**Suppl 1. A comprehensive multivariable logistic regression analysis for all irAEs**

**Dermatitis**

| Dermatitis | Coef. | Std.Err. | z | P>|z| | [95% CI] |

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

|Age | | | | | |

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

|65-79 | -0.1254 | 0.4102 | -0.31| 0.760 | -0.9294 to 0.6786 |

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

|≥80 | -0.5508 | 0.4265 | -1.29| 0.197 | -1.3867 to 0.2852 |

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

| BMI | | | | | |

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

| 18.5-24.9 | 0.2733 | 0.7411 | 0.37 | 0.712 | -1.1793 to 1.7258 |

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

| 25-29.9 | 0.7172 | 0.7559 | 0.95 | 0.343 | -0.7644 to 2.1987 |

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

| ≥30 | 1.7604 | 0.7469 | 2.36 | 0.018 | 0.2965 to 3.2244 |

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

| Race | | | | | |

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

| Hispanic | -1.5176 | 0.6962 | -2.18| 0.029 | -2.8822 to -0.1531 |

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

| Asian | -0.4935 | 1.5988 | -0.31| 0.758 | -3.6271 to 2.6401 |

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

| African American | 0.9972 | 0.9609 | 1.04 | 0.299 | -0.8860 to 2.8805 |

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

| Sex | | | | | |

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

| Male | -0.2990 | 0.3336 | -0.90| 0.370 | -0.9529 to 0.3549 |

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

| Treatment | | | | | |

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

| Pembrolizumab | 1.1736 | 1.7061 | 0.69 | 0.492 | -2.1703 to 4.5175 |

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

| Nivolumab | 1.1798 | 1.6790 | 0.70 | 0.482 | -2.1111 to 4.4706 |

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

| Ipilimumab+Nivolumab| 0.6793 | 1.8210 | 0.37 | 0.709 | -2.8899 to 4.2484 |

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

| Cons | -3.4129 | 3.4982 | -0.98| 0.329 | -10.2694 to 3.4435 |

**Hepatitis**

| Hepatitis | Coef. | Std.Err. | z | P>|z| | [95% CI] |

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

| Age | | | | | |

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

|65-79 | -0.1560 | 0.3576 | -0.44| 0.663 | -0.8568 to 0.5449 |

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

| ≥80 | -0.1547 | 0.3576 | -0.43| 0.665 | -0.8557 to 0.5462 |

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

| BMI | | | | | |

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

|18.5-24.9 | 1.2089 | 0.7148 | 1.69 | 0.091 | -0.1921 to 2.6099 |

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

|25-29.9 | 1.2791 | 0.7309 | 1.75 | 0.080 | -0.1533 to 2.7116 |

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

|≥30 | 1.2439 | 0.7396 | 1.68 | 0.093 | -0.2056 to 2.6934 |

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

| Race | | | | | |

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

| Hispanic | -0.0355 | 0.4021 | -0.09| 0.930 | -0.8235 to 0.7525 |

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

| Asian | 2.2521 | 1.5514 | 1.45 | 0.147 | -0.7886 to 5.2928 |

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

| African American | -1.7495 | 1.4936 | -1.17| 0.241 | -4.6769 to 1.1779 |

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

| Sex | | | | | |

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

| Male | -0.1439 | 0.2736 | -0.53| 0.599 | -0.6801 to 0.3923 |

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

| Treatment | | | | | |

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

| Pembrolizumab | -1.4637 | 1.6896 | -0.87| 0.386 | -4.7752 to 1.8478 |

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

| Nivolumab | -1.6312 | 1.6729 | -0.98| 0.330 | -4.9100 to 1.6477 |

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

|Ipilimumab+Nivolumab| -1.8223 | 1.7730 | -1.03| 0.304 | -5.2973 to 1.6528 |

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

| Cons | 1.8329 | 3.4641 | 0.53 | 0.597 | -4.9566 to 8.6225 |

**Colitis**

| Colitis | Coef. | Std.Err. | z | P>|z| | [95% CI] |

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

| Age | | | | | |

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

| 65-79 | -0.0472 | 0.3876 | -0.12| 0.903 | -0.8069 to 0.7124 |

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

| ≥80 | -0.1170 | 0.3917 | -0.30| 0.765 | -0.8848 to 0.6509 |

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

| BMI | | | | | |

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

| 18.5-24.9 | 0.2994 | 0.5947 | 0.50 | 0.615 | -0.8662 to 1.4651 |

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

| 25-29.9 | -0.5318 | 0.6518 | -0.82| 0.415 | -1.8093 to 0.7458 |

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

| ≥30 | 0.3022 | 0.6296 | 0.48 | 0.631 | -0.9318 to 1.5362 |

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

| Race | | | | | |

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

| Hispanic | -0.8577 | 0.5429 | -1.58| 0.114 | -1.9218 to 0.2064 |

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

| Asian | -0.8954 | 1.5762 | -0.57| 0.570 | -3.9847 to 2.1940 |

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

| African American | -1.6324 | 1.4980 | -1.09| 0.276 | -4.5684 to 1.3036 |

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

