize Total Sales	○ Limit total # of calls <= 5,000 ○ Min # calls each sales rep >= 50 ○ Focus on segment 1; pct calls >= 65% ○ ~~Set minimum total sales >= 1,000~~ ○ Distribute effort over each month; pct calls >= 45%	None

Analysis Example II

Budget Optimization: Client has many audience and channel options for their acquisition marketing efforts and would like to look at various optimization solutions.

Dataset: Budget Opt Sample File.csv

Type: Rolled-up

Records: 1,800

Dimensions:

- Channels (9)
- Decile (10)
- Segment (4)
- Age Group (5)

Metrics:

- # of Prospects
- Cost Per Piece (CPP)
- Response Rate
- Life Time Value (LTV)

Budget Opt

Channel	Decile	Segment	AgeGroup	Available to Promot	Cost Per Piece	Adjusted Response Rate	LTV
AM/Anne	Decile 01	African American	50-59	500.00	0.10	0.00	179.90
AM/Anne	Decile 01	African American	60-64	500.00	0.10	0.00	179.90
AM/Anne	Decile 01	African American	65-69	500.00	0.10	0.00	179.90
AM/Anne	Decile 01	African American	70+	500.00	0.10	0.00	179.90
AM/Anne	Decile 01	African American	Under 50	0.00	0.10	0.00	179.90
AM/Anne	Decile 01	General Market	50-59	6,000.00	0.10	0.00	179.90
AM/Anne	Decile 01	General Market	60-64	10,000.00	0.10	0.00	179.90
AM/Anne	Decile 01	General Market	65-69	10,000.00	0.10	0.00	179.90
AM/Anne	Decile 01	General Market	70+	3,000.00	0.10	0.00	179.90
AM/Anne	Decile 01	General Market	Under 50	1,000.00	0.10	0.00	179.90
AM/Anne	Decile 01	JT50	50-59	1,000.00	0.10	0.00	179.90
AM/Anne	Decile 01	JT50	60-64	0.00	0.10	0.00	179.90
AM/Anne	Decile 01	JT50	65-69	0.00	0.10	0.00	179.90
AM/Anne	Decile 01	JT50	70+	0.00	0.10	0.00	179.90
AM/Anne	Decile 01	JT50	Under 50	1,000.00	0.10	0.00	179.90
AM/Anne	Decile 01	Latino	50-59	500.00	0.10	0.00	179.90
AM/Anne	Decile 01	Latino	60-64	500.00	0.10	0.00	179.90
AM/Anne	Decile 01	Latino	65-69	500.00	0.10	0.00	179.90
AM/Anne	Decile 01	Latino	70+	500.00	0.10	0.00	179.90

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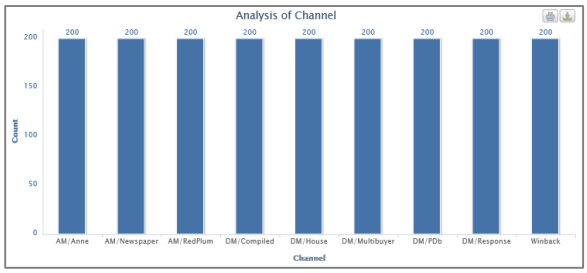
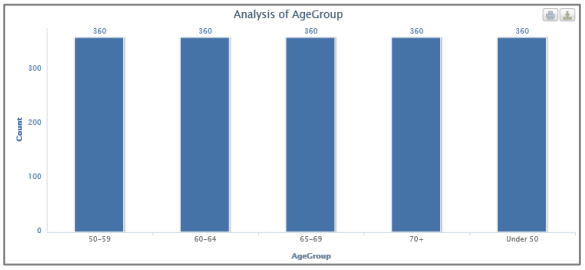
Scenarios

Scenario	Objective	Constraints	Additional Data Rules
1	Max Responders	○ Total cost <= $9MM across all dimensions	None
2	Min Cost Per Response	○ Total responders >= 100,000 across all dimensions	None

