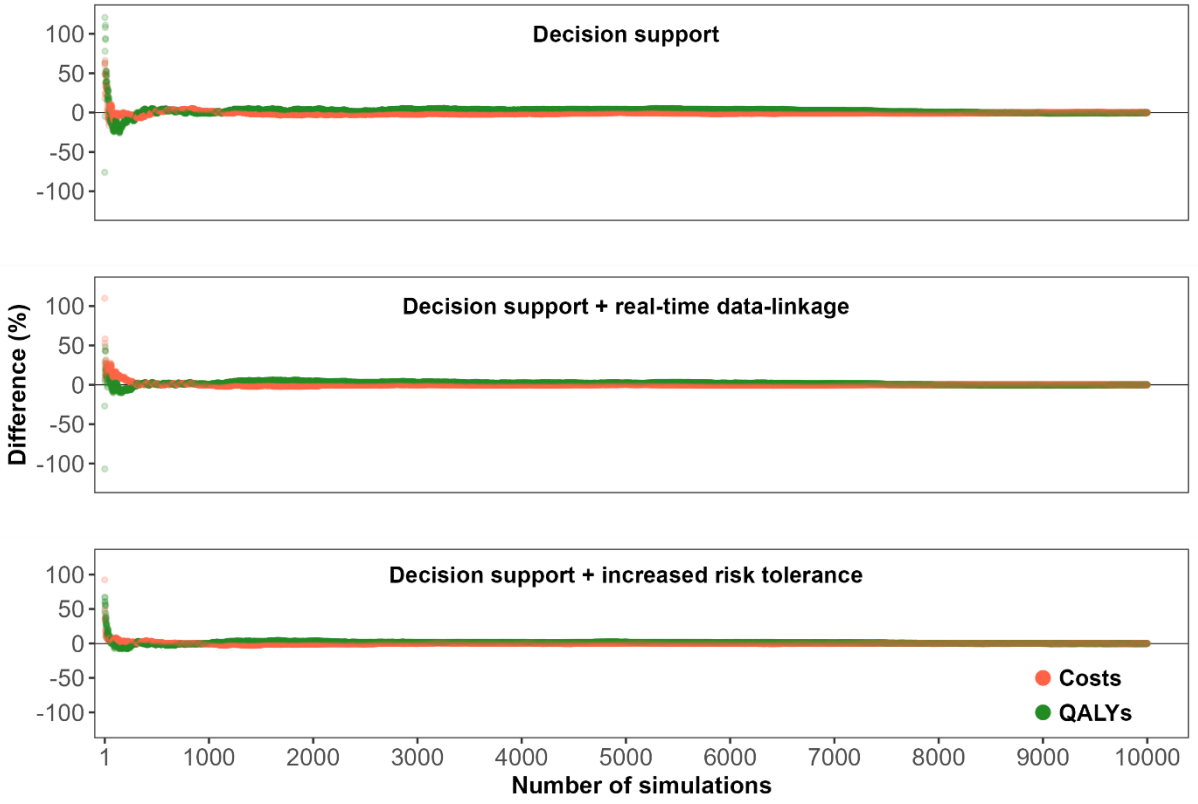
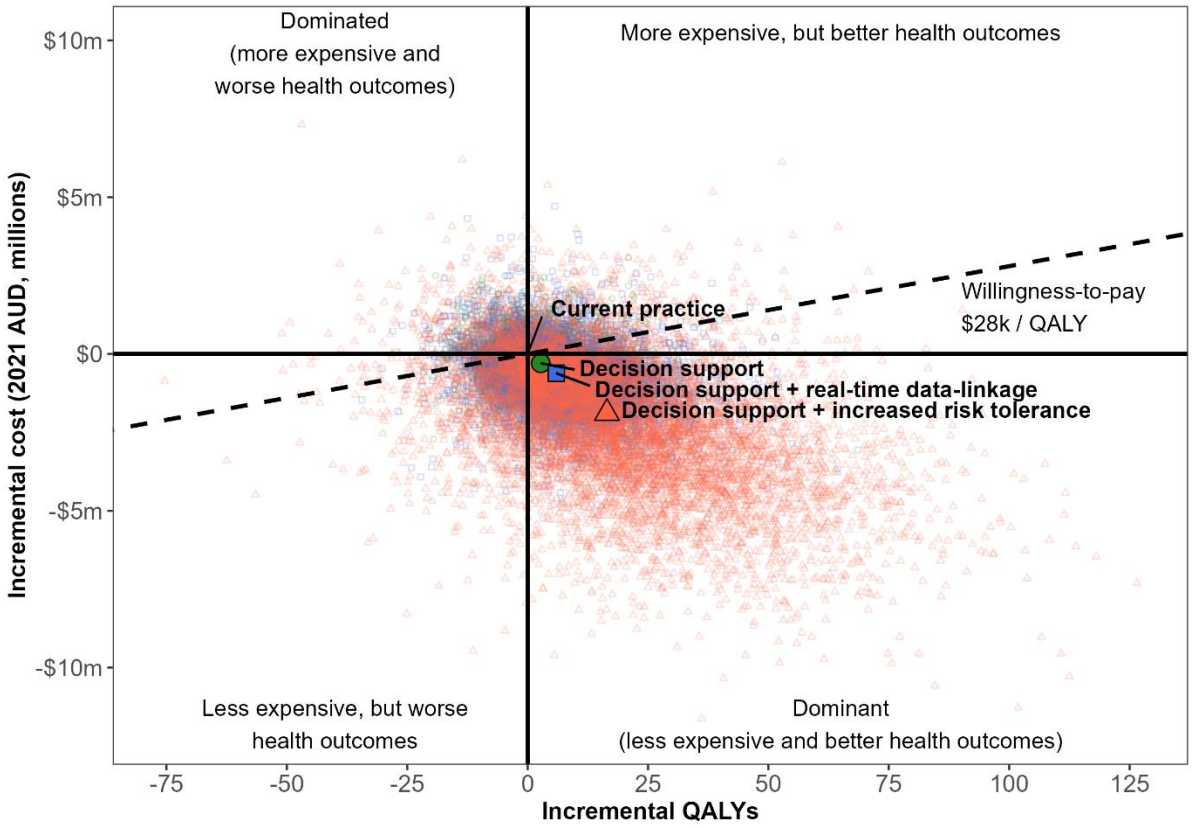
Supplementary Figures

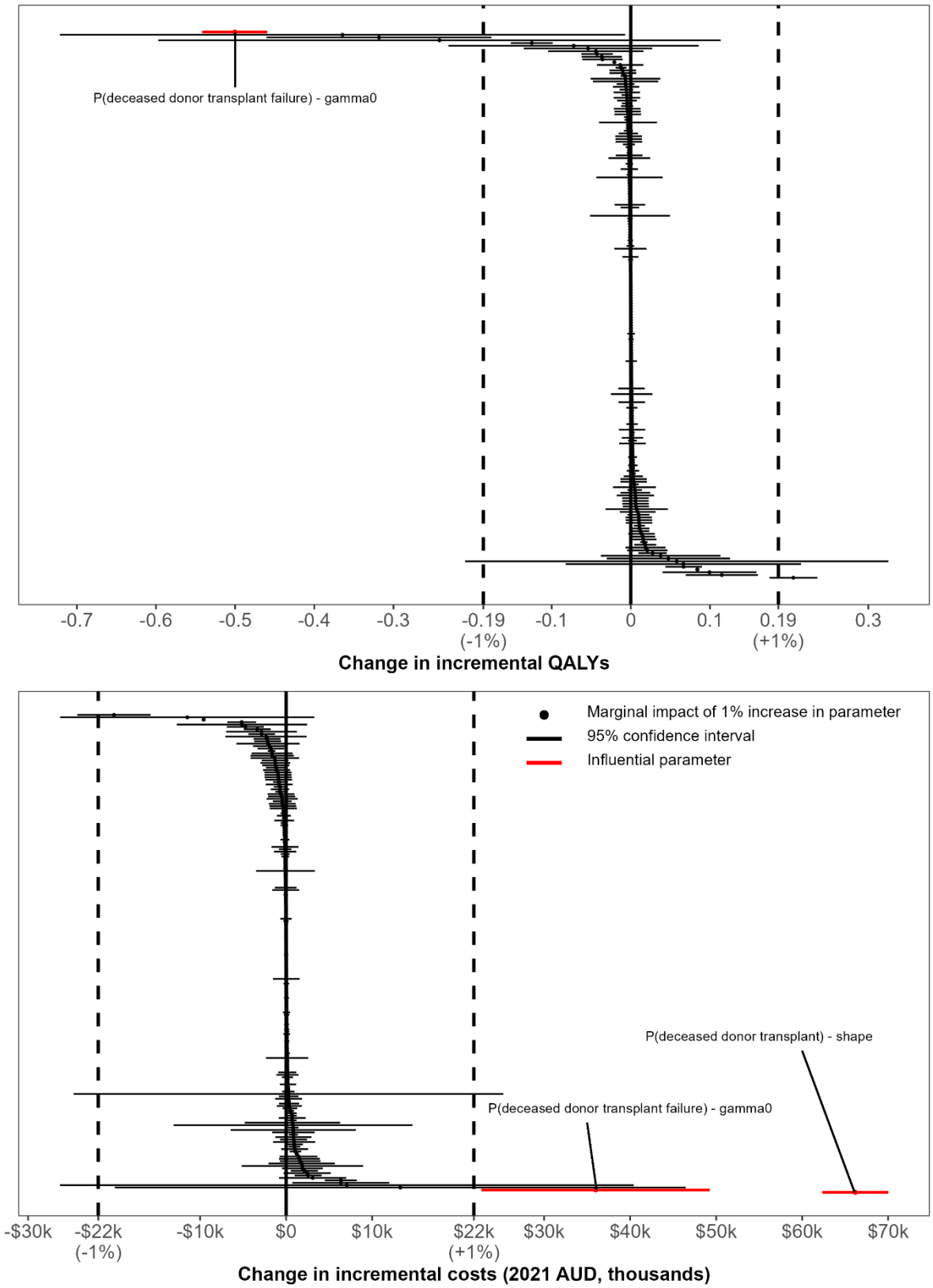
Supplementary Figure 1: Proportional difference between cumulative average incremental costs and quality-adjusted life-years (QALYs) gained compared with current practice, and their final values under each intervention



Supplementary Figure 2: Incremental costs and quality-adjusted life-years (QALYs) gained from 10,000 probabilistic sensitivity analysis simulations of each intervention



Supplementary Figure 3: Marginal change in incremental costs and quality-adjusted life-years (QALYs) from a 1% increase in each parameter



Based on a linear regression of the results from 10,000 probabilistic sensitivity analysis simulations.
Each point represents a model paramater. Dashed lines represent a 1% change in incremental costs or QALYs (in the decison support + increased risk tolerance scenario). Parameters with a 95% CI that lies outside the dashed lines may be considered influential, i.e. the model is sensitive to changes in these parameters (highlighted in red and labeled).

