To estimate the **Potential Peak Sales** for pembrolizumab (Keytruda) in the indication of locally advanced unresectable or metastatic biliary tract cancer (BTC) 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 (e.g., exact patient numbers, pricing, or market penetration) is not provided, I will use reasonable assumptions based on publicly available information, epidemiology data, and market trends for oncology drugs. This analysis will be a high-level estimate and should be refined with more precise data if available.

Step 1: Key Assumptions

1. **Patient Population for BTC**:

- Biliary tract cancer (BTC) is a rare cancer, including cholangiocarcinoma (intrahepatic and extrahepatic) and gallbladder cancer. Incidence rates vary by geography:

- **US**: ~12,000 new cases/year (incidence ~3-4 per 100,000).

- **EU5**: ~15,000-20,000 new cases/year (incidence ~2-3 per 100,000, adjusted for population).

- **China**: ~50,000-60,000 new cases/year (higher incidence in Asia, ~5-6 per 100,000).

- **Japan**: ~20,000-25,000 new cases/year (incidence ~5-7 per 100,000, higher in Asia).

- Approximately 60-70% of BTC cases are diagnosed at locally advanced or metastatic stages, eligible for systemic therapy like pembrolizumab in combination with gemcitabine and cisplatin.

2. **Treatable Population**:

- Of the advanced/metastatic cases, assume ~50% are fit for first-line systemic therapy (due to performance status, comorbidities, etc.).

- Pembrolizumab is approved for first-line use in combination, so we focus on incident cases rather than prevalent cases for peak sales estimation.

3. **Market Share**:

- Given the query assumes a 20-30% share of treated patients, we will use this range for peak sales calculations.

- Pembrolizumab, as a leading PD-1 inhibitor with proven efficacy, could achieve significant penetration, especially in a rare cancer with limited treatment options.

4. **Pricing**:

- Pembrolizumab's annual cost per patient is approximately $150,000-$180,000 in the US (based on typical checkpoint inhibitor pricing).

- In EU5 and Japan, pricing is lower due to negotiations and healthcare systems (~$80,000-$120,000/year).

- In China, pricing is significantly lower due to market access agreements and generics (~$30,000-$50,000/year).

- Assume treatment duration of ~6-12 months for advanced BTC (median progression-free survival often dictates duration).

5. **Peak Sales Timing**:

- Peak sales are typically reached 5-7 years post-launch in a new indication, assuming steady uptake and no major competitors disrupting the market.

Step 2: Estimate Treatable Patient Population

Using the above incidence data and assumptions:

| **Region** | **Annual BTC Incidence** | **% Advanced/Metastatic (60-70%)** | **Eligible for 1L Therapy (50%)** | **Treatable Patients/Year** |

|---|---|---|---|---|

| **US** | 12,000 | 8,400 (70%) | 4,200 | 4,200 |

| **EU5** | 18,000 | 12,600 (70%) | 6,300 | 6,300 |

| **China** | 55,000 | 38,500 (70%) | 19,250 | 19,250 |

| **Japan** | 22,000 | 15,400 (70%) | 7,700 | 7,700 |

| **Total** | 107,000 | 74,900 | 37,450 | 37,450 |

Step 3: Estimate Annual Cost per Patient

Using the pricing assumptions:

| **Region** | **Annual Cost per Patient (USD)** |

|---|---|

| **US** | $165,000 |

| **EU5** | $100,000 |

| **China** | $40,000 |

| **Japan** | $110,000 |

Step 4: Calculate Potential Peak Sales (20-30% Market Share)

Peak sales are calculated as:

Peak Sales = Treatable Patients × Market Share × Annual Cost per Patient

At 20% Market Share:

| **Region** | **Treatable Patients** | **Patients Treated (20%)** | **Annual Cost/Patient (USD)** | **Peak Sales (USD Million)** |

|---|---|---|---|---|

| **US** | 4,200 | 840 | 165,000 | 138.6 |

| **EU5** | 6,300 | 1,260 | 100,000 | 126.0 |

| **China** | 19,250 | 3,850 | 40,000 | 154.0 |

| **Japan** | 7,700 | 1,540 | 110,000 | 169.4 |

| **Total** | 37,450 | 7,490 | - | **588.0** |

At 30% Market Share:

| **Region** | **Treatable Patients** | **Patients Treated (30%)** | **Annual Cost/Patient (USD)** | **Peak Sales (USD Million)** |

|---|---|---|---|---|

| **US** | 4,200 | 1,260 | 165,000 | 207.9 |

| **EU5** | 6,300 | 1,890 | 100,000 | 189.0 |

| **China** | 19,250 | 5,775 | 40,000 | 231.0 |

| **Japan** | 7,700 | 2,310 | 110,000 | 254.1 |

| **Total** | 37,450 | 11,235 | - | **882.0** |

Potential Peak Sales Range: **$588 million to $882 million** annually across the US, EU5, China, and Japan for this indication.

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

1% Share Value = Treatable Patients × 1% × Annual Cost per Patient

| **Region** | **Treatable Patients** | **Patients Treated (1%)** | **Annual Cost/Patient (USD)** | **Value of 1% Share (USD Million)** |

|---|---|---|---|---|

| **US** | 4,200 | 42 | 165,000 | 6.93 |

| **EU5** | 6,300 | 63 | 100,000 | 6.30 |

| **China** | 19,250 | 192.5 | 40,000 | 7.70 |

| **Japan** | 7,700 | 77 | 110,000 | 8.47 |

| **Total** | 37,450 | 374.5 | - | **29.40** |

$ Value of 1% Share of Treated Patients: **$29.4 million** annually across the US, EU5, China, and Japan.

Final Answer

1. **Potential Peak Sales for Pembrolizumab in BTC Indication**:

- **Range**: $588 million to $882 million annually across the US, EU5, China, and Japan, assuming a 20-30% market share of treated patients.

- **Breakdown**:

- US: $138.6M - $207.9M

- EU5: $126.0M - $189.0M

- China: $154.0M - $231.0M

- Japan: $169.4M - $254.1M

2. **$ Value of 1% Share of Treated Patients**:

- **Total**: $29.4 million annually

- **Breakdown**:

- US: $6.93M

- EU5: $6.30M

- China: $7.70M

- Japan: $8.47M

Notes and Caveats

- These estimates are based on assumptions about incidence, eligibility, pricing, and market share. Real-world data may differ due to competition, payer negotiations, or access barriers.

- Pembrolizumab's sales in BTC will contribute to its overall revenue but are likely a small fraction compared to larger indications like lung cancer or melanoma.

- China and Japan have higher patient numbers due to higher BTC incidence in Asia, but lower pricing impacts total revenue.

- Further refinement can be made with specific clinical trial data (e.g., KEYNOTE-966 trial results for BTC), exact pricing, or updated epidemiology data.