**Supplementary Figure Legends.**

**Supplemental Figure 1**. **A**, graph indicating the number of patients for which best response data to pembrolizumab was obtained, and from which institution. **B**,various response groups of patients treated with pembrolizumab, separated by gender, and using 62 years of age as the most statistically significant cut-off.

**Supplemental Figure 2.** **A**, **B** Change in mouse weight on final day of experiment from start in female and male mice bearing BSC9AJ2 tumors, after treatment with 3 doses of 300µg rat IgG2AK (N=5) or 4 doses of 300µg anti-PD1 (N=5) every 5 days, starting on day 0.

**Supplemental Figure 3**. **A**, CD45+ cells within Yumm1.7 and **B**. BSC9AJ2 tumors. Err=95%CI. **B**, CD45+ cells within in tumors of Yumm1.7 and Yumm2.1 tumors. **C,** CD8b+ cells following 5 hour incubation with PMA and ionomycin analyzed by FACS analysis. Err=SD. **D**, **E** CD45+CD8b+ cells expressing TNFα and IFNγ within spleens from mice harboring Yumm1.7 or BSC9AJ2 tumors. Err=95%CI. Significance was determined using individual two-tailed student’s t-test assuming unequal variance for 1-2 factors and using a 2-way ANOVA for 3 or more factors.

**Supplemental Figure 4.** **A** 10X view with 40X zoom of FOXP3+ foci staining in melanoma patient biopsies. **B**, FOXP3+ staining from patient tumors across various age groups. **C**, CD8+ staining from patient tumors across various age groups. **D**, percentages of patients in the indicated age groups, whose CD8:FOXP3 ratio is low (< median - 1), med (median +/- 1), or high (> median + 1).

**Supplemental Figure 5. A**. Mouse weight on final day of experiment from start in mice treated with anti-CD25 or an IgG1A isotype 5 days prior to sub-dermal of BSC9AJ2 cells with treatments continuing every 5 days until sacrifice. Anti-PD1 was administered every 3-4 days, starting on day 9 post-tumoral injection. Err=95%CI. Statistical significance determined by 2 way ANOVA. Err bars = SEM. **B**. Tumor growth for individual mice, per condition in A.

**Supplemental Figure 6. A.** Ratios of CD3+CD8a+ to CD3+CD4+FoxP3+ in BSC9AJ2 tumors from young female mice 4 days following cyclophosphamide intraperitoneal injection at indicated doses. 5 mice in PBS group, and 3 mice per dose. Err=SEM. **B,** intra-tumoral CD3+CD4+FoxP3+ populations. Err=SD. **C,** tumor growth in young female mice bearing BSC9AJ2 tumors were injected 6 days post tumor implantation with either 100µL PBS control, or 100µL PBS containing 25 mgs/kg cyclophosphamide intra-peritoneally. Four days later, mice were also given either 300µg anti-PD1 or vehicle control. A total of 4 doses of PD1 was given on day 0, 5, 10, and 14. Statistical significance was determined using a linear mixed-effect model. Err.=SEM. **D,** fold change in mouse weight from **C**. Err=SD. **E**. Intra-tumoral ratios of CD3+CD8a+ to CD3+CD4+FoxP3+ at the end of the experiment. Err.=SEM.