Supplementary Tables

Supplementary Table 1: Current classification of transmission risk from deceased donor brain cancers in Australia

Minimal risk of transmission (<0.1%) – Likely to be acceptable for all organ types and recipients

WHO Grade I and II tumours:

- Pilocytic/ Subependymal giant cell
- Diffuse astrocytoma, IDH-mutant
- Pleomorphic xanthoastrocytoma
- Oligodendroglioma, IDH-mutant & 1p/19q-codeleted
- Oligoastrocytoma
- Subependymoma/ Myxopapillary ependymoma
- Ependymoma
- Choroid plexus/ Atypical choroid plexus papilloma
- Angiocentric glioma
- Chordoid glioma of the third ventricle
- Gangliocytoma
- Ganglioglioma
- Desmoplastic infantile astrocytoma and ganglioglioma
- Dysembryoplastic neuroepithelial tumour
- Dysplastic gangliocytoma of cerebellum (Lhermitte-Duclos)
- Central/ Extraventricular neurocytoma
- Cerebellar liponeurocytoma
- Papillary glioneuronal tumour
- Rosette-forming glioneuronal tumour
- Pineocytoma
- Schwannoma
- Neurofibroma
- Perineurioma
- Meningioma/ Atypical meningioma
- Solitary fibrous tumour/Haemangiopericytoma (I, II or III)
- Haemangioblastoma
- Craniopharyngioma
- Granular cell tumour
- Pituicytoma
- Spindle cell oncocytoma of the adenohypophysis

Low-risk of transmission (0.1% to <2%) – Likely to be acceptable for many organ types and recipients

WHO Grade III and equivalents:

- Anaplastic astrocytoma, IDH-mutant
- Anaplastic oligodendroglioma, IDH-mutant & 1p/19q-codeleted
- Ependymoma, RELA fusion-positive (II or III)
- Anaplastic ependymoma
- Choroid plexus carcinoma
- Anaplastic gangliomyoma
- Pineal parenchymal tumour of intermediate differentiation (II or III)
- Papillary tumour of the pineal region (II or III)
- Malignant peripheral sheath tumour (II, III or IV)
- Anaplastic (malignant) meningioma
- Anaplastic pleomorphic xanthoastrocytoma

Low- to intermediate-risk of transmission[a] – consider on a case-by-case basis

WHO Grade IV tumours and equivalents:

- Glioblastoma
- Diffuse midline glioma, H3K27 M-mutant
- Pineoblastoma
- Medulloblastoma
- Embryonal tumour with multilayered rosettes, C19MCaltered
- CNS embryonal tumour, NOS
- CNS embryonal tumour with rhabdoid features
- Medulloepithelioma
- Ependymoblastoma
- Atypical teratoid/rhabdoid tumour
- Germinoma
- Immature teratoma
- Teratoma with malignant transformation
- Yolk sac tumour
- Embryonal carcinoma
- Non-gestational Choriocarcinoma

Unacceptable risk

- Primary cerebral lymphoma
- All secondary intracranial tumours

[a] Best available evidence suggests that the risk of transmission from donor to recipient in the case of Grade IV CNS tumours is ≤2%

Reproduced from Table M1 of TSANZ Clinical Guidelines for Organ Transplantation from Deceased Donors [1]

Supplementary Table 2: Distributions and parameters used to simulate patient characteristics

Parameter, mean (SE)	Number of previous transplants	Blood group			Female	Age at waitlisting	Number of comorbidities
		A	B	AB			
Distribution	Poisson		Multinomial		Binomial	Normal	Poisson
Standard deviation (σ)	-	-	-	-	-	14.51	-
Intercept	-3.79 (0.07)	-0.19 (0.02)	-1.21 (0.03)	-2.32 (0.06)	-0.53 (0.03)	50.21 (0.27)	-1.57 (0.06)
Number of previous transplants	-	0.03 (0.16)	-0.08 (0.24)	0.68 (0.27)	0.20 (0.15)	-8.62 (1.06)	-0.08 (0.09)
Blood group A	-	-	-	-	-0.02 (0.05)	0.40 (0.35)	-0.04 (0.03)
Blood group B	-	-	-	-	-0.06 (0.07)	-0.25 (0.50)	-0.03 (0.04)
Blood group AB	-	-	-	-	-0.19 (0.12)	0.31 (0.79)	-0.13 (0.06)
Female	-	-	-	-	-	-1.54 (0.33)	-0.22 (0.03)
Age at waitlisting	-	-	-	-	-	-	0.03 (0.001)

SE, standard error

Supplementary Table 3: Distributions and parameters used to simulate donor characteristics

Parameter, mean (SE)	Primary brain malignancy	Deceased donor type		Donor female	Donor age	KDPI
		DBD SCD	DBD ECD			
Distribution	Binomial	Multinomial		Binomial	Normal	Logit-normal
Standard deviation (σ)	-	-	-	-	13.48	0.91
Intercept	-8.08 (0.76)	2.70 (0.11)	-0.20 (0.14)	-0.46 (0.05)	35.85 (0.33)	-2.70 (0.05)
Number of previous transplants	-0.26 (0.26)	0.15 (0.06)	0.13 (0.07)	0.03 (0.03)	-0.74 (0.22)	-0.04 (0.02)
Blood group A	-0.13 (0.22)	-0.05 (0.05)	-0.11 (0.07)	-0.01 (0.03)	0.06 (0.21)	-0.08 (0.02)
Blood group B	-0.01 (0.31)	0.17 (0.08)	-0.01 (0.10)	-0.08 (0.05)	-0.41 (0.31)	-0.01 (0.03)
Blood group AB	0.08 (0.44)	0.17 (0.12)	-0.22 (0.15)	-0.02 (0.07)	-0.83 (0.47)	-0.08 (0.04)
Female	0.27 (0.20)	0.03 (0.05)	-0.09 (0.06)	-0.15 (0.03)	0.09 (0.20)	0.01 (0.02)
Number of comorbidities	-0.16 (0.12)	-0.13 (0.02)	-0.07 (0.03)	0.07 (0.02)	0.66 (0.11)	-0.03 (0.01)
Age at transplant	-0.01 (0.01)	-0.03 (0.002)	0.01 (0.003)	0.01 (0.001)	0.19 (0.01)	0.0002 (0.0007)
Deceased donor	3.58 (0.72)	-	-	-	-	-
Donor primary brain malignancy	-	0.36 (0.29)	-0.97 (0.49)	0.13 (0.20)	-0.66 (1.34)	0.16 (0.11)
DCD donor	-	-	-	-0.50 (0.05)	-0.75 (0.35)	-
DBD standard criteria donor	-	-	-	-0.09 (0.03)	-9.11 (0.22)	-0.45 (0.02)
DBD expanded criteria donor	-	-	-	0.12 (0.05)	17.73 (0.33)	0.40 (0.03)
Donor female	-	-	-	-	3.36 (0.19)	0.29 (0.02)
Donor age	-	-	-	-	-	0.07 (0.0007)

SE, standard error; DCD, donation after circulatory death; DBD, donation after brain death; SCD, standard criteria donor; ECD, expanded criteria donor; KPDI, kidney donor profile index

Supplementary Table 4: Standardized mortality ratios (SMRs) for patients with kidney failure, by age and sex

Age	Female		Male	
	Dialysis	Transplant	Dialysis	Transplant
25	143.1	9.0	61.6	-
35	63.9	4.1	38.0	3.1
45	52.5	4.2	23.8	3.3
55	26.6	4.5	16.1	2.9
65	15.5	3.8	9.9	2.5
75	6.8	1.8	5.3	1.9
85	3.3	2.1	2.6	1.6

Estimated from ANZDATA annual reports [2]

Supplementary Table 5: Average relative survival with cancer by 5-year age group, sex, and years after diagnosis