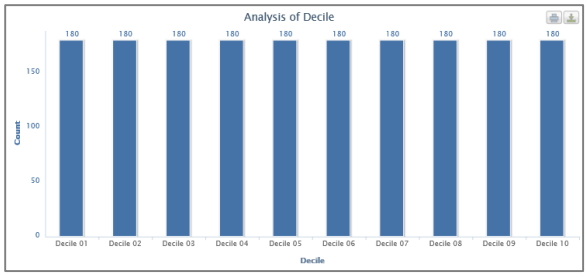
Channel



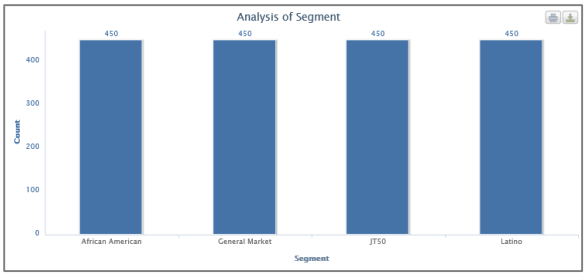
Age Group



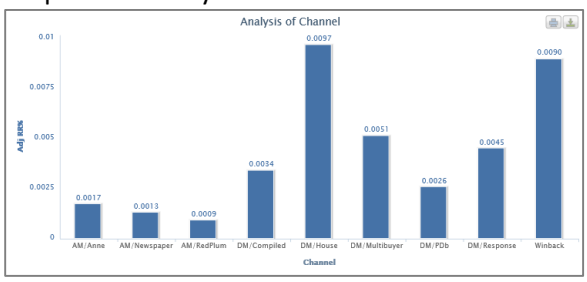
Decile



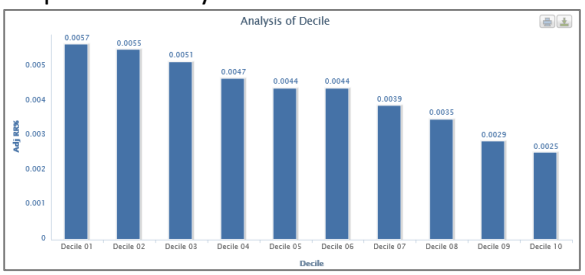
Segment



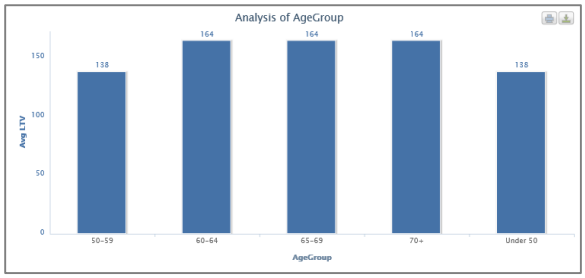
Response Rate by Channel



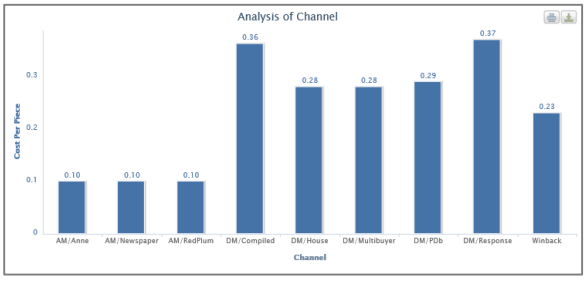
Response Rate by Decile



Dwelling Type



Cost Per Piece by Channel



EXERCISE

Data Manager

1. In Active Project 'Training Area_*your initials*' and within this project create a dataset library called 'Training Session II_*your initials*'
2. Using File Manager create a new dataset in Training Session II called 'Budget Opt_*your initials*' by reading in 'Budget Opt Sample File.csv' from the Public folder. How many records and variables were read in?
3. Open the Console Window to see that everything ran correctly.
4. QC the Campaign dataset using 'Browse Data' and 'Summary Statistics'.

