

Top-Down and Bottom-Up Market Sizing Example

Market sizing at this stage in the Biodesign process is different than traditional market sizing approaches because you don't yet have a solution. But it's still an important part of your need research.

As described in *Becoming an Expert in Your Need through Research* toolkit, there are two different ways to size the market for your need: top-down and bottom-up. It's a good idea to explore both approaches as they can vary widely. Looking at the market from both directions can help you better understand its true potential. At a basic level, these two approaches are defined as follows:

- **Top-Down:** Determine the size of the population specified in your need statement and then multiply that by the average cost to treat each patient with available solutions or potential money saved by addressing the need.
- **Bottom-Up:** Identify all of the existing solutions and estimate how much money is spent on them today to address your chosen clinical need.

To illustrate how top-down and bottom-up methods differ, we'll use an example from a team that was working in the area of xerostomia, commonly known as dry mouth. This condition, which affects approximately one-third of the US population, can significantly diminish quality of life. This suffering from moderate to severe dry mouth report that it's a constant source of distraction and discomfort, negatively impacting their sleep and even causing mental anguish.

Top Down

When it was time to size the xerostomia market, the team compiled prevalence estimates of dry mouth across different age groups in the US from their research. Then they reduced the total population in each group by applying two figures from the literature. First, they multiplied the total number of people in each age group by 33% since that was the percentage of all dry mouth that was considered as moderate to severe. Second, they multiplied each segment by 39% since that was the percentage of all dry mouth sufferers that currently seek treatment. Next, the team assumed an average annual spend of \$500 per patient per year based on an estimate derived from looking at the range of prices for available treatments. Adding up the groups, they got a total addressable market estimate of \$2.1 billion (see Table 1).

Table 1 – Preliminary Top-Down Market Estimate for Xerostomia

Age	% of US pop	# of people ¹	% of pop with dry mouth ²	# of ppl with dry mouth	# of ppl with mod to severe dry mouth (33%) ³	# of ppl who seek treatment (39%) ⁴	Annual spend on treatment (\$500/ patient/ year)
0-18	24%	78,168,000	0%	0	0	0	\$0
19-25	9%	29,313,000	5%	1,465,650	483,664	188,629	\$94,314,577
26-34	12%	39,084,000	17%	6,644,280	2,192,612	855,118	\$427,559,418
35-54	26%	84,682,000	10%	8,468,200	2,794,506	1,089,857	\$544,928,670
55-64	13%	42,341,000	14%	5,927,740	1,956,154	762,900	\$381,450,069
65+	16%	52,112,000	21%	10,943,520	3,611,361	1,408,431	\$704,215,512
Total	100%	325,700,000	10.27%	33,449,390	11,038,299	4,304,936	\$2,152,468,247

Source: Example courtesy of Michael Crowe, Jack Lund, Becca Saenz, and Ash Shaub. (1) US Population Distribution, Kaiser Family Foundation. (2) AML Benn, et al. Occurrence and Impact of Xerostomia Among Dentate Adult New Zealanders: Findings from a National Survey. Australian Dental Journal, 2015. (3) American Dental Association. "Percentage of Adults in the US Who Experienced Select Problems Due to The Condition of Their Mouth and Teeth as of 2015." Statista - The Statistics Portal. (4) Dirix, P, et al. Support Care Cancer, 2008.

Using this top-down approach, it seemed that xerostomia was a highly attractive market opportunity. However, the team noted that this estimate hinged on a couple of key assumptions. They would need to confirm whether the 39% figure for those likely to seek treatment was a reasonable average for all age groups. The mean age from the cited source was 64 years old, with a range from 45-80 years old, so they wondered if younger patients be likely to seek treatment at the same rate. Additionally, they knew they should further validate the spending estimate used in their calculations. While \$500 per patient per year seemed reasonable for those in sever distress, could be high for those only moderately affected by the condition or with constraints on their ability to pay out-of-pocket for dry mouth solutions, which were largely not reimbursed.

Bottom-Up

To calculate a bottom-up market estimate, the team looked individually at the main solutions that existed in the market. For each one, they calculated the approximate average annual cost of using the treatment and the number of patients using each one. Multiplying the cost of each treatment by the total number of users and then adding all results gave the team a bottom-up market estimate of \$206 million (see Table 2).

Table 2 – Preliminary Bottom-Up Market Estimate for Xerostomia

Category	Cost calculation	Annual cost per treatment	Population	Total annual cost
Oral lubricants, gums, pastes	40–150 mL of saliva substitute per day × \$0.2/mL approximate US retail price for Biotene Oral Balance Liquid ¹	\$455	285,714 ²	\$129,999,870
Pilocarpine, Cevilemine	Pilocarpine: average spending per dosage unit is \$2.46 Cevilemine: average spending per dosage unit is \$1.90 ³	Pilocarpine: \$385 Cevilemine: \$1,030 ³	Pilocarpine: 126,320 Cevilemine: 27,181 ³	\$76,568,706
Hydration device	Device retail price = \$799 ¹	\$799	N/A	N/A
Electrical stimulation	Device retail price = \$575 ¹	\$575	N/A	N/A
			Total US Market:	\$206,568,576

Source: Example courtesy of Michael Crowe, Jack Lund, Becca Saenz, and Ash Shaub. (1) Sasportas, L.S. et al. Oral Surg Oral Med Oral Pathol Oral Radiol, 2013. (2) Mintel Group Ltd. “US Oral Care market report,” 2018. (3) Centers for Medicare and Medicaid Services. Note that the team did not include the hydration device and electrical stimulation in their analysis because the use of these two solutions was negligible.

Importantly, they team acknowledged that the data they needed to achieve an accurate bottom-up market size was difficult to find, and that the assumptions they made about the cost of current treatments and number of people using them would require further validation. But, through some additional research, they found a third-party market research report that similarly estimated the current market for dry mouth solutions at \$270 million per year, so they knew that they generally were on the right track.

Reconciling the Top-Down and Bottom-Up Approach

When top-down and bottom-up market estimates vary substantially, it’s not a cause for concern! More than anything, it’s a healthy “reality check” on what the team can realistically expect.

More often than not, the bottom-up estimate reflects a realistic estimate of the current solution space while the top-down figure represents the total potential market opportunity for a new, more effective solution.

In the case of the dry mouth project, the team knew that current solution offerings were suboptimal and, as a result, weren't being widely utilized – even by those with moderate to severe xerostomia. They speculated that if they could come up with a solution that was more effective than existing oral or drug treatments, they could dramatically expand the market.

Having both estimates of the market size in their need area gave them a stronger understanding of the market and enabled them to speak more credibly to relevant stakeholders about the potential opportunity.

Credits

This example was written by Lyn Denend, Michelle de Haaff, and Ravi Pamnani. We'd like to thank Michael Crowe, Jack Lund, Becca Saenz, and Ash Shaub for sharing the example.