	Average relative survival compared with the general population, %									
			Females					*Males*		
Age group	0-1 years	1-2 years	2-3 years	3-4 years	4+ years	0-1 years	1-2 years	2-3 years	3-4 years	4+ years
0-4	98.5	97.4	97.0	96.8	96.6	97.5	96.8	96.4	96.0	95.9
5-9	98.9	98.5	98.4	98.3	98.3	98.7	98.0	97.7	97.5	97.4
10-14	98.5	97.7	97.3	96.7	96.5	99.0	98.1	97.3	97.3	97.3
15-19	98.6	97.5	96.8	96.0	95.6	98.8	97.2	96.6	95.7	95.8
20-24	98.9	97.6	97.2	96.8	96.2	98.4	96.7	96.1	95.5	95.0
25-29	98.4	97.1	96.7	95.9	95.5	97.8	96.2	95.7	95.1	94.6
30-34	97.4	94.9	95.2	94.5	94.0	96.1	95.0	94.9	94.9	94.5
35-39	96.1	93.8	92.9	92.9	92.3	95.5	92.9	92.5	92.9	92.6
40-44	94.4	90.7	89.2	89.1	88.5	92.8	88.5	86.2	85.5	85.0
45-49	92.0	88.5	86.7	84.8	84.2	89.7	85.9	83.2	81.9	80.7
50-54	89.9	85.1	83.5	82.2	81.0	88.0	81.2	78.9	77.6	77.1
55-59	87.6	82.0	79.2	78.5	77.1	84.6	79.1	76.8	75.9	74.2
60-64	86.8	80.8	77.1	75.3	75.1	83.3	76.5	72.8	70.3	68.0
65-69	84.1	77.7	73.2	72.0	70.4	79.9	72.8	69.7	67.3	67.6
70-74	81.5	74.7	71.4	71.6	70.3	77.6	72.7	68.7	66.5	64.5
75-79	77.3	71.2	70.6	68.3	66.2	75.3	68.8	65.5	63.3	61.3
80-84	72.3	68.3	66.6	65.9	65.3	71.5	66.8	64.0	65.2	64.8
85+	62.8	62.4	62.6	61.6	64.2	65.5	63.9	63.5	63.8	67.5

Derived from cancer data from the Australian Institute of Health and Welfare (AIHW) [3]

Supplementary Table 6: Annual mortality rates by age, sex, treatment, and years since cancer diagnosis

Age	Sex	General population	Dialysis	Dialysis with cancer					Transplant	Transplant with cancer				
				0-1 years	1-2 years	2-3 years	3-4 years	4+ years		0-1 years	1-2 years	2-3 years	3-4 years	4+ years
0	Male	0.00364	0.22436	0.24412	0.22925	0.22788	0.22717	0.22587	0.01761	0.04264	0.02380	0.02206	0.02117	0.01952
0	Female	0.00297	0.42496	0.43363	0.43130	0.42759	0.42622	0.42601	0.02676	0.04142	0.03748	0.03121	0.02888	0.02852
1	Male	0.00025	0.01541	0.04050	0.02162	0.01987	0.01898	0.01733	0.00121	0.02666	0.00751	0.00574	0.00483	0.00315
1	Female	0.00024	0.03434	0.04889	0.04498	0.03875	0.03644	0.03609	0.00216	0.01720	0.01315	0.00672	0.00433	0.00397
2	Male	0.00014	0.00863	0.03389	0.01488	0.01312	0.01222	0.01056	0.00068	0.02614	0.00698	0.00521	0.00430	0.00262
2	Female	0.00012	0.01717	0.03198	0.02800	0.02166	0.01931	0.01895	0.00108	0.01613	0.01208	0.00565	0.00325	0.00289
3	Male	0.00012	0.00740	0.03269	0.01366	0.01190	0.01099	0.00933	0.00058	0.02604	0.00688	0.00511	0.00420	0.00253
3	Female	0.00010	0.01431	0.02916	0.02517	0.01881	0.01645	0.01609	0.00090	0.01596	0.01191	0.00547	0.00307	0.00271
4	Male	0.00010	0.00616	0.03148	0.01243	0.01067	0.00976	0.00810	0.00048	0.02595	0.00679	0.00502	0.00411	0.00243
4	Female	0.00008	0.01145	0.02634	0.02234	0.01597	0.01360	0.01324	0.00072	0.01578	0.01173	0.00529	0.00289	0.00253
5	Male	0.00009	0.00555	0.01832	0.01288	0.00878	0.00705	0.00649	0.00044	0.01327	0.00780	0.00369	0.00195	0.00139
5	Female	0.00007	0.01002	0.02104	0.01425	0.01072	0.01117	0.01002	0.00063	0.01176	0.00491	0.00134	0.00180	0.00063
6	Male	0.00008	0.00493	0.01771	0.01226	0.00817	0.00644	0.00588	0.00039	0.01322	0.00775	0.00364	0.00190	0.00134
6	Female	0.00006	0.00859	0.01963	0.01283	0.00929	0.00974	0.00859	0.00054	0.01167	0.00482	0.00125	0.00171	0.00054
7	Male	0.00007	0.00431	0.01710	0.01165	0.00755	0.00582	0.00526	0.00034	0.01317	0.00771	0.00359	0.00185	0.00129
7	Female	0.00006	0.00859	0.01963	0.01283	0.00929	0.00974	0.00859	0.00054	0.01167	0.00482	0.00125	0.00171	0.00054
8	Male	0.00007	0.00431	0.01710	0.01165	0.00755	0.00582	0.00526	0.00034	0.01317	0.00771	0.00359	0.00185	0.00129
8	Female	0.00006	0.00859	0.01963	0.01283	0.00929	0.00974	0.00859	0.00054	0.01167	0.00482	0.00125	0.00171	0.00054
9	Male	0.00007	0.00431	0.01710	0.01165	0.00755	0.00582	0.00526	0.00034	0.01317	0.00771	0.00359	0.00185	0.00129
9	Female	0.00006	0.00859	0.01963	0.01283	0.00929	0.00974	0.00859	0.00054	0.01167	0.00482	0.00125	0.00171	0.00054
10	Male	0.00007	0.00431	0.01421	0.01351	0.01196	0.00452	0.00483	0.00034	0.01028	0.00957	0.00802	0.00055	0.00086
10	Female	0.00006	0.00859	0.02301	0.01667	0.01353	0.01379	0.01065	0.00054	0.01508	0.00870	0.00553	0.00579	0.00262
11	Male	0.00008	0.00493	0.01482	0.01412	0.01258	0.00514	0.00545	0.00039	0.01033	0.00962	0.00807	0.00060	0.00091
11	Female	0.00007	0.01002	0.02442	0.01809	0.01496	0.01522	0.01208	0.00063	0.01517	0.00879	0.00562	0.00588	0.00271
12	Male	0.00010	0.00616	0.01604	0.01534	0.01380	0.00637	0.00668	0.00048	0.01042	0.00972	0.00816	0.00069	0.00100
12	Female	0.00009	0.01288	0.02724	0.02093	0.01780	0.01806	0.01493	0.00081	0.01535	0.00896	0.00580	0.00606	0.00289
13	Male	0.00013	0.00801	0.01788	0.01718	0.01563	0.00822	0.00853	0.00063	0.01056	0.00986	0.00831	0.00084	0.00115
13	Female	0.00011	0.01574	0.03006	0.02377	0.02065	0.02091	0.01779	0.00099	0.01552	0.00914	0.00598	0.00624	0.00307
14	Male	0.00017	0.01048	0.02032	0.01962	0.01808	0.01068	0.01099	0.00082	0.01076	0.01005	0.00850	0.00103	0.00134
14	Female	0.00013	0.01860	0.03288	0.02661	0.02350	0.02376	0.02064	0.00117	0.01570	0.00932	0.00615	0.00642	0.00325
15	Male	0.00024	0.01479	0.02633	0.03123	0.02017	0.02475	0.01479	0.00116	0.01286	0.01783	0.00661	0.01126	0.00116