Optimize

1. In Scenario Library 'Budget Opt Library' click on Manage Scenario Libraries within the Optimize links on the left side of the screen.
2. At the top click on Create New Library and call it 'Budget Opt_*your initials*'
3. Go into Manage Metadata within the Optimize links
4. Terminology and Problem Definition, edit and enter the words 'contacts' and 'dimensions' in the two fields.
5. Dimensions and Levels click on +Add Dimensions then choose Add Dimensions Using Dataset. Dataset select 'Budget Opt_*your initials*'. Available Dataset Variables select each of the variables shown AgeGroup, Channel, Decile, Segment. Click on +Add Selected Dimensions.

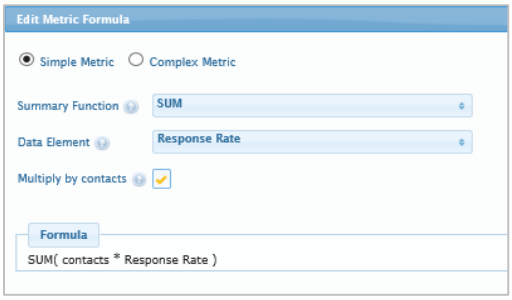
Dimension	No. Levels	Levels
AgeGroup	5	50-59, 60-64, 65-69, 70+, Under 50
Channel	9	AM/Anne, AM/Newspaper, AM/RedPlum, DM/Compiled, DM/House ...
Decile	10	Decile 01, Decile 02, Decile 03, Decile 04, Decile 05 ...
Segment	4	African American, General Market, JT50, Latino

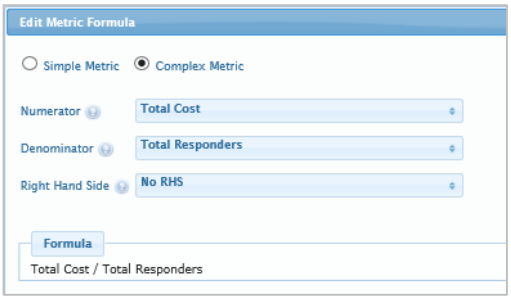
6. Data Elements click on +Add Data Element and add Cost Per Piece and separately Response Rate. You do not need to fill in any information on them. These are just place holders that will be pointed back to your dataset where the value exist.

Data Element Name	Type/Formula
Available to Promote	Special Universe Size Data
Cost Per Piece	Basic
Response Rate	Basic

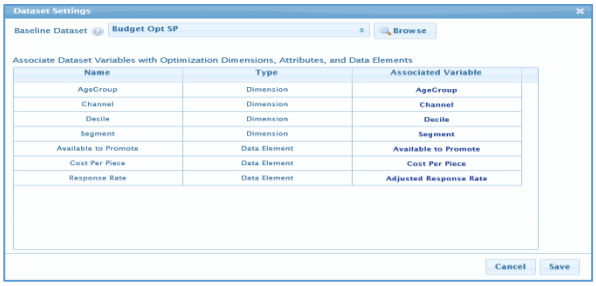
7. Summary Metrics and Objective Functions click on +Add Metric and enter each of the metrics below. Note the Formula shown and the Type. Create them from the bottom up as Overall CPO is a ratio of the other two. You will have to click on Edit Formula to create them.

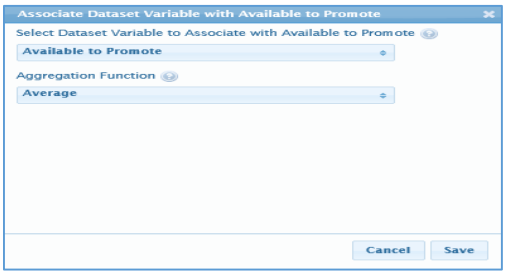
Metric Name	Type	Formula
Overall CPO	Complex	Total Cost / Total Responders
Total Cost	Simple	SUM(contacts * Cost Per Piece)
Total Responders	Simple	SUM(contacts * Response Rate)



