Health Impact Projection of Anti-PD-(L)1 Inhibitors in 13 Cancer Indications in France

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Background and objectives:

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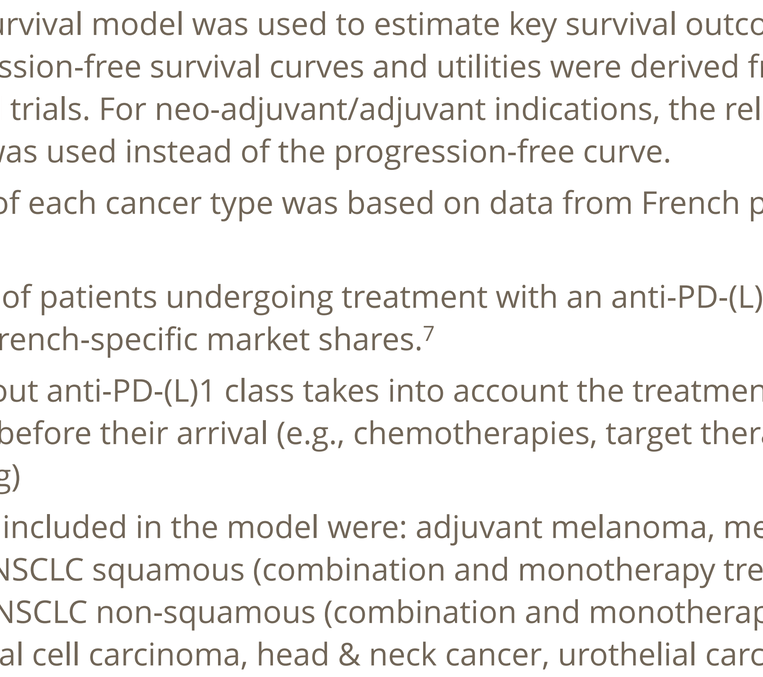
- The development of immunotherapy and, in particular, antibodies targeting programmed death-ligand one (PD-(L)1) has revolutionized the treatment of cancer patients with various tumour types, demonstrating clinical efficacy in a wide range of malignancies.[1,2] The anti-PD-(L)1 class offers new opportunities to treat cancer effectively by prolonging survival, with more favorable tolerability.[3] Clinical trials in key indications have shown patients have benefitted from a significant decrease in the relative risk of progression.
- In 2020, there were an estimated 467,965 newly diagnosed cancer cases and 185,621 deaths due to cancer in France.[4] The increasing incidence in cancer cases is due, in part, to growing lifestyle risk factors such as smoking, dietary risks, and alcohol use. One in three French people is an active smoker, which is 19% above the EU average.[5] Equally, the average alcohol consumption in France is 20% above the EU average.[5]
- In 2021, President Macron, in collaboration with the French National Institute of Cancer, launched a ten-year national strategy to fight against cancers, including concrete goals, from access to innovation to prevention.
- Therefore, given the challenges and ambitions of cancer care in France, the objective of this project was to predict key health outcomes resulting from the implementation of the anti-PD-(L)1 inhibitors in 13 cancer indications and to value immuno-oncology drugs as an innovation for patients towards policy makers.

Methodology:

- A model was developed to estimate key health outcomes for patients initiating treatment with anti-PD-(L)1 class from 2023 to 2027 in two worlds: one without anti-PD-(L)1 treatments and one with anti-PD-(L)1 inhibitors (see Figure 1).
- A partitioned survival model was used to estimate key survival outcomes. Overall survival, progression-free survival curves and utilities were derived from published Phase III clinical trials. For neo-adjuvant/adjuvant indications, the relapse-free survival curve was used instead of the progression-free curve.
- The incidence of each cancer type was based on data from French public databases.[6]
- The proportion of patients undergoing treatment with an anti-PD-(L)1 treatment was based on French-specific market shares.[7]
- The world without anti-PD-(L)1 class takes into account the treatments recommended before their arrival (e.g., chemotherapies, target therapies, watchful waiting)
- The indications included in the model were: adjuvant melanoma, metastatic melanoma, 1L NSCLC squamous (combination and monotherapy treatment separately), 1L NSCLC non-squamous (combination and monotherapy treatment separately), renal cell carcinoma, head & neck cancer, urothelial carcinoma, metastatic breast cancer, neo-adjuvant/adjuvant breast cancer, endometrial carcinoma, and oesophageal cancer.
- The model adopted a one to five-year time horizon, where a new cohort joined in each of the years in weekly cycles. The time horizon was extended to show the results of year six onwards, capturing outcomes as a single set of results for "2028+" (Figure 3), which modelled the health outcomes for all cohorts captured within the model for a full five years after treatment commencement.