Age	Sex	General population	Dialysis	Dialysis with cancer					Transplant	Transplant with cancer				
				0-1 years	1-2 years	2-3 years	3-4 years	4+ years		0-1 years	1-2 years	2-3 years	3-4 years	4+ years
15	Female	0.00016	0.02289	0.03667	0.03355	0.03042	0.03096	0.02659	0.00144	0.01552	0.01233	0.00913	0.00968	0.00522
16	Male	0.00031	0.01911	0.03059	0.03548	0.02446	0.02902	0.01911	0.00150	0.01319	0.01816	0.00695	0.01159	0.00150
16	Female	0.00018	0.02576	0.03949	0.03638	0.03326	0.03380	0.02944	0.00162	0.01569	0.01251	0.00931	0.00986	0.00540
17	Male	0.00040	0.02466	0.03608	0.04093	0.02998	0.03451	0.02466	0.00193	0.01362	0.01859	0.00738	0.01202	0.00193
17	Female	0.00020	0.02862	0.04231	0.03921	0.03609	0.03663	0.03229	0.00180	0.01587	0.01269	0.00949	0.01004	0.00558
18	Male	0.00048	0.02959	0.04095	0.04578	0.03488	0.03939	0.02959	0.00232	0.01400	0.01897	0.00777	0.01240	0.00232
18	Female	0.00022	0.03148	0.04513	0.04204	0.03893	0.03947	0.03514	0.00198	0.01605	0.01287	0.00966	0.01022	0.00576
19	Male	0.00054	0.03328	0.04460	0.04942	0.03856	0.04305	0.03328	0.00261	0.01429	0.01926	0.00806	0.01269	0.00261
19	Female	0.00023	0.03291	0.04654	0.04346	0.04035	0.04089	0.03657	0.00207	0.01614	0.01296	0.00975	0.01031	0.00585
20	Male	0.00058	0.03575	0.05072	0.05246	0.04167	0.04201	0.04086	0.00281	0.01828	0.02008	0.00893	0.00928	0.00809
20	Female	0.00024	0.03434	0.04453	0.04722	0.03892	0.03806	0.03989	0.00216	0.01269	0.01547	0.00689	0.00600	0.00790
21	Male	0.00060	0.03698	0.05193	0.05367	0.04290	0.04324	0.04208	0.00290	0.01838	0.02018	0.00903	0.00938	0.00818
21	Female	0.00024	0.03434	0.04453	0.04722	0.03892	0.03806	0.03989	0.00216	0.01269	0.01547	0.00689	0.00600	0.00790
22	Male	0.00062	0.03822	0.05314	0.05488	0.04412	0.04446	0.04331	0.00300	0.01847	0.02027	0.00912	0.00948	0.00828
22	Female	0.00024	0.03434	0.04453	0.04722	0.03892	0.03806	0.03989	0.00216	0.01269	0.01547	0.00689	0.00600	0.00790
23	Male	0.00063	0.03883	0.05375	0.05549	0.04474	0.04508	0.04392	0.00305	0.01852	0.02032	0.00917	0.00952	0.00833
23	Female	0.00024	0.03434	0.04453	0.04722	0.03892	0.03806	0.03989	0.00216	0.01269	0.01547	0.00689	0.00600	0.00790
24	Male	0.00064	0.03945	0.05436	0.05609	0.04535	0.04569	0.04453	0.00310	0.01857	0.02037	0.00922	0.00957	0.00837
24	Female	0.00024	0.03434	0.04453	0.04722	0.03892	0.03806	0.03989	0.00216	0.01269	0.01547	0.00689	0.00600	0.00790
25	Male	0.00065	0.04006	0.06145	0.05573	0.04482	0.04565	0.04556	0.00314	0.02535	0.01941	0.00809	0.00894	0.00885
25	Female	0.00024	0.03434	0.04961	0.04723	0.03867	0.04181	0.03859	0.00216	0.01794	0.01548	0.00664	0.00988	0.00655
26	Male	0.00066	0.04068	0.06205	0.05634	0.04544	0.04626	0.04618	0.00319	0.02540	0.01946	0.00813	0.00899	0.00890
26	Female	0.00026	0.03720	0.05242	0.05005	0.04152	0.04465	0.04144	0.00234	0.01811	0.01566	0.00682	0.01006	0.00673
27	Male	0.00067	0.04130	0.06265	0.05694	0.04605	0.04687	0.04679	0.00324	0.02544	0.01951	0.00818	0.00904	0.00895
27	Female	0.00027	0.03863	0.05383	0.05147	0.04295	0.04607	0.04286	0.00243	0.01820	0.01575	0.00691	0.01015	0.00682
28	Male	0.00069	0.04253	0.06386	0.05816	0.04728	0.04810	0.04801	0.00334	0.02554	0.01960	0.00828	0.00913	0.00905
28	Female	0.00028	0.04006	0.05524	0.05288	0.04437	0.04749	0.04429	0.00252	0.01829	0.01584	0.00700	0.01024	0.00691
29	Male	0.00072	0.04438	0.06567	0.05997	0.04912	0.04994	0.04985	0.00348	0.02568	0.01975	0.00842	0.00928	0.00919
29	Female	0.00028	0.04006	0.05524	0.05288	0.04437	0.04749	0.04429	0.00252	0.01829	0.01584	0.00700	0.01024	0.00691
30	Male	0.00075	0.02850	0.06674	0.03942	0.02915	0.02854	0.03269	0.00230	0.04157	0.01351	0.00297	0.00235	0.00661
30	Female	0.00030	0.01917	0.04468	0.04420	0.01917	0.02588	0.02428	0.00122	0.02721	0.02672	0.00122	0.00807	0.00644
31	Male	0.00079	0.03002	0.06820	0.04092	0.03067	0.03006	0.03421	0.00242	0.04169	0.01364	0.00309	0.00247	0.00673
31	Female	0.00033	0.02108	0.04655	0.04607	0.02108	0.02779	0.02619	0.00135	0.02733	0.02684	0.00135	0.00819	0.00656

Age	Sex	General population	Dialysis	Dialysis with cancer					Transplant	Transplant with cancer				
				0-1 years	1-2 years	2-3 years	3-4 years	4+ years		0-1 years	1-2 years	2-3 years	3-4 years	4+ years
32	Male	0.00083	0.03154	0.06966	0.04242	0.03219	0.03158	0.03572	0.00255	0.04181	0.01376	0.00322	0.00259	0.00686
32	Female	0.00037	0.02364	0.04904	0.04856	0.02364	0.03033	0.02873	0.00151	0.02749	0.02700	0.00151	0.00835	0.00672
33	Male	0.00088	0.03344	0.07148	0.04430	0.03409	0.03348	0.03761	0.00270	0.04196	0.01391	0.00337	0.00275	0.00701
33	Female	0.00041	0.02619	0.05153	0.05105	0.02619	0.03286	0.03127	0.00167	0.02764	0.02716	0.00167	0.00851	0.00688
34	Male	0.00094	0.03572	0.07367	0.04655	0.03636	0.03576	0.03988	0.00288	0.04213	0.01409	0.00355	0.00293	0.00719
34	Female	0.00045	0.02875	0.05401	0.05354	0.02875	0.03540	0.03382	0.00184	0.02780	0.02732	0.00184	0.00868	0.00704
35	Male	0.00100	0.03800	0.08123	0.06385	0.04230	0.03800	0.04182	0.00307	0.04787	0.02986	0.00753	0.00307	0.00703
35	Female	0.00050	0.03194	0.07010	0.05457	0.04129	0.03194	0.03815	0.00204	0.04137	0.02537	0.01167	0.00204	0.00844
36	Male	0.00107	0.04066	0.08377	0.06644	0.04495	0.04066	0.04447	0.00328	0.04808	0.03007	0.00774	0.00328	0.00725
36	Female	0.00054	0.03450	0.07255	0.05707	0.04382	0.03450	0.04069	0.00220	0.04153	0.02553	0.01184	0.00220	0.00860
37	Male	0.00114	0.04331	0.08631	0.06903	0.04760	0.04331	0.04712	0.00350	0.04828	0.03028	0.00796	0.00350	0.00746
37	Female	0.00058	0.03705	0.07500	0.05956	0.04635	0.03705	0.04323	0.00237	0.04169	0.02569	0.01200	0.00237	0.00877
38	Male	0.00121	0.04597	0.08885	0.07161	0.05024	0.04597	0.04977	0.00371	0.04849	0.03049	0.00817	0.00371	0.00767
38	Female	0.00064	0.04089	0.07869	0.06330	0.05014	0.04089	0.04704	0.00261	0.04192	0.02593	0.01224	0.00261	0.00901
39	Male	0.00129	0.04901	0.09175	0.07457	0.05327	0.04901	0.05280	0.00396	0.04872	0.03073	0.00842	0.00396	0.00792
39	Female	0.00070	0.04472	0.08237	0.06705	0.05394	0.04472	0.05085	0.00286	0.04216	0.02616	0.01248	0.00286	0.00925
40	Male	0.00138	0.03291	0.10214	0.07824	0.05744	0.04119	0.03904	0.00452	0.07579	0.05119	0.02978	0.01305	0.01083
40	Female	0.00076	0.03987	0.09400	0.07715	0.05607	0.04080	0.04602	0.00317	0.05938	0.04188	0.01999	0.00414	0.00956
41	Male	0.00147	0.03505	0.10414	0.08029	0.05953	0.04332	0.04117	0.00482	0.07607	0.05147	0.03007	0.01335	0.01113
41	Female	0.00082	0.04302	0.09697	0.08018	0.05916	0.04394	0.04915	0.00342	0.05961	0.04212	0.02024	0.00439	0.00981
42	Male	0.00157	0.03744	0.10635	0.08256	0.06186	0.04569	0.04354	0.00515	0.07637	0.05178	0.03038	0.01367	0.01145
42	Female	0.00090	0.04721	0.10093	0.08421	0.06329	0.04813	0.05332	0.00376	0.05993	0.04244	0.02056	0.00472	0.01015
43	Male	0.00170	0.04054	0.10923	0.08551	0.06488	0.04876	0.04662	0.00557	0.07677	0.05219	0.03080	0.01409	0.01188
43	Female	0.00099	0.05193	0.10539	0.08875	0.06793	0.05285	0.05801	0.00413	0.06028	0.04281	0.02093	0.00510	0.01052
44	Male	0.00184	0.04388	0.11233	0.08870	0.06813	0.05207	0.04994	0.00603	0.07719	0.05263	0.03125	0.01455	0.01233
44	Female	0.00107	0.05613	0.10935	0.09278	0.07205	0.05704	0.06218	0.00447	0.06060	0.04313	0.02126	0.00543	0.01085
45	Male	0.00200	0.04769	0.14588	0.08839	0.07724	0.06244	0.06205	0.00655	0.10898	0.04901	0.03738	0.02194	0.02153
45	Female	0.00116	0.06085	0.13620	0.09622	0.07999	0.08107	0.06811	0.00484	0.08469	0.04233	0.02513	0.02627	0.01254
46	Male	0.00217	0.05174	0.14951	0.09227	0.08116	0.06643	0.06604	0.00711	0.10948	0.04955	0.03792	0.02249	0.02208
46	Female	0.00125	0.06557	0.14054	0.10077	0.08462	0.08569	0.07280	0.00522	0.08503	0.04269	0.02549	0.02664	0.01291
47	Male	0.00233	0.05556	0.15293	0.09592	0.08486	0.07019	0.06980	0.00764	0.10995	0.05005	0.03843	0.02301	0.02260
47	Female	0.00136	0.07134	0.14585	0.10632	0.09027	0.09134	0.07852	0.00568	0.08545	0.04313	0.02594	0.02709	0.01337
48	Male	0.00250	0.05961	0.15657	0.09981	0.08879	0.07418	0.07379	0.00819	0.11045	0.05058	0.03897	0.02355	0.02315