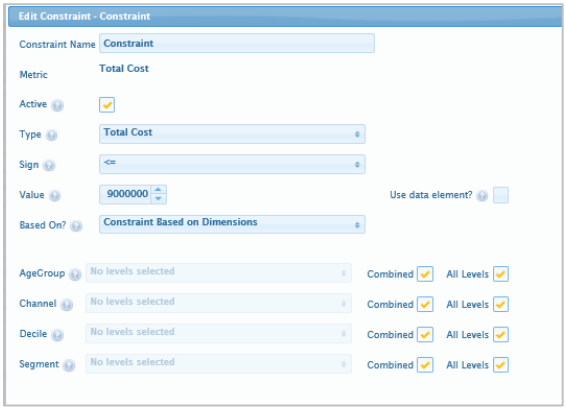


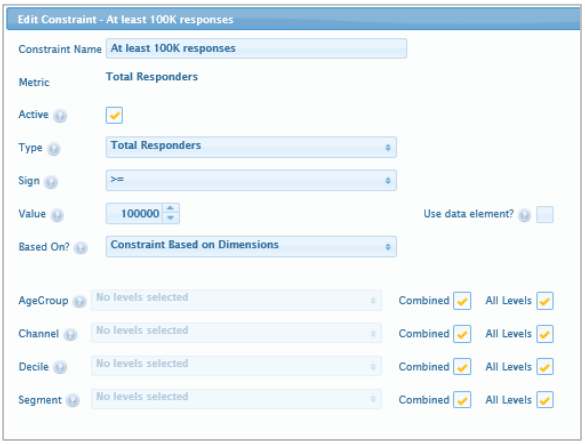
8. Define Scenarios click within Optimize Links on the left side of the screen
9. At the top of the screen where it says "Associated Dataset: None" click on None.
10. Select Dataset 'Budget Opt_*your initials*'
11. Next for each of the Dimensions and Data Elements associate them to your dataset.
12. The Data Elements choose Average for the Aggregation Function. Save.





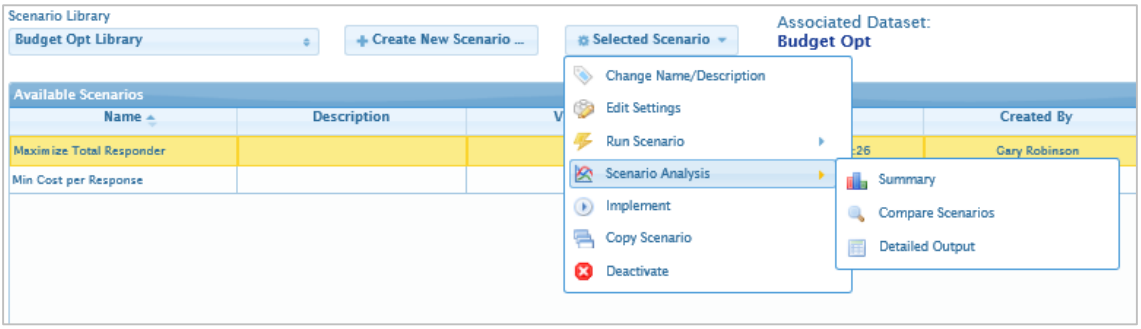
13. Create New Scenario at the top of the screen click on and call it 'Maximize Responders'.
14. Set Objective Max/Min select Maximize; Objective Function select Total Responders.
15. Constraint click +Add Constraint and select Total Cost. For Constraint Name call it 'Budget'; Type select Total Cost; Sign select <=; Value enter 9000000