Figure 1. Model approach



Anti-PD-1/PD-L1: Anti-programmed death-ligand 1

1L: First-line, 2L: Second-line, SQ: Squamous, NSQ: Non-squamous, TNBC: Triple negative breast cancer, eTNBC: Early triple negative breast cancer

*The eligible population for 1L NSCLC combo SQ and NSQ encompasses all those patients eligible for 1L NSCLC SQ and NSQ treatment- both monotherapy and combination therapy.

Presented at ISPOR EU, Vienna, 2022

Results:

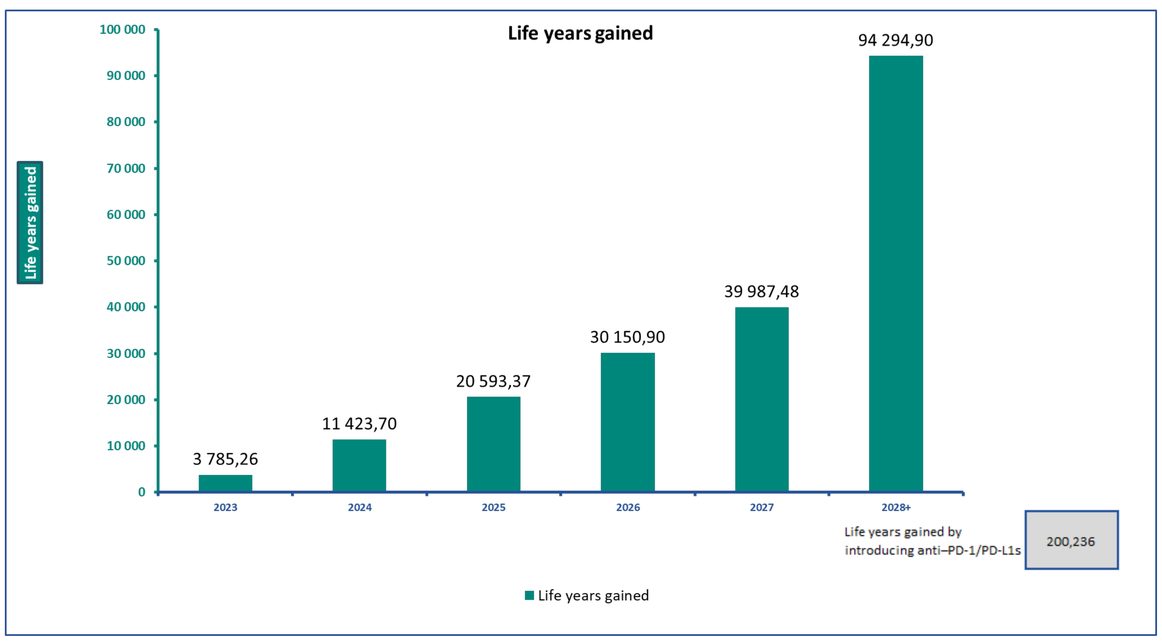
- The model estimated that 237,089 patients would be treated with anti-PD-(L)1, across the 13 indications over a five-year time horizon.
- The model estimated a gain of 200,236 life years in overall survival (+40% of relative gain), 133,434 life years in progression-free survival (+40%), 149,100 quality-adjusted life years (QALYs) (+37%), and 5,383 more adverse events grade 3+ (AE) (+1%).

Figure 2. Absolute and relative results

Absolute gains	Changed with anti-PD-1/PD-L1s	Relative gains
200,236	Life years gained	+40%
149,100	QALYs gained	+37%
133,434	PFS life years gained	+40%
5,383	Change in AEs	+1%

Anti-PD-1/PD-L1: anti-programmed death-ligand 1, QALY: quality-adjusted life year, PFS: progression-free life year, AE: adverse event

Figure 3. Absolute life years gained over the model time horizon



- The absolute gain in life years increases over the five-year time horizon and for an additional five years after treatment commencement (2028+) as patients in the world with the anti-PD-(L)1 class experience longer overall survival versus those in the world without the anti-PD-(L)1 class. This rationale is applicable to the other health benefits of the class as well which are realized in later years.

Conclusions

- Due to the favourable efficacy profile of anti-PD-(L)1s, treated patients experience increased QALYs (149,100, +37% of relative gain), increased progression-free life years (133,434, +40% of relative gain) and increased overall survival (200,236, +40% of relative gain). The increased quality of life is a result of the increased time patients spend progression-free.
- AEs increased with the introduction of anti-PD-(L)1s mainly due to the presence of combination treatments and longer time on treatment in the world with anti-PD-(L)1 class in comparison to the world without anti-PD-(L)1 class.
- Results demonstrate the need to maintain anti-PD-(L)1 inhibitors' status as therapeutic innovation now and in the future in a broad range of cancers.

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