

EVALUATION OF THE FUTURE IMPACT OF IMMUNO-ONCOLOGY INTRODUCTION ON CANCER MORTALITY IN ITALY

Fiorentino F,¹ Mezzanotte C,² Patanè G, ² Zapparelli G,² Urbinati D¹

¹IQVIA Italia - Milano; ²BMS Italia - Roma



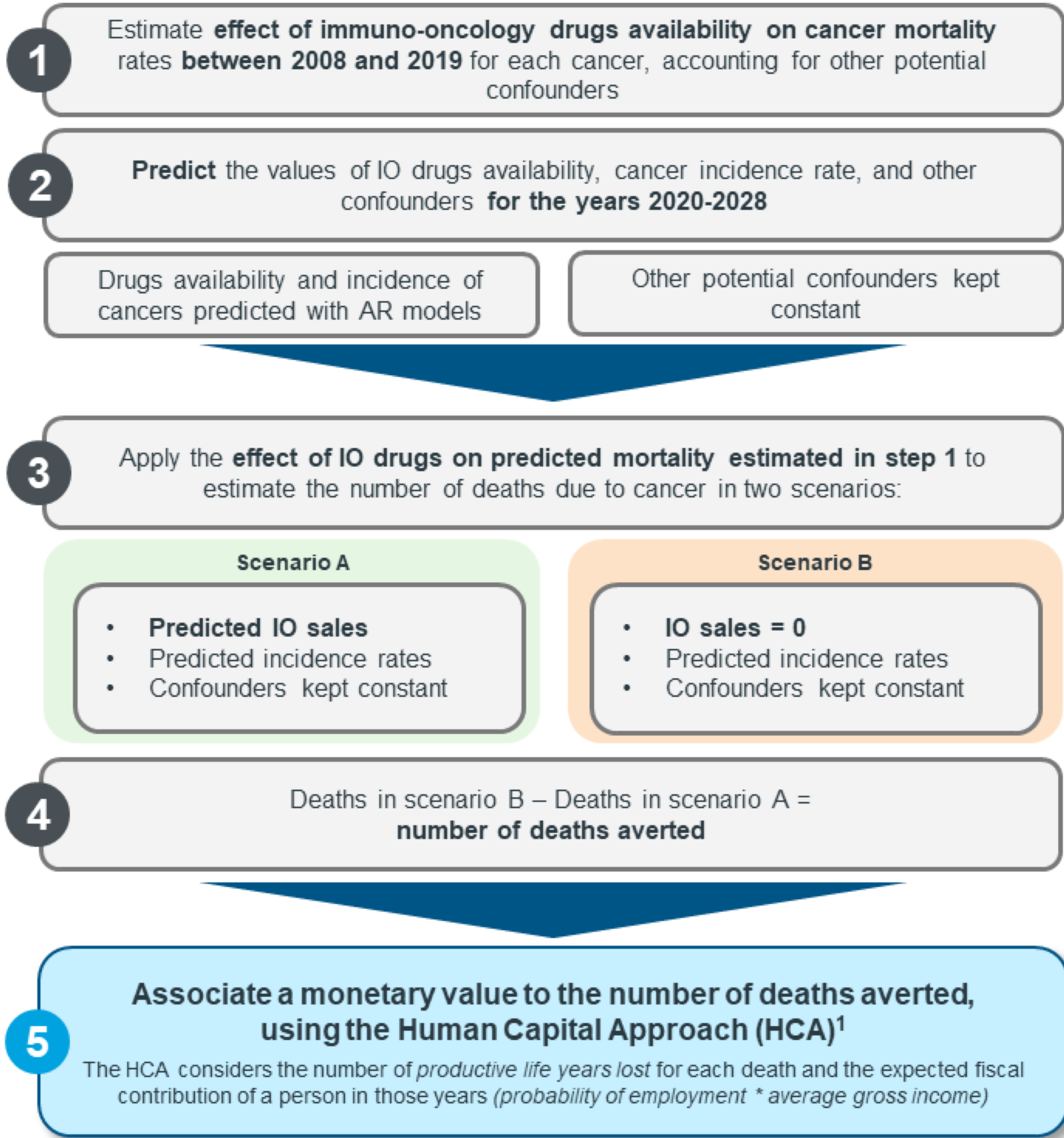
Introduction

- Since its first introduction in Italy in 2013, immuno-oncology (IO) has significantly improved health outcomes for cancer patients.¹
- This effect is more evident for malignancies for which they have been available the longest, such as melanoma, lung cancer and renal cancer, since assessing the impact of cancer therapeutics requires a minimum of five years follow-up to identify the benefit in overall survival.²
- Furthermore, since it is demonstrated that there is a time lag between the introduction of a new drug and its peak utilization, their increasing use is expected to reduce cancer mortality rates in future years even further.³
- This study aims to estimate the impact of IO introduction on incidence-adjusted mortality rates and the economic value associated with a reduction of premature mortality for melanoma, lung cancer, and renal cancer in Italy between 2020 and 2028.