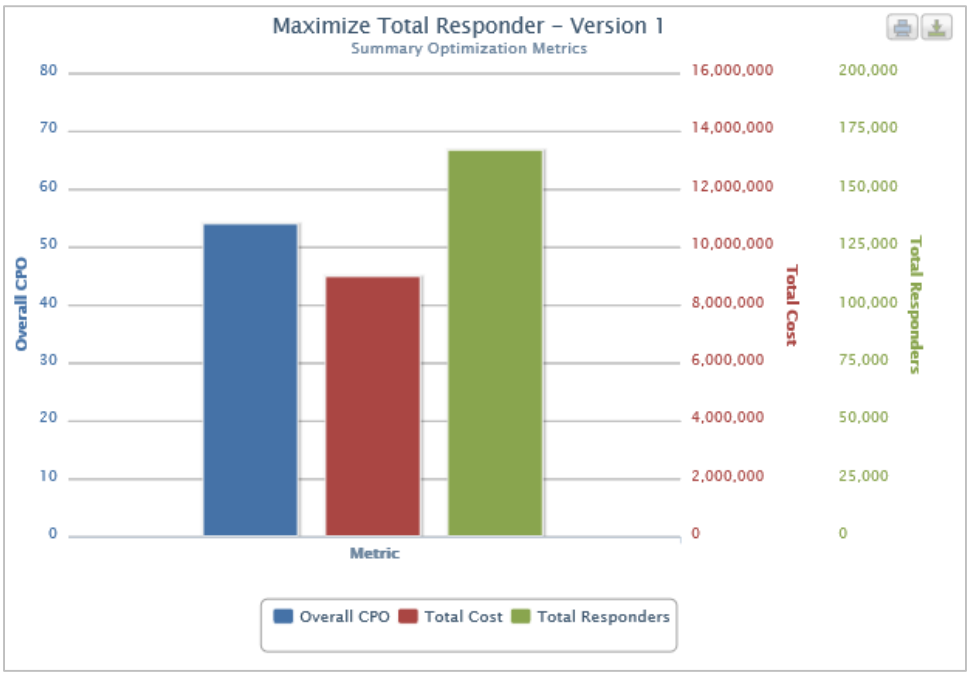


16. Create New Scenario at the top of the screen click on and call it 'Minimize Cost Per Response'.
17. Set Objective Max/Min select Minimize; Objective Function select Overall CPO.
18. Constraints click +Add Constraint and select Total Responder. For Constraint Name call it 'At least 100k responses'; Type select Total Responders; Sign select >=; Value enter 100000; Save
19. Once you have the scenarios setup you can then click on them and under Select Scenario select Run Scenario.

20. Scenario Analysis, click on one of your scenarios and choose Scenario Analysis then Summary, Compare Scenarios or Detailed Output.



21. You should be able to produce the charts and tables below.



Maximize Total Responder - Detailed contacts

AgeGroup	Channel	Decile	Segment	contacts	vailable to Promote	Cost Per Piece	Response Rate
60-64	AM/Anne	Decile 01	African American	500	500	0.1	0.003
65-69	AM/Anne	Decile 02	JTSO	0	0	0.1	0.0028
Under 50	AM/Anne	Decile 02	Latino	0	0	0.1	0.0028
50-59	AM/Anne	Decile 03	African American	500	500	0.1	0.0026
Under 50	AM/Anne	Decile 03	African American	0	0	0.1	0.0026
60-64	AM/Anne	Decile 03	JTSO	0	0	0.1	0.0026
70+	AM/Anne	Decile 03	JTSO	0	0	0.1	0.0026
Under 50	AM/Anne	Decile 03	JTSO	1,000	1,000	0.1	0.0026
70+	AM/Anne	Decile 04	African American	500	500	0.1	0.0026
60-64	AM/Anne	Decile 04	Latino	500	500	0.1	0.0026
60-64	AM/Anne	Decile 05	African American	500	500	0.1	0.002
60-64	AM/Anne	Decile 05	Latino	500	500	0.1	0.002
70+	AM/Anne	Decile 06	African American	500	500	0.1	0.002
65-69	AM/Anne	Decile 06	JTSO	0	0	0.1	0.002
Under 50	AM/Anne	Decile 06	Latino	0	0	0.1	0.002
50-59	AM/Anne	Decile 07	African American	0	500	0.1	0.001
Under 50	AM/Anne	Decile 07	African American	0	0	0.1	0.001
60-64	AM/Anne	Decile 07	Latino	0	500	0.1	0.001
Under 50	AM/Anne	Decile 07	Latino	0	0	0.1	0.001
70+	AM/Anne	Decile 08	General Market	0	3,000	0.1	0.001