| Sex | | | | | |

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

| Male | -0.4883 | 0.3096 | -1.58| 0.115 | -1.0950 to 0.1184 |

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

| Treatment | | | | | |

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

| Pembrolizumab | 0.3220 | 1.7054 | 0.19 | 0.850 | -3.0206 to 3.6646 |

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

| Nivolumab | 0.7376 | 1.6784 | 0.44 | 0.660 | -2.5521 to 4.0273 |

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

| Ipilimumab+Nivolumab| 1.0088 | 1.8553 | 0.54 | 0.587 | -2.6276 to 4.6452 |

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

| Cons | -2.3624 | 3.4925 | -0.68| 0.499 | -9.2076 to 4.4828 |

**Thyroiditis**

|Thyroiditis | Coef. | Std.Err. | z | P>|z| | [95% CI] |

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

| Age | | | | | |

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

| 65-79 | 0.3663 | 0.3666 | 1.00 | 0.318 | -0.3521 to 1.0848 |

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

|≥80 | 0.3167 | 0.3603 | 0.88 | 0.379 | -0.3894 to 1.0229 |

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

| BMI | | | | | |

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

| 18.5-24.9 | -0.4410 | 0.5277 | -0.84| 0.403 | -1.4753 to 0.5934 |

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

| 25-29.9 | 0.0799 | 0.5423 | 0.15 | 0.883 | -0.9829 to 1.1427 |

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

| ≥30 | -0.5471 | 0.5665 | -0.97| 0.334 | -1.6574 to 0.5632 |

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

| Race | | | | | |

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

| Hispanic | 0.4204 | 0.3936 | 1.07 | 0.285 | -0.3510 to 1.1917 |

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

| Asian | -0.7878 | 1.5861 | -0.50| 0.619 | -3.8964 to 2.3209 |

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

| African American | 0.1786 | 0.8543 | 0.21 | 0.834 | -1.4957 to 1.8529 |

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

| Sex | | | | | |

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

| Male | -0.4769 | 0.2761 | -1.73| 0.084 | -1.0181 to 0.0644 |

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

| Treatment | | | | | |

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

| Pembrolizumab | 0.8202 | 1.6904 | 0.49 | 0.628 | -2.4928 to 4.1333 |

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

| Nivolumab | 0.5151 | 1.6739 | 0.31 | 0.758 | -2.7656 to 3.7958 |

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

| Ipilimumab+Nivolumab| 1.3338 | 1.7915 | 0.74 | 0.457 | -2.1774 to 4.8450 |

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

| Cons | -2.2516 | 3.4428 | -0.65| 0.513 | -9.0000 to 4.4962 |

**Pneumonitis**

| Pneumonitis | Coef. | Std.Err. | z | P>|z| | [95% CI] |

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

| Age | | | | | |

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

| 65-79 | 0.0900 | 0.4779 | 0.19 | 0.851 | -0.8467 to 1.0266 |

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

|≥80 | -0.5480 | 0.5093 | -1.08| 0.282 | -1.5462 to 0.4502 |

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

| BMI | | | | | |

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

| 18.5-24.9 | 1.0094 | 0.8928 | 1.13 | 0.258 | -0.7405 to 2.7594 |

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

| 25-29.9 | 0.6395 | 0.9337 | 0.68 | 0.493 | -1.1905 to 2.4695 |

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

|≥30 | -0.7086 | 1.0771 | -0.66| 0.511 | -2.8196 to 1.4024 |

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

| Race | | | | | |

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

| Hispanic | 0.1178 | 0.5707 | 0.21 | 0.837 | -1.0009 to 1.2364 |

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

| Asian | 1.0949 | 1.2298 | 0.89 | 0.373 | -1.3155 to 3.5054 |

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

| African American | -0.0857 | 1.5130 | -0.06| 0.955 | -3.0512 to 2.8798 |

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

| Sex | | | | | |

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

| Male | 0.7203 | 0.3807 | 1.89 | 0.058 | -0.0259 to 1.4665 |

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

| Treatment | | | | | |

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

| Pembrolizumab | -2.8036 | 1.8644 | -1.50| 0.133 | -6.4578 to 0.8506 |

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

| Nivolumab | -1.9066 | 1.7887 | -1.07| 0.286 | -5.4125 to 1.5993 |

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

| Ipilimumab+Nivolumab| -2.5510 | 2.0167 | -1.26| 0.206 | -6.5036 to 1.4016 |

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

| Cons | 2.0710 | 3.7982 | 0.55 | 0.586 | -5.3733 to 9.5153 |

**Anemia**

| Anemia | Coef. | Std.Err. | z | P>|z| | [95% CI] |

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

| Age | | | | | |

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

| 65-79 | -0.2922 | 0.3539 | -0.83| 0.409 | -0.9859 to 0.4014 |

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

|≥80 | -0.6413 | 0.3525 | -1.82| 0.069 | -1.3322 to 0.0496 |

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

| BMI | | | | | |

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

|18.5-24.9 | 0.4436 | 0.5417 | 0.82 | 0.413 | -0.6181 to 1.5054 |

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

|25-29.9 | -0.2107 | 0.5676 | -0.37| 0.710| -1.3232 to 0.9018 |