Age	Sex	General population	Dialysis	Dialysis with cancer					Transplant	Transplant with cancer				
				0-1 years	1-2 years	2-3 years	3-4 years	4+ years		0-1 years	1-2 years	2-3 years	3-4 years	4+ years
48	Female	0.00148	0.07764	0.15164	0.11238	0.09644	0.09750	0.08477	0.00618	0.08591	0.04361	0.02643	0.02758	0.01386
49	Male	0.00268	0.06391	0.16042	0.10391	0.09295	0.07840	0.07802	0.00878	0.11098	0.05115	0.03954	0.02413	0.02373
49	Female	0.00162	0.08498	0.15840	0.11945	0.10363	0.10468	0.09206	0.00676	0.08645	0.04417	0.02701	0.02815	0.01444
50	Male	0.00287	0.04614	0.16033	0.12051	0.07288	0.06139	0.05259	0.00843	0.12713	0.08574	0.03622	0.02428	0.01513
50	Female	0.00176	0.04673	0.14265	0.09752	0.06540	0.06165	0.06048	0.00785	0.10767	0.06071	0.02727	0.02338	0.02215
51	Male	0.00309	0.04968	0.16344	0.12378	0.07632	0.06487	0.05610	0.00907	0.12770	0.08634	0.03685	0.02491	0.01577
51	Female	0.00191	0.05071	0.14623	0.10129	0.06930	0.06557	0.06440	0.00852	0.10828	0.06134	0.02793	0.02404	0.02281
52	Male	0.00334	0.05370	0.16698	0.12748	0.08022	0.06882	0.06009	0.00981	0.12834	0.08701	0.03757	0.02563	0.01650
52	Female	0.00207	0.05496	0.15005	0.10531	0.07347	0.06976	0.06859	0.00923	0.10892	0.06202	0.02863	0.02474	0.02352
53	Male	0.00363	0.05836	0.17108	0.13178	0.08476	0.07341	0.06472	0.01066	0.12909	0.08780	0.03839	0.02647	0.01734
53	Female	0.00225	0.05974	0.15435	0.10984	0.07815	0.07446	0.07330	0.01003	0.10964	0.06278	0.02941	0.02553	0.02431
54	Male	0.00396	0.06366	0.17575	0.13667	0.08991	0.07863	0.06999	0.01163	0.12995	0.08869	0.03934	0.02742	0.01831
54	Female	0.00244	0.06479	0.15888	0.11461	0.08310	0.07943	0.07827	0.01088	0.11040	0.06358	0.03025	0.02636	0.02514
55	Male	0.00432	0.06945	0.21239	0.13006	0.09698	0.07976	0.09115	0.01268	0.16434	0.07699	0.04189	0.02362	0.03571
55	Female	0.00264	0.07010	0.18535	0.12912	0.10214	0.07899	0.08653	0.01177	0.13426	0.07449	0.04583	0.02122	0.02923
56	Male	0.00472	0.07588	0.21784	0.13608	0.10322	0.08612	0.09744	0.01386	0.16534	0.07809	0.04303	0.02478	0.03686
56	Female	0.00285	0.07567	0.19024	0.13434	0.10753	0.08451	0.09200	0.01271	0.13508	0.07537	0.04673	0.02215	0.03015
57	Male	0.00515	0.08280	0.22369	0.14254	0.10993	0.09296	0.10419	0.01512	0.16641	0.07927	0.04425	0.02603	0.03809
57	Female	0.00308	0.08178	0.19559	0.14006	0.11342	0.09056	0.09800	0.01373	0.13598	0.07633	0.04772	0.02316	0.03116
58	Male	0.00562	0.09035	0.23008	0.14960	0.11726	0.10043	0.11157	0.01650	0.16758	0.08056	0.04559	0.02740	0.03944
58	Female	0.00336	0.08921	0.20210	0.14702	0.12060	0.09792	0.10531	0.01498	0.13707	0.07750	0.04893	0.02440	0.03238
59	Male	0.00614	0.09871	0.23716	0.15742	0.12537	0.10870	0.11973	0.01803	0.16887	0.08199	0.04708	0.02891	0.04093
59	Female	0.00364	0.09665	0.20861	0.15398	0.12778	0.10529	0.11261	0.01623	0.13816	0.07867	0.05013	0.02564	0.03361
60	Male	0.00669	0.06630	0.22192	0.14322	0.11059	0.09898	0.09674	0.01684	0.18070	0.09784	0.06348	0.05125	0.04889
60	Female	0.00397	0.06158	0.18535	0.12613	0.10550	0.08353	0.06334	0.01518	0.14506	0.08292	0.06127	0.03822	0.01702
61	Male	0.00728	0.07215	0.22679	0.14859	0.11616	0.10462	0.10239	0.01833	0.18194	0.09920	0.06490	0.05268	0.05033
61	Female	0.00432	0.06701	0.19006	0.13118	0.11067	0.08883	0.06876	0.01651	0.14623	0.08416	0.06254	0.03952	0.01836
62	Male	0.00791	0.07839	0.23199	0.15432	0.12211	0.11065	0.10843	0.01991	0.18326	0.10066	0.06641	0.05421	0.05186
62	Female	0.00466	0.07228	0.19464	0.13609	0.11570	0.09398	0.07402	0.01781	0.14735	0.08537	0.06378	0.04079	0.01965
63	Male	0.00856	0.08483	0.23736	0.16023	0.12825	0.11686	0.11466	0.02155	0.18462	0.10216	0.06797	0.05579	0.05344
63	Female	0.00499	0.07740	0.19908	0.14086	0.12058	0.09898	0.07913	0.01907	0.14845	0.08655	0.06499	0.04202	0.02091
64	Male	0.00925	0.09167	0.24306	0.16650	0.13476	0.12346	0.12128	0.02329	0.18607	0.10375	0.06962	0.05747	0.05513
64	Female	0.00536	0.08314	0.20406	0.14620	0.12605	0.10459	0.08486	0.02049	0.14968	0.08786	0.06633	0.04341	0.02233

Age	Sex	General population	Dialysis	Dialysis with cancer					Transplant	Transplant with cancer				
				0-1 years	1-2 years	2-3 years	3-4 years	4+ years		0-1 years	1-2 years	2-3 years	3-4 years	4+ years
65	Male	0.01000	0.09910	0.28034	0.17949	0.13722	0.12985	0.09910	0.02518	0.22128	0.11215	0.06642	0.05845	0.02518
65	Female	0.00583	0.09043	0.23495	0.15961	0.14343	0.10543	0.11040	0.02229	0.17764	0.09665	0.07926	0.03841	0.04376
66	Male	0.01083	0.10733	0.28691	0.18698	0.14510	0.13780	0.10733	0.02726	0.22295	0.11406	0.06842	0.06047	0.02726
66	Female	0.00639	0.09911	0.24226	0.16763	0.15161	0.11397	0.11890	0.02443	0.17944	0.09863	0.08128	0.04051	0.04585
67	Male	0.01176	0.11655	0.29427	0.19537	0.15392	0.14670	0.11655	0.02961	0.22482	0.11619	0.07066	0.06273	0.02961
67	Female	0.00705	0.10935	0.25087	0.17709	0.16125	0.12404	0.12891	0.02695	0.18156	0.10096	0.08365	0.04300	0.04832
68	Male	0.01281	0.12695	0.30259	0.20485	0.16389	0.15675	0.12695	0.03225	0.22694	0.11860	0.07319	0.06528	0.03225
68	Female	0.00779	0.12083	0.26052	0.18770	0.17206	0.13533	0.14014	0.02978	0.18394	0.10357	0.08632	0.04578	0.05109
69	Male	0.01401	0.13884	0.31209	0.21568	0.17528	0.16824	0.13884	0.03527	0.22935	0.12135	0.07609	0.06820	0.03527
69	Female	0.00860	0.13339	0.27109	0.19931	0.18390	0.14768	0.15243	0.03287	0.18654	0.10643	0.08923	0.04882	0.05412
70	Male	0.01539	0.08146	0.28736	0.13966	0.13140	0.11133	0.10861	0.02911	0.24675	0.09063	0.08190	0.06069	0.05781
70	Female	0.00954	0.06490	0.23768	0.14310	0.10574	0.06490	0.08196	0.01727	0.19886	0.09946	0.06020	0.01727	0.03520
71	Male	0.01695	0.08972	0.29377	0.14740	0.13921	0.11932	0.11663	0.03206	0.24904	0.09340	0.08469	0.06354	0.06068
71	Female	0.01061	0.07217	0.24362	0.14977	0.11270	0.07217	0.08910	0.01921	0.20044	0.10123	0.06205	0.01921	0.03711
72	Male	0.01870	0.09898	0.30095	0.15607	0.14797	0.12829	0.12562	0.03538	0.25161	0.09650	0.08782	0.06675	0.06389
72	Female	0.01186	0.08068	0.25055	0.15756	0.12083	0.08068	0.09745	0.02147	0.20228	0.10331	0.06421	0.02147	0.03933
73	Male	0.02068	0.10946	0.30909	0.16589	0.15788	0.13843	0.13579	0.03912	0.25451	0.10001	0.09136	0.07037	0.06752
73	Female	0.01326	0.09020	0.25831	0.16629	0.12994	0.09020	0.10680	0.02401	0.20435	0.10563	0.06664	0.02401	0.04181
74	Male	0.02289	0.12116	0.31816	0.17685	0.16894	0.14974	0.14714	0.04330	0.25775	0.10392	0.09531	0.07441	0.07158
74	Female	0.01481	0.10074	0.26691	0.17595	0.14002	0.10074	0.11715	0.02681	0.20664	0.10820	0.06932	0.02681	0.04457
75	Male	0.02542	0.13455	0.34789	0.20949	0.17598	0.16422	0.16161	0.04809	0.28274	0.13052	0.09365	0.08072	0.07784
75	Female	0.01658	0.11279	0.31402	0.18255	0.12079	0.14176	0.13969	0.03002	0.25003	0.10629	0.03876	0.06169	0.05944
76	Male	0.02835	0.15006	0.35958	0.22366	0.19074	0.17920	0.17663	0.05363	0.28692	0.13558	0.09893	0.08607	0.08321
76	Female	0.01856	0.12625	0.32444	0.19496	0.13413	0.15479	0.15275	0.03360	0.25280	0.10959	0.04232	0.06516	0.06291
77	Male	0.03175	0.16806	0.37314	0.24010	0.20788	0.19658	0.19407	0.06006	0.29176	0.14145	0.10505	0.09228	0.08945
77	Female	0.02081	0.14156	0.33627	0.20906	0.14930	0.16959	0.16760	0.03767	0.25595	0.11334	0.04635	0.06910	0.06686
78	Male	0.03568	0.18886	0.38881	0.25910	0.22769	0.21667	0.21422	0.06750	0.29737	0.14824	0.11213	0.09946	0.09665
78	Female	0.02346	0.15959	0.35021	0.22567	0.16717	0.18703	0.18508	0.04247	0.25966	0.11776	0.05111	0.07374	0.07151
79	Male	0.04014	0.21247	0.40660	0.28066	0.25016	0.23947	0.23709	0.07593	0.30372	0.15595	0.12016	0.10761	0.10482
79	Female	0.02653	0.18047	0.36636	0.24491	0.18786	0.20723	0.20533	0.04803	0.26396	0.12288	0.05661	0.07912	0.07690
80	Male	0.04518	0.11890	0.37005	0.17696	0.15538	0.11890	0.12477	0.07169	0.33630	0.13286	0.11012	0.07169	0.07787
80	Female	0.03016	0.09841	0.34816	0.14868	0.12052	0.10826	0.10614	0.06368	0.32306	0.11589	0.08664	0.07391	0.07171
81	Male	0.05085	0.13382	0.38072	0.19090	0.16968	0.13382	0.13959	0.08068	0.34273	0.14127	0.11875	0.08068	0.08681