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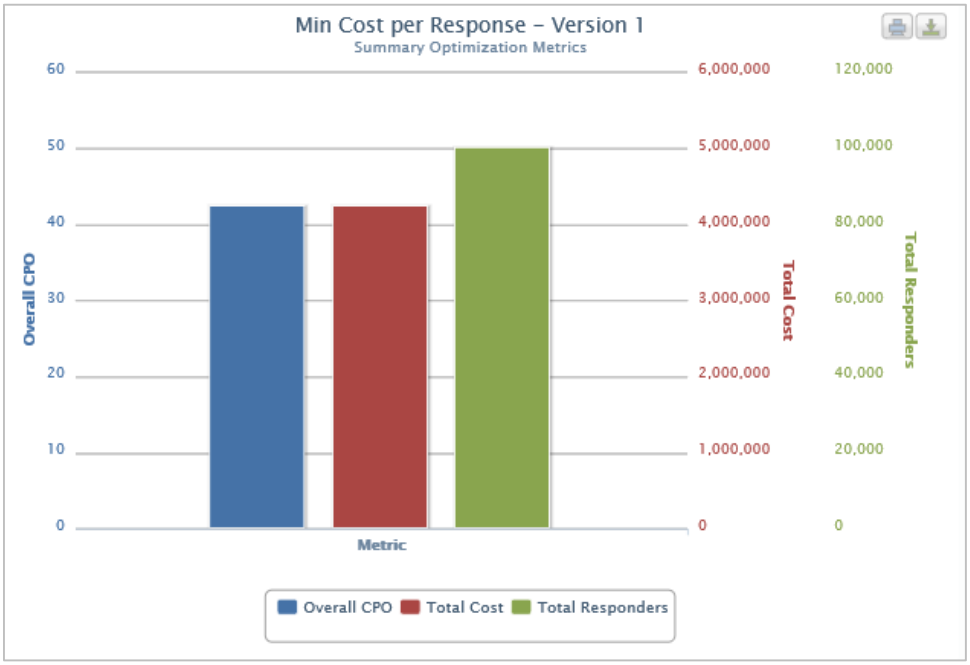