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

|≥30 | -0.3088 | 0.5787 | -0.53| 0.594 | -1.4430 to 0.8253 |

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

| Race | | | | | |

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

| Hispanic | -0.9071\* | 0.4531 | -2.00| 0.045 | -1.7952 to -0.0191 |

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

| Asian | -0.4708 | 1.1633 | -0.40| 0.686 | -2.7508 to 1.8092 |

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

| African American | -0.0824 | 0.8585 | -0.10| 0.924 | -1.7649 to 1.6002 |

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

| Sex | | | | | |

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

| Male | 0.0897 | 0.2740 | 0.33 | 0.743 | -0.4474 to 0.6267 |

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

| Treatment | | | | | |

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

| Pembrolizumab | -2.4773 | 1.7018 | -1.46| 0.145 | -5.8127 to 0.8582 |

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

| Nivolumab | -1.4639 | 1.6741 | -0.87| 0.382 | -4.7451 to 1.8173 |

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

| Ipilimumab+Nivolumab| -1.9213 | 1.7952 | -1.07| 0.285 | -5.4399 to 1.5973 |

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

| Cons | 3.6210 | 3.4521 | 1.05 | 0.294 | -3.1451 to 10.3870 |

**Neutropenia**

| Neutropenia | Coef. | Std.Err. | z | P>|z| | [95% CI] |

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

| Age | | | | | |

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

| 65-79 | -0.8847\*\* | 0.3709 | -2.39| 0.017 | -1.6116 to -0.1577 |

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

|≥80 | -1.6612\*\*\* | 0.4050 | -4.10| 0.000 | -2.4550 to -0.8675 |

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

| BMI | | | | | |

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

| 18.5-24.9 | 0.1169 | 0.6190 | 0.19 | 0.850 | -1.0964 to 1.3302 |

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

| 25-29.9 | 0.2167 | 0.6531 | 0.33 | 0.740 | -1.0633 to 1.4967 |

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

|≥30 | -0.3376 | 0.6740 | -0.50| 0.616 | -1.6586 to 0.9834 |

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

| Race | | | | | |

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

| Hispanic | -0.2915 | 0.5006 | -0.58| 0.560 | -1.2726 to 0.6896 |

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

| Asian | 1.9426 | 2.0538 | 0.95 | 0.344 | -2.0827 to 5.9679 |

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

| African American | 2.1591\* | 1.0447 | 2.07 | 0.039 | 0.1115 to 4.2066 |

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

| Sex | | | | | |

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

| Male | -0.6812\* | 0.3189 | -2.14| 0.033 | -1.3062 to -0.0561 |

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

| Treatment | | | | | |

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

| Pembrolizumab | -2.0429 | 1.7094 | -1.20| 0.232 | -5.3932 to 1.3074 |

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

| Nivolumab | -2.0391 | 1.6866 | -1.21| 0.227 | -5.3449 to 1.2666 |

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

| Ipilimumab+Nivolumab| 0.5824 | 2.2260 | 0.26 | 0.794 | -3.7805 to 4.9454 |

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

| Cons | 1.7385 | 3.7150 | 0.47 | 0.640 | -5.5428 to 9.0198 |

**Thrombocytopenia**

| Thrombocytopenia | Coef. | Std.Err. | z | P>|z| | [95% CI] |

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

| Age | | | | | |

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

| 65-79 | -0.9162\* | 0.4371 | -2.10| 0.036 | -1.7729 to -0.0594 |

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

|≥80 | -1.0007\* | 0.4288 | -2.33| 0.020 | -1.8412 to -0.1602 |

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

| BMI | | | | | |

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

| 18.5-24.9 | -0.4311 | 0.6162 | -0.70| 0.484 | -1.6388 to 0.7766 |

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

| 25-29.9 | -0.6656 | 0.6621 | -1.01| 0.315 | -1.9633 to 0.6321 |

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

|≥30 | -0.9792 | 0.7011 | -1.40| 0.163 | -2.3533 to 0.3949 |

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

| Race | | | | | |

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

| Hispanic | 0.2963 | 0.5225 | 0.57 | 0.571 | -0.7279 to 1.3204 |

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

| Asian | 1.4444 | 1.2910 | 1.12 | 0.263 | -1.0858 to 3.9747 |

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

| African American | 0.3595 | 0.9723 | 0.37 | 0.712 | -1.5461 to 2.2651 |

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

| Sex | | | | | |

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

| Male | -0.1082 | 0.3618 | -0.30| 0.765 | -0.8172 to 0.6009 |

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

| Treatment | | | | | |

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

| Pembrolizumab | -3.1362 | 1.7454 | -1.80| 0.072 | -6.5571 to 0.2846 |

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

| Nivolumab | -3.3551 | 1.7210 | -1.95| 0.051 | -6.7283 to 0.0181 |

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

| Ipilimumab+Nivolumab| -2.3266 | 1.9862 | -1.17| 0.241 | -6.2195 to 1.5662 |

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

| Cons | 5.3206 | 3.6235 | 1.47 | 0.142 | -1.7814 to 12.4226 |