

## Supplementary Materials

Jackson et al. "Sex differences in cancer incidence among solid organ transplant recipients"

<b>Supplementary Table 1.</b> Cancer sites and their ICD-0-3 site and histology codes evaluated in the Transplant Cancer Match Study		
<b>Cancer Site</b>	<b>ICD-0-3 Site</b>	<b>ICD-O-3 Histology (Type)</b>
Lip	C000–C009	excluding 9050-9055, 9140, 9590-9992
Oral cavity	C019–C029, C079–C089, C040–C049, C030–C039, C050–C059, C060–C069, C110–C119, C090–C099, C129, C130–C139, C140, C142, C148	
Oropharynx	C100–C109	
Esophagus	C150–C159	
Stomach	C160–C169	
Colorectal		
Proximal colon	C180–C185	
Distal colon	C186–C187	
Unspecified colon	C188–C189, C260	
Rectum	C199, C209	
Liver	C220, C221	
Larynx	C320–C329	
Lung and bronchus	C340–C349	
Melanoma skin	C440–C449	
Bladder	C670–C679	
Kidney and renal pelvis	C649, C659	
Thyroid	C739	
Non-Hodgkin lymphoma	C024, C098, C099, C111, C142, C379, C422, C770–C779	9590-9597, 9670-9671, 9673, 9675, 9678-9680, 9684, 9687- 9691, 9695, 9698-9702, 9705, 9708-9709, 9712, 9714-9719, 9724-9729, 9735, 9737-9738, 9811-9818, 9823, 9827, 9837
Kaposi sarcoma		9140

**Supplementary Table 2.** Male-to-female incidence rate ratios (IRRs) and 95% confidence intervals (CIs) in the transplant population and the general population for all cancer sites stratified by age

Cancer site	<55 years of age at transplantation			≥55 years of age at transplantation		
	M:F IRR <sub>Transplant</sub> (95% CI)	M:F IRR <sub>GP</sub>	P-value <sup>a</sup>	M:F IRR <sub>Transplant</sub> (95% CI)	M:F IRR <sub>GP</sub>	P-value <sup>a</sup>
Lip	1.75 (1.22, 2.52)	3.57	0.0001	1.82 (1.20, 2.78)	3.98	0.0002
Oral cavity	1.71 (1.23, 2.37)	2.27	0.090	1.93 (1.37, 2.73)	2.11	0.612
Oropharynx	1.00 (0.17, 6.00)	2.25	0.372	—	2.08	—
Esophagus	4.01 (2.43, 6.60)	4.76	0.501	3.43 (2.22, 5.30)	4.29	0.314
Adenocarcinoma	14.92 (4.69, 47.45)	8.84	0.375	6.61 (3.21, 13.64)	8.25	0.743
Squamous cell carcinoma	1.80 (0.95, 3.40)	2.37	0.398	1.72 (0.96, 3.10)	2.14	0.465
Stomach	1.18 (0.86, 1.62)	1.57	0.005	1.69 (1.29, 2.21)	2.10	0.114
Colorectum	0.99 (0.84, 1.17)	1.38	<0.0001	0.93 (0.81, 1.08)	1.39	<0.0001
Proximal colon	0.90 (0.71, 1.14)	1.22	0.012	0.74 (0.61, 0.88)	1.11	<0.0001
Distal colon	1.21 (0.87, 1.69)	1.34	0.547	1.29 (0.94, 1.77)	1.59	0.195
Rectum	1.11 (0.79, 1.56)	1.58	0.042	1.43 (0.97, 2.10)	1.74	0.319
Liver	2.51 (1.85, 3.40)	4.18	0.001	2.20 (1.65, 2.94)	2.95	0.047
Larynx	5.29 (2.97, 9.43)	4.41	0.537	2.76 (1.85, 4.12)	5.05	0.003
Lung	1.18 (1.05, 1.32)	1.29	0.127	1.34 (1.23, 1.46)	1.34	1.0
Adenocarcinoma	0.87 (0.73, 1.04)	1.04	0.050	1.06 (0.92, 1.22)	1.12	0.444
Squamous cell carcinoma	1.90 (1.50, 2.40)	2.32	0.096	1.61 (1.39, 1.86)	1.99	0.004
Small cell carcinoma	1.51 (1.01, 2.27)	1.20	0.266	1.47 (1.10, 1.96)	1.19	0.152
Kidney	1.78 (1.57, 1.98)	2.21	0.0003	1.49 (1.29, 1.72)	2.17	<0.0001
Bladder	1.35 (1.03, 1.78)	3.80	<0.0001	2.60 (2.01, 3.37)	4.09	0.0006
Thyroid	0.45 (0.37, 0.54)	0.33	0.001	0.58 (0.44, 0.77)	0.52	0.444
Melanoma skin	1.47 (1.21, 1.79)	1.28	0.166	2.53 (2.06, 3.13)	2.29	0.350
Kaposi sarcoma <sup>b</sup>	1.74 (1.08, 2.82)	50.17	<0.0001	1.74 (1.14, 2.66)	10.14	<0.0001
Non-Hodgkin lymphoma	1.35 (1.22, 1.48)	1.63	<0.0001	1.30 (1.16, 1.46)	1.56	0.002
Diffuse large B-cell lymphoma	1.25 (1.10, 1.41)	1.75	<0.0001	1.22 (1.06, 1.42)	1.44	0.026

Abbreviations: GP, general population; M:F IRR, male-to-female incidence rate ratio; NHL, non-Hodgkin lymphoma.