Age	Sex	General population	Dialysis	Dialysis with cancer					Transplant	Transplant with cancer				
				0-1 years	1-2 years	2-3 years	3-4 years	4+ years		0-1 years	1-2 years	2-3 years	3-4 years	4+ years
81	Female	0.03444	0.11238	0.35826	0.16187	0.13414	0.12207	0.11998	0.07272	0.32959	0.12443	0.09546	0.08285	0.08067
82	Male	0.05727	0.15071	0.39280	0.20668	0.18588	0.15071	0.15637	0.09087	0.35001	0.15078	0.12851	0.09087	0.09693
82	Female	0.03942	0.12862	0.37001	0.17721	0.14999	0.13814	0.13609	0.08324	0.33719	0.13436	0.10572	0.09325	0.09109
83	Male	0.06458	0.16995	0.40655	0.22465	0.20432	0.16995	0.17548	0.10247	0.35830	0.16161	0.13963	0.10247	0.10845
83	Female	0.04519	0.14745	0.38362	0.19499	0.16836	0.15676	0.15476	0.09542	0.34600	0.14586	0.11760	0.10530	0.10317
84	Male	0.07300	0.19211	0.42239	0.24535	0.22556	0.19211	0.19749	0.11583	0.36785	0.17409	0.15244	0.11583	0.12172
84	Female	0.05200	0.16967	0.39968	0.21597	0.19003	0.17874	0.17679	0.10980	0.35640	0.15944	0.13163	0.11952	0.11743
85	Male	0.08261	0.21740	0.48706	0.23751	0.22154	0.21740	0.21740	0.13107	0.43048	0.15340	0.13567	0.13107	0.13107
85	Female	0.05980	0.19512	0.49447	0.20025	0.19512	0.20777	0.19512	0.12627	0.45123	0.13183	0.12627	0.14000	0.12627
86	Male	0.09340	0.24579	0.50567	0.26517	0.24978	0.24579	0.24579	0.14819	0.44170	0.17008	0.15270	0.14819	0.14819
86	Female	0.06851	0.22354	0.51232	0.22849	0.22354	0.23574	0.22354	0.14466	0.46278	0.15011	0.14466	0.15810	0.14466
87	Male	0.10549	0.27761	0.52652	0.29617	0.28143	0.27761	0.27761	0.16738	0.45427	0.18877	0.17178	0.16738	0.16738
87	Female	0.07849	0.25611	0.53277	0.26084	0.25611	0.26780	0.25611	0.16573	0.47601	0.17105	0.16573	0.17884	0.16573
88	Male	0.11900	0.31316	0.54982	0.33081	0.31680	0.31316	0.31316	0.18881	0.46832	0.20966	0.19310	0.18881	0.18881
88	Female	0.08970	0.29268	0.55575	0.29719	0.29268	0.30380	0.29268	0.18940	0.49088	0.19457	0.18940	0.20214	0.18940
89	Male	0.13397	0.35256	0.57564	0.36919	0.35598	0.35256	0.35256	0.21257	0.48389	0.23280	0.21673	0.21257	0.21257
89	Female	0.10258	0.33471	0.58214	0.33895	0.33471	0.34516	0.33471	0.21660	0.50796	0.22159	0.21660	0.22891	0.21660
90	Male	0.15008	0.39495	0.60343	0.41050	0.39815	0.39495	0.39495	0.23813	0.50064	0.25770	0.24216	0.23813	0.23813
90	Female	0.11717	0.38232	0.61204	0.38625	0.38232	0.39202	0.38232	0.24741	0.52731	0.25220	0.24741	0.25923	0.24741
91	Male	0.16705	0.43961	0.63270	0.45401	0.44258	0.43961	0.43961	0.26505	0.51829	0.28394	0.26894	0.26505	0.26505
91	Female	0.13299	0.43394	0.64447	0.43754	0.43394	0.44283	0.43394	0.28081	0.54829	0.28539	0.28081	0.29211	0.28081
92	Male	0.18446	0.48543	0.66273	0.49865	0.48815	0.48543	0.48543	0.29268	0.53640	0.31085	0.29642	0.29268	0.29268
92	Female	0.14985	0.48895	0.67902	0.49220	0.48895	0.49698	0.48895	0.31641	0.57065	0.32076	0.31641	0.32715	0.31641
93	Male	0.20160	0.53054	0.69230	0.54260	0.53302	0.53054	0.53054	0.31987	0.55422	0.33735	0.32347	0.31987	0.31987
93	Female	0.16781	0.54755	0.71583	0.55043	0.54755	0.55466	0.54755	0.35433	0.59447	0.35845	0.35433	0.36448	0.35433
94	Male	0.21751	0.57241	0.71974	0.58339	0.57467	0.57241	0.57241	0.34512	0.57077	0.36194	0.34858	0.34512	0.34512
94	Female	0.18700	0.61017	0.75515	0.61265	0.61017	0.61629	0.61017	0.39485	0.61992	0.39871	0.39485	0.40436	0.39485
95	Male	0.22528	0.59285	0.73314	0.60331	0.59501	0.59285	0.59285	0.35744	0.57885	0.37395	0.36084	0.35744	0.35744
95	Female	0.19743	0.64420	0.77653	0.64647	0.64420	0.64979	0.64420	0.41688	0.63375	0.42059	0.41688	0.42604	0.41688
96	Male	0.24431	0.64293	0.76597	0.65211	0.64482	0.64293	0.64293	0.38764	0.59864	0.40337	0.39088	0.38764	0.38764
96	Female	0.22285	0.72714	0.82862	0.72888	0.72714	0.73143	0.72714	0.47055	0.66746	0.47392	0.47055	0.47887	0.47055
97	Male	0.26334	0.69301	0.79879	0.70090	0.69464	0.69301	0.69301	0.41783	0.61843	0.43279	0.42091	0.41783	0.41783
97	Female	0.23874	0.77899	0.86119	0.78040	0.77899	0.78246	0.77899	0.50410	0.68854	0.50726	0.50410	0.51190	0.50410

Age	Sex	General population	Dialysis	Dialysis with cancer					Transplant	Transplant with cancer				
				0-1 years	1-2 years	2-3 years	3-4 years	4+ years		0-1 years	1-2 years	2-3 years	3-4 years	4+ years
98	Male	0.28237	0.74309	0.83161	0.74969	0.74445	0.74309	0.74309	0.44803	0.63822	0.46221	0.45095	0.44803	0.44803
98	Female	0.25276	0.82474	0.88992	0.82585	0.82474	0.82749	0.82474	0.53371	0.70713	0.53668	0.53371	0.54103	0.53371
99	Male	0.30140	0.79317	0.86444	0.79849	0.79427	0.79317	0.79317	0.47822	0.65801	0.49163	0.48098	0.47822	0.47822
99	Female	0.26774	0.87362	0.92062	0.87442	0.87362	0.87560	0.87362	0.56534	0.72700	0.56811	0.56534	0.57217	0.56534
100	Male	0.32043	0.84325	0.89726	0.84728	0.84408	0.84325	0.84325	0.50841	0.67780	0.52105	0.51101	0.50841	0.50841
100	Female	0.28385	0.92618	0.95364	0.92665	0.92618	0.92734	0.92618	0.59935	0.74836	0.60191	0.59935	0.60565	0.59935

Based on life tables from the Australian Bureau of Statistics (ABS) [4], standardized mortality ratios (SMRs) for dialysis and transplant estimated from ANZDATA annual reports [2], and relative survival with cancer derived from Australian Institute of Health and welfare (AIHW) cancer data [3]

Supplementary Table 7: Annual incidence rates of cancer for dialysis patients compared with the general population, by 5-year age group and sex