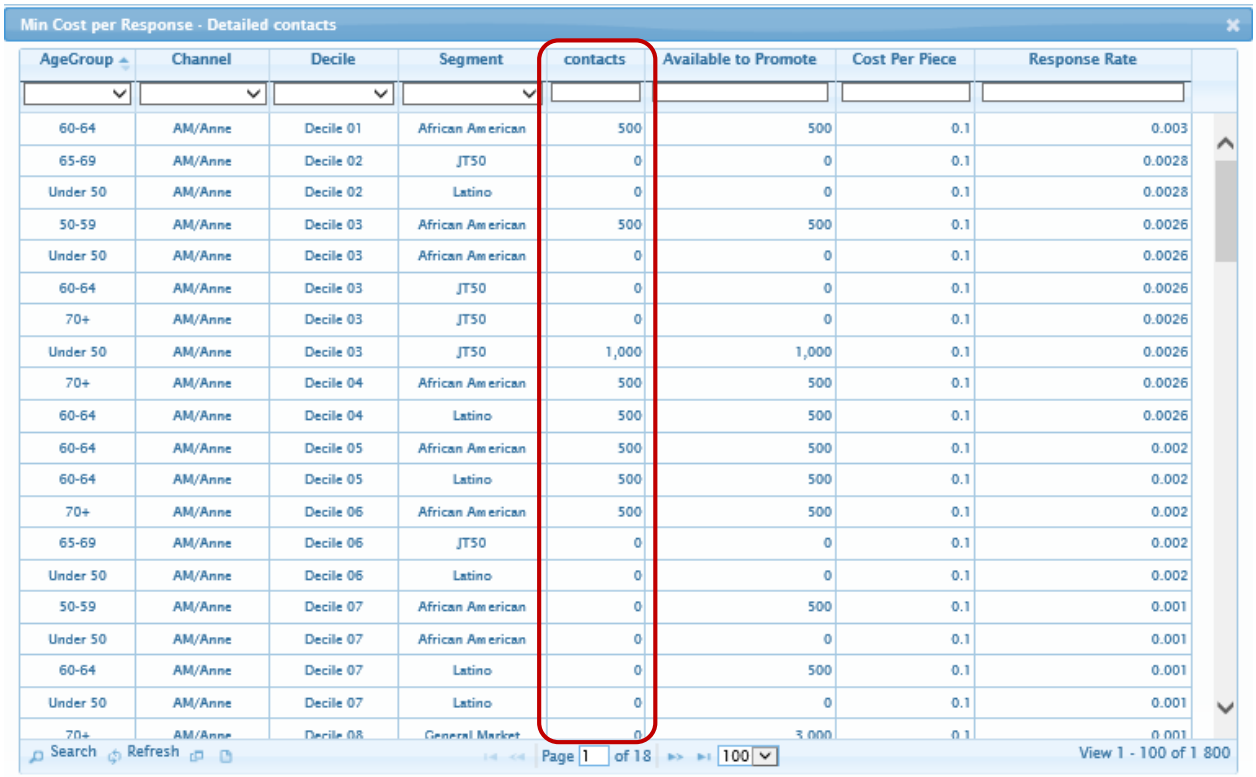

Min Cost per Response - Detailed contacts

AgeGroup	Channel	Decile	Segment	contacts	Available to Promote	Cost Per Piece	Response Rate
60-64	AM/Anne	Decile 01	African American	500	500	0.1	0.003
65-69	AM/Anne	Decile 02	JT50	0	0	0.1	0.0028
Under 50	AM/Anne	Decile 02	Latino	0	0	0.1	0.0028
50-59	AM/Anne	Decile 03	African American	500	500	0.1	0.0026
Under 50	AM/Anne	Decile 03	African American	0	0	0.1	0.0026
60-64	AM/Anne	Decile 03	JT50	0	0	0.1	0.0026
70+	AM/Anne	Decile 03	JT50	0	0	0.1	0.0026
Under 50	AM/Anne	Decile 03	JT50	1,000	1,000	0.1	0.0026
70+	AM/Anne	Decile 04	African American	500	500	0.1	0.0026
60-64	AM/Anne	Decile 04	Latino	500	500	0.1	0.0026
60-64	AM/Anne	Decile 05	African American	500	500	0.1	0.002
60-64	AM/Anne	Decile 05	Latino	500	500	0.1	0.002
70+	AM/Anne	Decile 06	African American	500	500	0.1	0.002
65-69	AM/Anne	Decile 06	JT50	0	0	0.1	0.002
Under 50	AM/Anne	Decile 06	Latino	0	0	0.1	0.002
50-59	AM/Anne	Decile 07	African American	0	500	0.1	0.001
Under 50	AM/Anne	Decile 07	African American	0	0	0.1	0.001
60-64	AM/Anne	Decile 07	Latino	0	500	0.1	0.001
Under 50	AM/Anne	Decile 07	Latino	0	0	0.1	0.001
70+	AM/Anne	Decile 08	General Market	0	3,000	0.1	0.001

