

To estimate the **Potential Peak Sales** for pembrolizumab (Keytruda) in the indication of first-line treatment of locally advanced unresectable or metastatic HER2-positive gastric or gastroesophageal junction (GEJ) adenocarcinoma with PD-L1 expression (CPS ≥ 1) in the US, EU5 (Germany, France, Italy, Spain, UK), China, and Japan, as well as the **\$ value of a 1% share of treated patients** in these geographies, we need to follow a structured approach. Since specific data on patient numbers, pricing, and market penetration may not be fully available, I will outline the methodology and provide illustrative calculations based on reasonable assumptions and publicly available data as of 2023. If you have specific data or a different indication in mind, please provide it for a more tailored analysis.

Step 1: Define the Target Patient Population

- **Indication:** First-line treatment for locally advanced unresectable or metastatic HER2-positive gastric or GEJ adenocarcinoma with PD-L1 expression (CPS ≥ 1).

- **Epidemiology:**

- Gastric cancer incidence varies by region, with higher rates in East Asia (e.g., China, Japan) compared to the US and EU.

- Approximately 20-30% of gastric/GEJ cancers are HER2-positive.

- Of these, around 60-70% may express PD-L1 (CPS ≥ 1), based on clinical trial data for pembrolizumab.

- We focus on advanced/metastatic patients eligible for first-line treatment.

Using approximate annual incidence numbers for advanced/metastatic gastric/GEJ cancer:

- **US:** ~27,000 new gastric cancer cases; ~40% are advanced/metastatic (~10,800); ~25% HER2-positive (~2,700); ~65% PD-L1 positive (~1,755 patients).

- **EU5:** ~60,000 new cases; ~40% advanced (~24,000); ~25% HER2-positive (~6,000); ~65% PD-L1 positive (~3,900 patients).

- **China:** ~400,000 new cases; ~40% advanced (~160,000); ~25% HER2-positive (~40,000); ~65% PD-L1 positive (~26,000 patients).

- **Japan:** ~130,000 new cases; ~40% advanced (~52,000); ~25% HER2-positive (~13,000); ~65% PD-L1 positive (~8,450 patients).

Total Eligible Patients Across Geographies: ~1,755 (US) + 3,900 (EU5) + 26,000 (China) + 8,450 (Japan) = **40,105 patients**.

Step 2: Estimate Market Share of Treated Patients

- The query assumes a **20-30% share of treated patients** for pembrolizumab in this indication.

- This accounts for competition (e.g., trastuzumab-based therapies like Herceptin, other immunotherapies like nivolumab in some regions, and standard chemotherapy).

- **Low-end (20%):** 20% of 40,105 = ~8,021 patients treated.

- **High-end (30%):** 30% of 40,105 = ~12,032 patients treated.

Step 3: Estimate Annual Treatment Cost per Patient

- Pembrolizumab pricing varies by region due to healthcare systems, negotiations, and access programs.
- Approximate annual cost per patient (based on typical dosing for 1 year, often 200 mg every 3 weeks):
- **US:** ~\$150,000–\$180,000 per year.
- **EU5:** ~\$100,000–\$120,000 per year (discounted due to payer negotiations).
- **China:** ~\$60,000–\$80,000 per year (lower due to pricing controls and local policies).
- **Japan:** ~\$100,000–\$130,000 per year (similar to EU5).
- For simplicity, use midpoint values:
- US: \$165,000
- EU5: \$110,000
- China: \$70,000
- Japan: \$115,000

Step 4: Calculate Potential Peak Sales

Peak sales are calculated by multiplying the number of treated patients (at 20% and 30% market share) by the annual cost per patient in each geography.

At 20% Market Share:

- **US:** $1,755 * 20\% = 351 \text{ patients} * \$165,000 = \text{\$57.9 million}$
- **EU5:** $3,900 * 20\% = 780 \text{ patients} * \$110,000 = \text{\$85.8 million}$
- **China:** $26,000 * 20\% = 5,200 \text{ patients} * \$70,000 = \text{\$364.0 million}$
- **Japan:** $8,450 * 20\% = 1,690 \text{ patients} * \$115,000 = \text{\$194.4 million}$
- **Total Peak Sales (20%):** $\$57.9\text{M} + \$85.8\text{M} + \$364.0\text{M} + \$194.4\text{M} = \text{\$702 million}$

At 30% Market Share:

- **US:** $1,755 * 30\% = 527 \text{ patients} * \$165,000 = \text{\$86.9 million}$
- **EU5:** $3,900 * 30\% = 1,170 \text{ patients} * \$110,000 = \text{\$128.7 million}$
- **China:** $26,000 * 30\% = 7,800 \text{ patients} * \$70,000 = \text{\$546.0 million}$
- **Japan:** $8,450 * 30\% = 2,535 \text{ patients} * \$115,000 = \text{\$291.5 million}$
- **Total Peak Sales (30%):** $\$86.9\text{M} + \$128.7\text{M} + \$546.0\text{M} + \$291.5\text{M} = \text{\$1,053 million}$

Potential Peak Sales Range: \$702 million to \$1,053 million annually across the US, EU5, China, and Japan for this indication.

Step 5: Calculate \$ Value of 1% Share of Treated Patients

A 1% share of treated patients corresponds to 1% of the total eligible patient population (40,105 patients) = **401 patients**.

- **US:** $1,755 * 1\% = 17.55 \text{ patients} * \$165,000 = \$2.9 \text{ million}$

- **EU5:** $3,900 * 1\% = 39 \text{ patients} * \$110,000 = \$4.3 \text{ million}$

- **China:** $26,000 * 1\% = 260 \text{ patients} * \$70,000 = \$18.2 \text{ million}$

- **Japan:** $8,450 * 1\% = 84.5 \text{ patients} * \$115,000 = \$9.7 \text{ million}$

- **Total \$ Value for 1% Share:** $\$2.9\text{M} + \$4.3\text{M} + \$18.2\text{M} + \$9.7\text{M} = \sim\$35.1 \text{ million}$

Final Answer:

- **Potential Peak Sales for Pembrolizumab** in this indication (20-30% market share) across the US, EU5, China, and Japan: **\$702 million to \$1,053 million annually**.

- **\$ Value of 1% Share of Treated Patients** across these geographies: **~\$35.1 million annually**.

Notes and Assumptions:

1. **Epidemiology Data:** Patient numbers are approximate and based on general incidence rates for gastric/GEJ cancer, adjusted for advanced/metastatic stages, HER2-positivity, and PD-L1 expression (CPS ≥ 1). Actual numbers may vary based on more precise data.

2. **Pricing:** Costs are illustrative and based on typical oncology drug pricing in these regions. Real-world pricing may differ due to discounts, rebates, or access programs.

3. **Market Share:** The 20-30% range accounts for competition and adoption rates. Pembrolizumab faces competition from trastuzumab-based regimens and other therapies like nivolumab (approved in some regions for gastric cancer).

4. **Treatment Duration:** Assumes 1 year of treatment per patient; actual duration may vary based on progression-free survival and clinical practice.

5. **Peak Sales Timing:** Peak sales typically occur several years after launch, assuming full market penetration and no major disruptions (e.g., new competitors or patent expiry).

If you have specific data on patient numbers, pricing, or market dynamics, I can refine these estimates further.