Age	General population		Dialysis	
	Female	Male	Female	Male
0-4	0.00066	0.00073	0.00105	0.00116
5-9	0.00038	0.00046	0.00061	0.00073
10-14	0.00050	0.00051	0.00079	0.00081
15-19	0.00085	0.00085	0.00136	0.00135
20-24	0.00117	0.00110	0.00187	0.00176
25-29	0.00190	0.00154	0.00303	0.00245
30-34	0.00324	0.00215	0.00518	0.00342
35-39	0.00472	0.00306	0.00753	0.00489
40-44	0.00747	0.00485	0.01193	0.00774
45-49	0.01115	0.00801	0.01780	0.01280
50-54	0.01517	0.01410	0.02423	0.02251
55-59	0.01895	0.02333	0.03026	0.03725
60-64	0.02523	0.03597	0.04028	0.05744
65-69	0.03309	0.05103	0.05283	0.08148
70-74	0.04134	0.06377	0.06600	0.10182
75-79	0.04696	0.07609	0.07497	0.12149
80-84	0.05276	0.08652	0.08424	0.13814
85-89	0.05699	0.09294	0.09100	0.14839
90+	0.05295	0.09149	0.08455	0.14607

Based on cancer data from the Australian Institute of Health and Welfare (AIHW) [3] and incidence rate ratio (IRR) of 1.60 estimated from AIHW cancer data and Wong et al., 2016 [5]

Supplementary Table 8: Distributions and parameters used to simulate probabilities of kidney transplant and *de-novo* cancer after kidney transplant

Parameter, mean (SE)	Kidney transplant		*De-novo* cancer after transplant	
	Deceased donor	Living donor	Deceased donor	Living donor
Distribution	Weibull	Generalized F (stable)	Weibull	Weibull
Shape	0.76 (0.01)	-	0.92 (0.05)	0.99 (0.04)
Scale	0.01 (0.0004)	-	0.000003 (0.000002)	0.00003 (0.00001)
Mu (μ)	-	6.81 (0.55)	-	-
Sigma (σ)	-	2.98 (0.31)	-	-
Q	-	-3.01 (0.93)	-	-
P	-	0.95 (0.65)	-	-
Number of previous transplants	0.29 (0.08)	0.12 (0.32)	0.24 (0.12)	0.08 (0.11)
Blood group A	0.49 (0.03)	-0.33 (0.11)	0.23 (0.13)	-0.09 (0.09)
Blood group B	-0.10 (0.04)	-0.05 (0.15)	0.18 (0.18)	-0.39 (0.16)
Blood group AB	1.05 (0.06)	-0.22 (0.29)	-0.01 (0.28)	-0.20 (0.26)
Female	-0.10 (0.03)	-0.002 (0.10)	-0.08 (0.12)	-0.05 (0.09)
Age at waitlisting	-0.002 (0.001)	0.02 (0.004)	-	-
Number of comorbidities	-0.01 (0.01)	0.29 (0.06)	-0.15 (0.07)	-0.26 (0.09)
Age at transplant	-	-	0.01 (0.005)	-0.001 (0.003)
DBD standard criteria donor	-	-	1.43 (0.31)	-
DBD expanded criteria donor	-	-	1.30 (0.33)	-
Donor female	-	-	-0.24 (0.12)	0.28 (0.09)
Donor age	-	-	-0.01 (0.01)	-0.01 (0.003)
KDPI	-	-	0.02 (0.004)	-

SE, standard error; DCD, donation after circulatory death; DBD, donation after brain death; KDPI, kidney donor profile index

Supplementary Table 9: Distributions and parameters used to simulate probabilities of transplant failure

Parameter, mean (SE)	Living donor transplant failure		Deceased donor transplant failure	
	Without cancer	With cancer	Without cancer	With cancer
Distribution	Spline	Generalised gamma (Prentice 1975)	Spline	Generalised gamma (Prentice 1975)
Mu (μ)	-	9.58 (0.13)	-	8.28 (0.27)
Sigma (σ)	-	0.56 (0.04)	-	0.49 (0.07)
Q	-	2.27 (0.20)	-	2.54 (0.48)
Gamma 0 (γ0)	-4.26 (0.14)	-	-5.04 (0.18)	-
Gamma 1 (γ1)	0.41 (0.02)	-	0.44 (0.03)	-
Gamma 2 (γ2)	0.09 (0.01)	-	0.04 (0.004)	-
Gamma 3 (γ3)	-0.30 (0.09)	-	-0.09 (0.05)	-
Gamma 4 (γ4)	0.47 (0.31)	-	0.14 (0.18)	-
Gamma 5 (γ5)	-1.04 (0.45)	-	-0.50 (0.34)	-
Gamma 6 (γ6)	0.94 (0.26)	-	0.51 (0.25)	-
Knot 1	5.88	-	4.44	-
Knot 2	7.47	-	6.66	-
Knot 3	8.02	-	7.41	-
Knot 4	8.41	-	7.91	-
Knot 5	8.78	-	8.32	-
Knot 6	9.79	-	9.22	-
Number of previous transplants	0.22 (0.05)	0.07 (0.06)	0.37 (0.04)	0.06 (0.08)
Blood group A	-0.04 (0.04)	0.04 (0.05)	0.05 (0.05)	0.04 (0.07)
Blood group B	-0.11 (0.07)	0.004 (0.09)	0.09 (0.08)	-0.17 (0.10)
Blood group AB	0.11 (0.11)	-0.17 (0.15)	0.14 (0.11)	-0.58 (0.14)
Female	-0.08 (0.04)	0.05 (0.05)	0.06 (0.05)	0.06 (0.08)
Number of comorbidities	0.04 (0.04)	-0.15 (0.05)	0.20 (0.03)	-0.05 (0.04)
Age at transplant	-0.03 (0.001)	0.02 (0.004)	-0.03 (0.002)	0.07 (0.01)
DBD standard criteria donor	-	-	0.003 (0.08)	0.59 (0.18)
DBD expanded criteria donor	-	-	0.10 (0.09)	0.44 (0.21)
Donor female	0.61 (0.04)	-0.14 (0.05)	0.02 (0.05)	-0.03 (0.07)
Donor age	-0.0007 (0.002)	-0.01 (0.002)	0.002 (0.003)	-0.005 (0.01)
KDPI	-	-	0.01 (0.002)	0.002 (0.002)
Age at cancer diagnosis	-	-0.03 (0.004)	-	-0.08 (0.01)

SE, standard error; DCD, donation after circulatory death; DBD, donation after brain death; KDPI, kidney donor profile index

Supplementary Table 10: Utility values for cancer by site and stage at diagnosis

Cancer site	Incidence (2011)	Proportion	Utility	Lower	Upper
Stage I					
Breast	6,110	0.10	0.73	0.56	0.90
Colorectal	3,098	0.05	0.71	0.64	0.77
Lung	1,183	0.02	0.73	0.59	0.86
Melanoma	8,730	0.14	0.69	0.58	0.80
Prostate	7,186	0.11	0.87	-	-
Total	26,307	0.42	0.75	0.58	0.83
Stage II					
Breast	4,936	0.08	0.64	0.48	0.79
Colorectal	3,399	0.05	0.64	0.56	0.72
Lung	662	0.01	0.69	0.56	0.81
Melanoma	1,577	0.02	0.69	0.58	0.80
Prostate	9,245	0.15	0.87	-	-
Total	19,819	0.31	0.75	0.53	0.77
Stage III					
Breast	1,721	0.03	0.61	0.45	0.77
Colorectal	3,299	0.05	0.64	0.56	0.72
Lung	1,131	0.02	0.58	0.27	0.89
Melanoma	331	0.01	0.62	0.54	0.70
Prostate	2,246	0.04	0.55	-	-
Total	8,728	0.14	0.60	0.48	0.76

Cancer site	Incidence (2011)	Proportion	Utility	Lower	Upper
Stage IV					
Breast	660	0.01	0.61	0.35	0.86
Colorectal	2,474	0.04	0.42	0.30	0.53
Lung	4,273	0.07	0.75	0.66	0.84
Melanoma	233	0.00	0.66	0.58	0.80
Prostate	836	0.01	0.55	-	-
Total	8,476	0.13	0.62	0.51	0.74
All stages					
Breast	13,427	0.21	0.67	0.51	0.84
Colorectal	12,270	0.19	0.61	0.53	0.69
Lung	7,249	0.11	0.71	0.58	0.85
Melanoma	10,871	0.17	0.69	0.58	0.80
Prostate	19,513	0.31	0.82	-	-
Total	63,330	1.00	0.71	0.54	0.79

Based on cancer data from the Australian Institute of Health and Welfare (AIHW) [3] and a systematic review by Pourrahmat et al., 2021 [6]

Appendix 1 – Health state transitions

Patients entered the model on the deceased donor transplant waitlist, receiving dialysis. If they developed cancer whilst waiting, they were moved off waitlist and continued dialysis but were ineligible for a transplant, consistent with national guidelines [1]. Some patients found a suitable living donor (either a relative/friend or through paired kidney exchange) whilst on the deceased donor waitlist [2], while others received a deceased donor kidney from the waitlist, or died.

We assumed that living donor transplants did not carry a risk of PBM transmission, so these recipients remained in the transplanted health state until transplant failure, *de-novo* cancer, or death. If PBM was transmitted from a deceased donor to a recipient, they had the same probability of transplant failure or death as a recipient diagnosed with *de-novo* cancer. We assumed that the transmission would be diagnosed after nine months (i.e., three model cycles), which was the average time from transplant to diagnosis among nine kidney transplant recipients with transmission from a donor with brain cancer identified in published case reports [7-12]. After nine months, the transplanted kidney was removed, and the patient remained in transplant failure with donor-transmitted cancer health state until death. Recipients without a transmission remained in the transplanted health state until they developed a *de-novo* cancer, transplant failure, or death.

After transplant failure, patients returned to dialysis but did not return to the waitlist. Instead, they remained on dialysis until death. We did not account for subsequent transplants in our model as 89% of kidney transplants are in first-time recipients [2]. We also assumed cancer was irreversible, so once a patient was diagnosed with cancer (*de-novo* or donor-transmitted) the cancer remained until death. We acknowledge that in contemporary

clinical practice cancer can be effectively treated, however we did not account for this to reduce model complexity and because patients with cancer may still have worse outcomes and higher healthcare utilization than those without cancer, even after their cancer is in remission.