Bolding indicates the M:F IRR<sub>Transplant</sub> is statistically different from M:F IRR<sub>GP</sub>

<sup>a</sup> Estimated from a chi-square test using the formula  $\log(\text{M:F IRR}_{\text{Transplant}} - \text{IRR}_{\text{GP}})^2 / \text{Var}(\text{M:F IRR}_{\text{Transplant}})$  with 1 degree of freedom comparing M:F IRR<sub>Transplant</sub> to M:F IRR<sub>GP</sub>.

<sup>b</sup> Estimates of the M:F IRR<sub>Transplant</sub> were restricted to non-Hispanic White and non-Hispanic Black participants in SEER9 (1973-1979) to calculate the M:F IRR<sub>GP</sub>.

**Supplementary Table 3.** Multivariable adjusted male-to-female incidence rate ratios (IRRs) and 95% confidence intervals (CIs) for all cancer sites among all transplant recipients and separately according to transplanted organ

Cancer site	All recipients	Liver recipients	Kidney recipients	Heart and/or lung recipients	P-value <sup>a</sup>
	M:F IRR <sub>Transplant</sub> (95% CI)	M:F IRR <sub>Transplant</sub> (95% CI)	M:F IRR <sub>Transplant</sub> (95% CI)	M:F IRR <sub>Transplant</sub> (95% CI)	
Lip <sup>b</sup>	1.43 (1.08, 1.90)	2.36 (0.96, 5.79)	1.62 (1.08, 2.41)	1.12 (0.69, 1.80)	0.352
Oral cavity	1.78 (1.40, 2.27)	1.82 (1.21, 2.73)	1.92 (1.34, 2.74)	1.83 (0.92, 3.61)	0.406
Oropharynx	1.59 (0.31, 8.21)	1.28 (0.12, 14.16)	2.08 (0.22, 20.0)	—	0.726
Esophagus	3.37 (2.41, 4.70)	2.94 (1.60, 5.40)	3.71 (2.33, 5.91)	3.53 (1.51, 8.23)	0.690
Adenocarcinoma	1.79 (1.15, 2.80)	1.83 (0.88, 3.81)	1.95 (1.03, 3.69)	1.24 (0.34, 4.50)	0.439
Squamous cell carcinoma	7.56 (4.08, 13.97)	—	6.92 (3.18, 15.03)	—	—
Stomach	1.52 (1.23, 1.88)	1.55 (0.95, 2.53)	1.31 (1.01, 1.70)	3.72 (1.79, 7.74)	0.006
Colorectum <sup>c</sup>	0.91 (0.81, 1.02)	0.79 (0.63, 1.00)	1.04 (0.89, 1.21)	0.79 (0.61, 1.03)	0.019
Proximal colon <sup>c</sup>	0.75 (0.64, 0.87)	0.66 (0.49, 0.89)	0.84 (0.68, 1.04)	0.66 (0.46, 0.93)	0.081
Distal colon <sup>c</sup>	1.23 (0.96, 1.56)	1.22 (0.71, 2.07)	1.32 (0.96, 1.81)	1.11 (0.60, 2.09)	0.534
Rectum <sup>c</sup>	1.16 (0.89, 1.51)	1.07 (0.58, 1.95)	1.28 (0.90, 1.81)	1.19 (0.63, 2.26)	0.904
Liver <sup>d</sup>	2.06 (1.65, 2.56)	2.03 (1.42, 2.92)	2.10 (1.54, 2.85)	1.64 (0.83, 3.22)	0.265
Larynx	3.34 (2.40, 4.65)	4.46 (2.43, 8.22)	3.57 (2.18, 5.84)	1.78 (0.92, 3.43)	0.131
Lung	1.14 (1.06, 1.22)	1.07 (0.91, 1.26)	1.26 (1.14, 1.39)	1.17 (1.02, 1.34)	0.458
Adenocarcinoma	0.89 (0.79, 0.99)	1.25 (0.95, 1.64)	1.60 (1.33, 1.92)	1.67 (1.32, 2.12)	0.756
Squamous cell carcinoma	1.47 (1.30, 1.67)	0.79 (0.60, 1.04)	0.96 (0.82, 1.12)	0.96 (0.77, 1.20)	0.980
Small cell carcinoma	1.33 (1.05, 1.69)	1.28 (0.78, 2.11)	1.59 (1.11, 2.27)	1.16 (0.75, 1.80)	0.205
Kidney <sup>c</sup>	1.76 (1.60, 1.93)	1.48 (1.06, 2.06)	1.71 (1.55, 1.90)	2.31 (1.60, 3.35)	0.003
Bladder	1.87 (1.54, 2.26)	2.79 (1.51, 5.15)	1.79 (1.42, 2.24)	2.15 (1.33, 3.46)	0.256
Thyroid <sup>e</sup>	0.49 (0.42, 0.58)	0.45 (0.29, 0.71)	0.51 (0.42, 0.61)	0.54 (0.34, 0.85)	0.843
Melanoma skin <sup>b</sup>	1.76 (1.53, 2.04)	1.21 (0.88, 1.66)	1.90 (1.57, 2.28)	2.03 (1.37, 3.00)	0.795
Kaposi sarcoma <sup>f</sup>	1.68 (1.12, 2.45)	1.35 (0.61, 2.98)	2.25 (1.31, 3.88)	0.39 (0.11, 1.38)	0.049
Non-Hodgkin lymphoma <sup>g</sup>	1.26 (1.17, 1.36)	1.18 (1.01, 1.37)	1.37 (1.23, 1.52)	1.14 (0.95, 1.36)	0.014
Diffuse large B-cell lymphoma <sup>g</sup>	1.18 (1.07, 1.30)	1.14 (0.94, 1.39)	1.29 (1.13, 1.48)	1.04 (0.83, 1.29)	0.035