Methodology

- To implement the current analysis an *ad hoc* database was built integrating regional IQVIA sales data⁴ on IO drug from 2008 to 2021 and data on cancer mortality, incidence rates, and various risk factors from 2008 to the latest year available, collected from publicly available data sources⁵⁻⁹ by region, age, and sex.
- The statistical analysis was conducted in five steps (see Figure 1):
 1. A multilevel multivariate fixed-effects regression was implemented to estimate the relationship between IO sales and the incidence-adjusted cancer mortality of melanoma, lung cancer, and renal cancer between 2008 and 2019, accounting for a vector of possible confounders which may have had an impact on mortality.
 2. Future values of IO sales and cancer incidence rates were forecasted from the first year of missing data for each variable up to 2028, using an auto-regressive model. At the same time, future values of other controls were assumed constant equal to their latest value, in order to minimize prediction error.
 3. The coefficients from the regression models used in step 1 were applied to IO sales data and all relevant confounding variables for the years 2020-2028, in order to obtain future incidence-adjusted mortality rates in two scenarios: A) a scenario in which the values of all variables for 2020-2028 are equal to those predicted in step 2, and B) a scenario in which IO sales data are assumed equal to 0 for the whole period of analysis.
 4. Deaths estimated in the two scenarios were compared to calculate the number of deaths averted by sex and age group between 2020 and 2028 thanks to the introduction of IO drugs for the three cancers of interest.
 5. Finally, the number of averted deaths were valued using the human capital approach (HCA).¹⁰

Figure 1. Graphical representation of the methodological approach



Abbreviations: AR: Auto-regressive; IO: Immuno-oncology; HCA: Human Capital Approach

References

1) Rachev et al. J Cancer Policy 2021;28:100279; 2) Koufman et al., Journal of ImmunoTherapy of Cancer; 2019;7:129; 3) Lidonnici et al., Glob Reg Health Technol Assess Ital North Eur Span 2018;2018:228424031879244; 4) IQVIA Sales Data, 2013-2019; 5) AIOM. I Numeri del Cancro in Italia, 2011-2021; 6) MEF. Statistiche e dati fiscali [Internet]. Available online: https://www1.finanze.gov.it/finanze/pagina_dichiarazioni/public/dichiarazioni.php; 7) Istituto Superiore di Sanità. Basi di Dati [Internet]. Available online: <https://www.iss.it/basi-di-dati->; 8) Ministero della Salute. Rapporti SDO, 2008-2019; 9) Istat. Banca Dati I.Stat [Internet]. Available from: <http://dati.istat.it/Index.aspx>; 10) Becker, NBER, 1964.

Results

The main results of the analysis are presented in Figures 2 and 3.

- Our analysis shows that the introduction of immuno-oncology is expected to significantly reduce the number of deaths for melanoma, lung cancer, and renal cancer by 11,202 (95% CI: 10,785-11,625), 19,490 (95% CI: 12,176-27,037), and 1,241 (95% CI: 682-1,811) respectively between 2020 and 2028, resulting in over 30,000 deaths averted in all cancers of interest in the same period (Figure 2).
- This estimate corresponds to a reduction in mortality of 9.9% with respect to the scenario without IO drugs.
- Lung cancer is responsible for the largest shares of the gains (61.0%) due to its higher relative weight in terms of overall mortality when compared with melanoma and renal cancer.
- In terms of associated economic value, this reduction in mortality results in a total of €407M (95% CI: €393-€422 M), €332M (95% CI: €194-€475 M) and 27M€ (95% CI: €14-€41 M) saved for indirect costs from premature mortality for melanoma, lung cancer, and renal cancer respectively, summing up to almost €800M in the same period (Figure 3).
- Melanoma accounts for 35.1% of total deaths averted and 53.2% of economic gains associated to them. This results from the application of HCA, which values only productive years of life lost (PYLL, i.e., age of retirement - age of death), and the fact that mortality of melanoma is more frequent in population in working age compared to renal and lung cancer.⁵
- In fact, our analysis found that the gains estimated in terms of number of deaths averted translate differently into PYLL for the three cancers of interest, with an average of 5.0 PYLL/ person for melanoma, 2.2 PYLL/ person for lung cancer, and 2.6 PYLL/ person for renal cancer.