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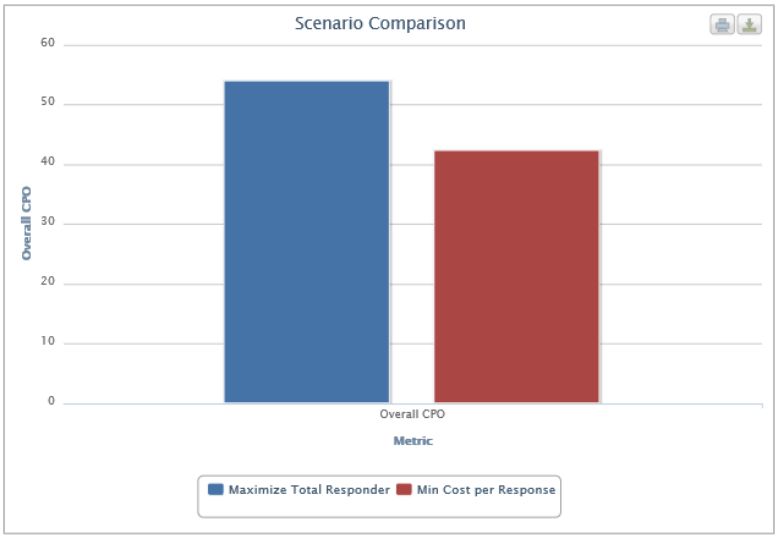
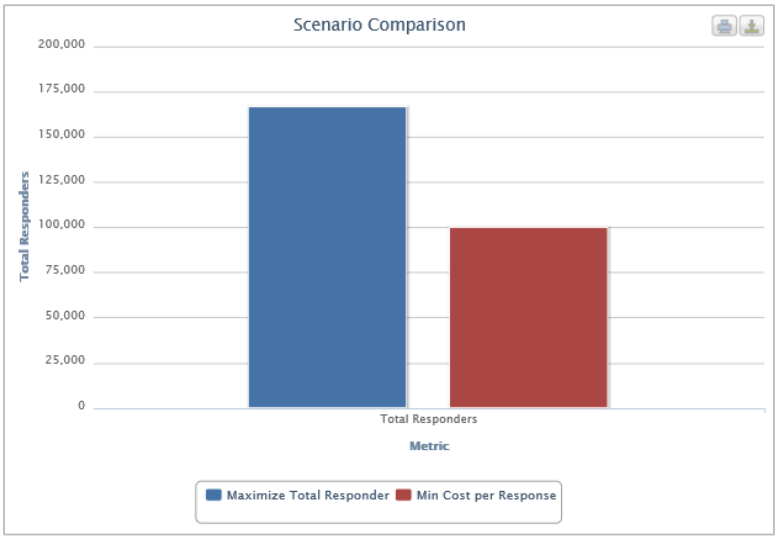
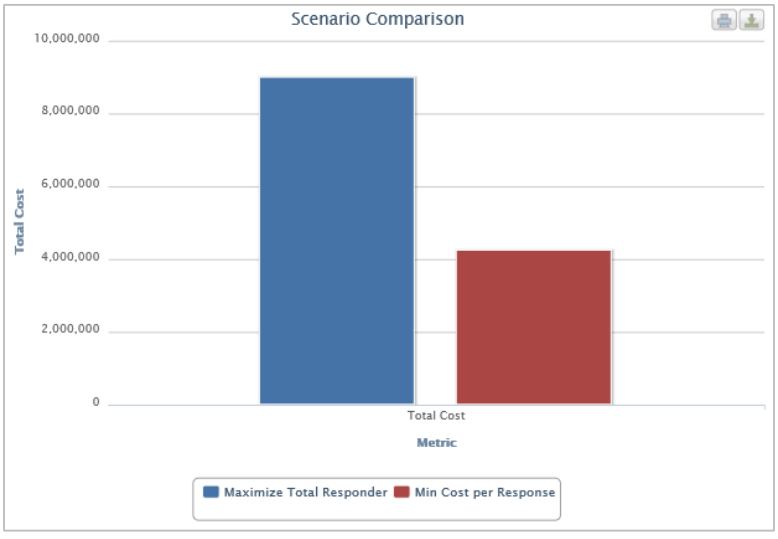

Scenario Comparison
60
50
40
30
20
10
0
Overall CPO
Overall CPO
Metric
Maximize Total Responder
Min Cost per Response


Scenario Comparison
200,000
175,000
150,000
125,000
100,000
75,000
50,000
25,000
0
Total Responders
Total Responders
Metric
Maximize Total Responder
Min Cost per Response


Scenario Comparison
10,000,000
8,000,000
6,000,000
4,000,000
2,000,000
0
Total Cost
Total Cost
Metric
Maximize Total Responder
Min Cost per Response