Purpose:
Radiotherapy of non-small-cell lung tumours (NSCLC) is undergoing significant advances due to conformal planning, respiration-motion strategies, hypofractionation and isotoxic prescription-dose individualisation (Fenwick et al 2009; Panettieri et al 2011). In order to maximise the efficacy of these various approaches a model for predicting local-control probability as a function of the (absolute, total) dose distribution, number of fractions, tumour volume and overall treatment time is essential.

Methods:
We have taken three contrasting dose and fraction regimens (CHART; the Martel data; our own Clatterbridge clinical experience: 55 Gy in 20 fractions) together with the published (and our won unpublished) local control data and modelled all these data using the Marsden quasi-mechanistic, LQ-based, population TCP model (Nahum, Webb, Sanchez-Nieto 1993, 2000). 'Best-fit' model parameters were derived using a Matlab optimisation routine.

Results:
The fit is virtually “exact” as the figure demonstrates; the ‘best-fit’ parameters are alpha = 0.307 per Gy, sigma_alpha = 0.037 Gy-1, T_K = 20.9 days, Td = 3.7 days with alpha/beta= 10 Gy and rho_clon =10^7 cm-3 as the fixed parameters.

Conclusions:
The Marsden TCP model together with the above 'best-fit' parameters is now ready to be used, togetrher with our in-house BioSuite software (Uzan et al 2011) to design radiobiologically optimised NSCLC protocols such as twice-a-day fractionation for larger, centrally located tumours and intermediate fraction number (8 to 15) schedules for tumours too large for the 3-5 fraction SBRT approach.

Funding Support, Disclosures, and Conflict of Interest:

This work was partially supported by Cancer Research UK