Figure 2. Number of deaths averted, by cancer (2020-2028)

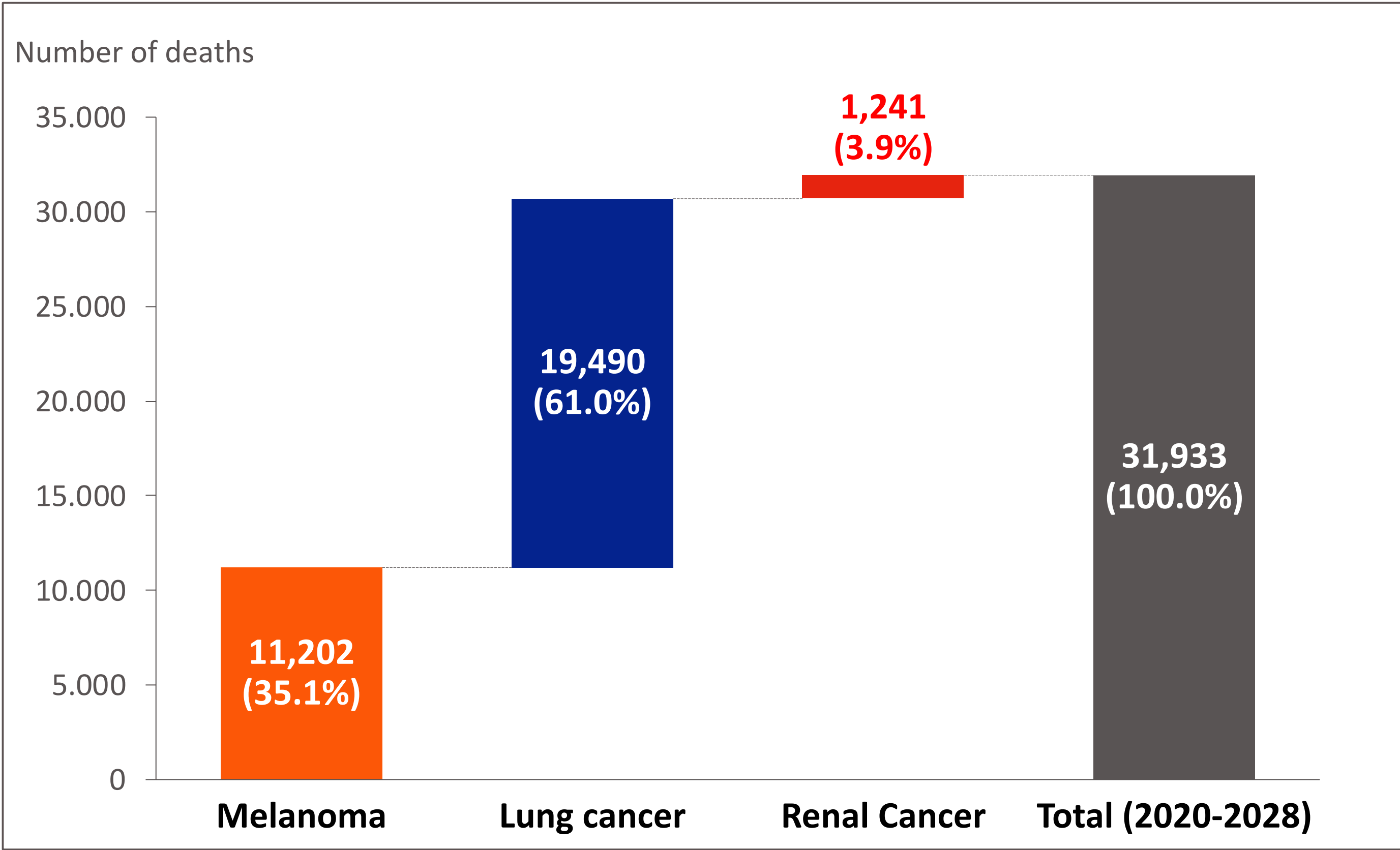
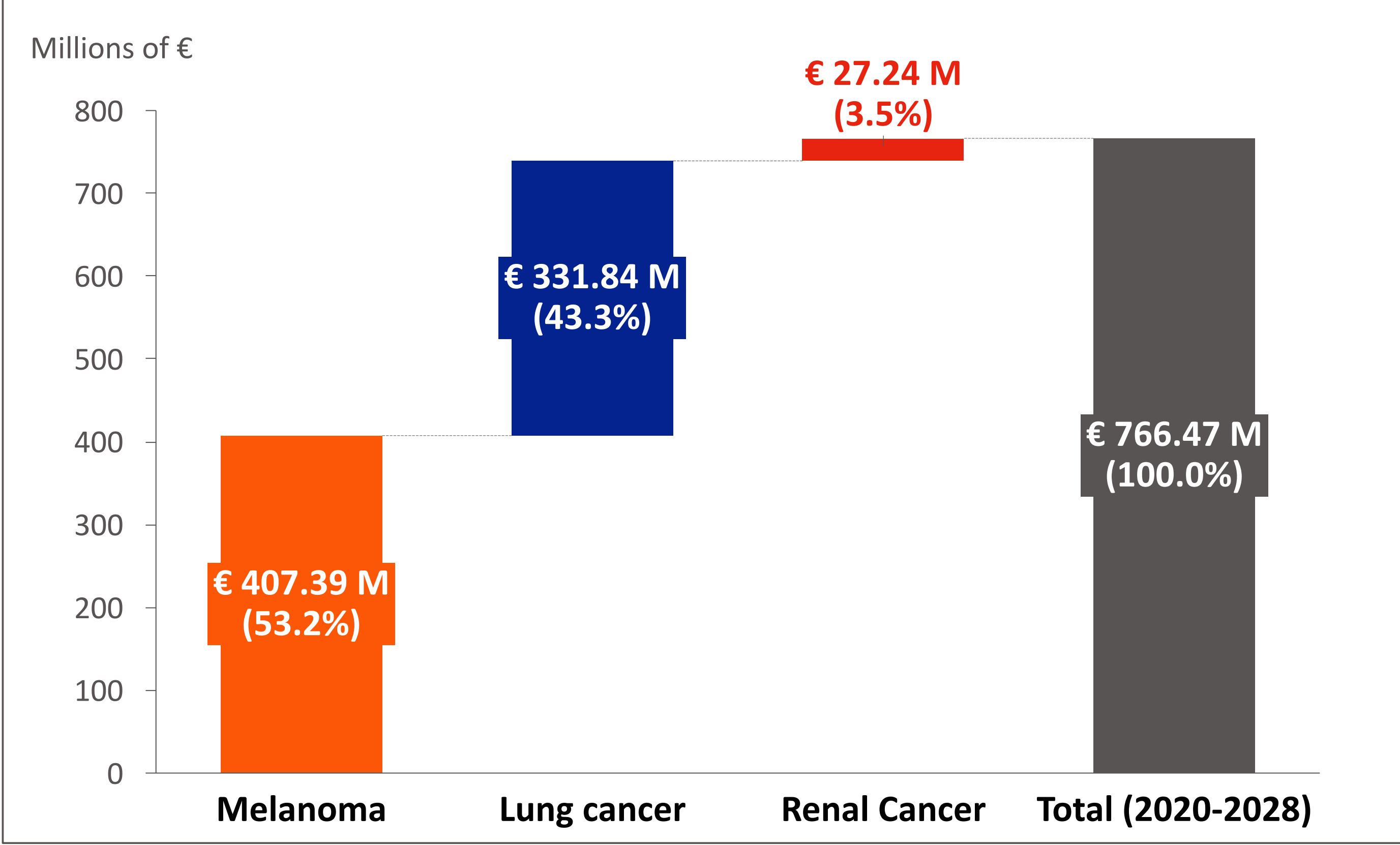


Figure 3. Indirect costs associated with number of deaths averted, by cancer (2020-2028)



Conclusions

- The future increase in the use of immunotherapy drugs in Italy is expected to reduce deaths and costs related to premature mortality for melanoma, lung, and renal cancers in the period 2020-2028.
- Our findings suggest that in this period in Italy IO drugs are expected to reduce the number of deaths from these three cancers of interest by 31,933 (95% CI: 23,643-40,473) (-9.9%), with an associated indirect economic value of €766M (95% CI: €601-€938 M).
- The contribution of melanoma to the total number of deaths averted (35.1%) translates into a higher contribution to total associated indirect costs (53.2%), since this malignancy affects patients who are younger than lung or renal cancer patients and are still in their productive years of life.
- The expected increased availability of IO drugs in earlier lines of treatment in the future, might lead to an even bigger impact on clinical and economic outcomes.
- Future research would thus benefit from the use of updated sales and mortality data, in order to reduce prediction uncertainty when estimating the future impact of this medical technology.