Abbreviations: M:F IRR, male-to-female incidence rate ratio; NHL, non-Hodgkin lymphoma

All models were adjusted for age at transplant, transplant year (1995–1999, 2000–2004, 2005–2009, 2010–2014, 2015–2017), race/ethnicity (non-Hispanic White, non-Hispanic Black, Hispanic, or Asian/Pacific Islander), transplanted organ (kidney, liver, heart and/or lung, or Other/multiple), Yost Index, and duration of time on the transplant wait list.

<sup>a</sup> P-value is a test for whether the M:F IRRs differ across transplanted organs and was estimated from an interaction term in the model.

<sup>b</sup> Models were additionally adjusted for prior diagnosis squamous cell carcinoma or basal cell carcinoma (time-dependent) and annual average daily UVB exposure.

<sup>c</sup> Models were additionally adjusted for BMI category (<18.5, 18.5–24.9, 25.0–29.9, or ≥30 kg/m<sup>2</sup>) and diabetes (yes, no, or missing).

<sup>d</sup> Model was additionally adjusted for BMI category (<18.5, 18.5–24.9, 25.0–29.9, or ≥30 kg/m<sup>2</sup>), diabetes (yes, no, or missing), hepatitis B and C (positive, negative, or unknown).

<sup>e</sup> Model was additionally adjusted for BMI category (<18.5, 18.5–24.9, 25.0–29.9, or ≥30 kg/m<sup>2</sup>).

<sup>f</sup> Estimates of the M:F IRR<sub>Transplant</sub> were restricted to non-Hispanic White and non-Hispanic Black participants. SEER9 (1973-1979) restricted to non-Hispanic White and non-Hispanic Black individuals to calculate the M:F IRR<sub>GP</sub>.

<sup>g</sup> Model was additionally adjusted for EBV status (positive, negative, or unknown) at time of transplant.

**Supplementary Table 4.** Male-to-female incidence rate ratios (IRRs) and 95% confidence intervals (CIs) for smoking-related cancers among lung recipients, with and without adjustment for smoking

Cancer site	Case counts in transplant recipients		Incidence/100,000 person-years		M:F IRR <sub>Transplant</sub> (95% CI)	Smoking adjusted M:F IRR <sub>Transplant</sub> (95% CI)
	Males	Females	Male	Females		
Lip	42	19	93.7	49.4	1.90 (1.10, 3.26)	1.80 (1.05, 3.11)
Oral cavity	18	8	40.1	20.8	1.57 (0.68, 3.65)	1.62 (0.70, 3.77)
Esophagus	22	6	49.1	15.6	3.15 (1.28, 7.76)	3.07 (1.24, 7.59)
Larynx	22	9	49.1	23.4	2.10 (0.97, 4.56)	1.94 (0.89, 4.23)
Lung	312	210	695.7	545.5	1.28 (1.07, 1.52)	1.14 (0.96, 1.36)
Bladder	40	17	89.2	44.2	2.02 (1.15, 3.56)	1.91 (1.08, 3.38)

Abbreviations: M:F IRR, male-to-female incidence rate ratio