Evidence of the risk of transmission from donors with PBM is limited, and some population-level studies have failed to identify any cases of transmission [13,14]. We therefore relied on upper-limit estimates of transmission risk used in national donation guidelines [1]. We assumed that all potential donors with PBM who would currently be accepted for transplantation were classified as low-risk, which means a transmission risk of 2%. For new donors that would be accepted under our proposed interventions, those classified as not contraindicated/minimal-risk had a transmission risk of 0.1%, low-risk was 2%, and intermediate-risk was 6.4%. Since our transmission risk estimates were based on upper limits, we assumed they already accounted for the additional risk associated with radiation, chemotherapy, craniotomy, or ventriculoperitoneal shunt in the donor (<1% increase in transmission risk according to national guidelines [1]). We estimated the weighted average transmission risk among all newly accepted donors under each intervention.

We assumed that patients with a donor-transmitted cancer would experience the same rates of transplant failure and mortality as those who develop *de-novo* cancer. Evidence surrounding transplant recipient outcomes after donor brain cancer transmission is scarce, largely based on reviews of limited case reports [15,16]. A US registry-based study included 14 transplant recipients with confirmed transmission from a donor with a malignant central nervous system (CNS) tumor [17]. Of these, 11 (79%) died within 26 months follow-up, however this was only reported in aggregate across all transplanted organs. Published

reviews[15,16] identified nine unique case reports of transmissions from five donors with glioblastoma multiforme [8-10,15,18,19], one with malignant meningioma [7], one with malignant glioma [20], one with CNS non-Hodgkin's lymphoma[12] (which would be contraindicated in current national guidelines [1]), and one with medulloblastoma [11]. They donated organs to 23 recipients (14 kidney, four liver, three heart, one lung, and one kidney-pancreas), with 15 transmissions (eight kidney, four liver, one heart, one lung, and one kidney-pancreas). The lung recipient[15] and three liver recipients[18-20] died within 10 months post-transplant, while the fourth liver recipient's outcome was not reported[15]. Outcomes for kidney recipients were more favorable; six had their transplanted kidney removed and were still alive on dialysis after follow-up[7-11], one had their transplanted kidney removed and after 10 months in remission was retransplanted with no evidence of recurrence[12], one had their transplanted kidney removed and underwent chemotherapy but died eight weeks later due to cytomegalovirus pneumonia and pericarditis with autopsy showing no signs of tumor recurrence[12], and one kidney-pancreas recipient had their transplanted pancreas removed after three days due to arterial thrombosis, and their transplanted kidney removed after four months but died one month later [11]. Transmission was identified on average nine months after transplant (range 4 – 18 months).

We assumed that all patients with a transmitted cancer would have their transplanted kidney removed (i.e., nephrectomy) after nine months. Although it may be possible to treat a transmitted cancer without removing the transplanted kidney, our assumption that all patients would undergo nephrectomy was conservative (i.e., favored current practice), and was consistent with available case-reports.

A case-control study of 12,805 kidney recipients in the Netherlands reported median survival after *de-novo* cancer diagnosis of 2.1 years [21]. Considering that only two of nine (22%) transmissions from case reports of kidney recipients resulted in death during follow-up, our assumption that outcomes for patients with a donor-transmitted cancer would be similar to those with *de-novo* cancer seems appropriate.

Appendix 2 – Model inputs

A2.1 Transition probabilities

A2.1.1 Mortality

Mortality was based on Australian life tables for 2017-2019, stratified by age and sex [4]. We adjusted mortality by 10-year age group and sex specific standardized mortality ratios (SMRs) for dialysis and transplant derived from figures published in the ANZDATA annual report [22,23] (Table S4). For patients with cancer, we further adjusted mortality (multiplicatively) based on relative survival reported by the Australian Institute for Health and Welfare (AIHW) for 2013-2017, stratified by 5-year age group, sex, and years since diagnosis [3] (Table S5). Average relative survival across all cancer sites was weighted by annual incidence of each cancer. We applied SMRs for the nearest age-group to each simulated patient. Mortality rates applied to all simulated patients by age, sex, treatment, and years since cancer diagnosis are summarized in Table S6.

A2.1.2 Cancer

The probability of developing any cancer whilst on dialysis (i.e., on the waiting list or after transplant failure) was based on cancer incidence reported by AIHW, stratified by 5-year age group and sex, and summed over all cancer sites [3]. We multiplied this by an estimated incidence rate ratio (IRR) of 1.60, based on the overall incidence of cancer among dialysis patients (22.2/1,000) [5] divided by the overall incidence of cancer in the Australian population (1390.4/100,000) [3]. Annual incidence rates of cancer among dialysis patients by 5-year age group and sex are presented in Table S7.

For patients with a deceased donor kidney transplant, we determined the probability of developing *de-novo* cancer using data provided by ANZDATA. We compared all 11 default time-to-event models as well as a spline model from the flexsurv R package [24] to estimate the time to cancer after transplantation, adjusted for patient and donor characteristics. We selected the most appropriate model based on the Akaike Information Criterion (AIC) as well as by assessing visual fit. In the economic model, the probability of developing cancer was dependent on individuals' patient and donor characteristics. We used the modelled distribution of time to cancer to determine the probability of developing cancer during each 3-month cycle.

If a deceased donor had brain cancer, there was a risk of cancer transmission in addition to the underlying risk of the recipient developing *de-novo* cancer. We assumed that under current practice, donors with brain cancer would only be accepted for transplantation if they were considered minimal or low risk according to national donation guidelines [1]. We therefore applied the upper-limit estimate for transmission risk from low-risk brain cancers of 2% to all transplants regardless of patient or donor characteristics.

A2.1.3 Transplant and transplant failure

We created separate time-to-event models to estimate time to living donor transplant and time to deceased donor transplant, adjusted for patient characteristics. The most appropriate model was selected based on AIC and visual fit, and the modelled distribution determined the probability of transplant during each cycle. For simplicity, we assumed that being removed from the waiting list due to cancer, death on the waiting list, living donor transplant, and deceased donor transplant were independent and mutually exclusive events.

Time-to-event models for time to transplant failure from transplantation and from cancer diagnosis were adjusted for patient and donor characteristics, and we selected the most appropriate model based on AIC and visual fit. We assumed that death, cancer diagnosis, and transplant failure were independent and mutually exclusive events.

The distributions and parameters for models for the probabilities of transplant, cancer, and transplant failure are presented in Table S8 and Table S9.

A2.2 Comparators

Reasons for underutilization of kidneys from deceased donors with PBM include inaccurate perception of PBM risk in potential donors with insufficient medical history available at the time of donation decisions, inconsistent decisions among different clinicians with tendencies to focus on increased relative risk rather than absolute risk, and reluctance to accept potential donors labeled as intermediate risk (6.4% transmission risk) according to donation guidelines.

We therefore considered three interventions that have previously been proposed to address these issues [25], and compared them with current practice (i.e., individual clinicians deciding which potential donors with PBM to accept or decline). Exactly how these interventions might be implemented is beyond the scope of this study, but briefly they were: 1) decision support for clinicians in accurately estimating absolute donor risk for cancer transmission; 2) improved data accuracy with real-time data-linkage to hospital records and cancer registries to improve classification of potential donor cancer type and

hence transmission risk; and 3) increased risk-tolerance to allow use of donors with intermediate-risk PBM (estimated transmission risk 6.4%) [1,25].

Both real-time data-linkage and increase risk tolerance were assumed to be in combination with decision support to ensure that donation decisions would adhere to guidelines [1]. In our previous study we did not identify any potential donors who would have been accepted if all three interventions (decision support, real-time data linkage, and increased risk tolerance) had been applied together. Nor did we identify any actual donors who would have been declined under all three interventions in combination with each other. In the absence of any evidence that combining these interventions would impact the number of donors with PBM or their average transmission risk [25], we therefore did not consider the combined effect of these three interventions.

Compared with current practice, each intervention would alter the model in two ways: 1) increasing the probability of receiving a deceased donor transplant (by increasing the number of deceased donor kidneys available), and 2) changing the cancer transmission risk associated with deceased donor transplant (e.g., by introducing more donors with PBM). We estimated potential impacts using data from a published study of 472 potential donors from NSW 2010-2013, of whom 340 (72%) became actual donors (including 8 with PBM), and 172 (28%) were declined due to cancer [25]. We assumed two kidneys were available for transplant from all 340 donors, which is consistent with national average of 1.91 (888 kidneys from 463 donors) in 2020 [26]. We also assumed two kidneys per donor would be available from any additional donors with PBM, hence the proportional increase in donation would be the same regardless of whether it was expressed in terms of donors or kidneys.

A2.3 Utility values

For patients on dialysis or with a transplant, we calculated the simple average of utilities reported in two studies on quality of life in chronic kidney disease (CKD): an Australian meta-analysis [27] and a multi-national cohort study [28]. The utility values for patients on dialysis from these quality-of-life studies were 0.70 and 0.76, hence the average utility applied to the model was 0.73. For patients with a kidney transplant, the utility values were 0.82 and 0.84, hence the average 0.83 was used.

For patients with cancer, we used utility values for the five most common cancer sites (breast, colorectal, lung, melanoma, and prostate) from a recent systematic review [6]. We calculated an average utility for each cancer stage (I, II, III, and IV) as well as overall, weighted by annual incidence by site and stage in Australia in 2011 reported by the AIHW [3]. We applied the average utility across all cancer stages (0.71) to patients with *de-novo* cancer. When a transmission occurs, the cancer in the recipient is likely to be a more advanced stage compared with a *de-novo* cancer since it has necessarily already metastasized in the donor. Therefore, we applied the weighted average utility for stage IV cancers (0.62) to patients with a donor-transmitted cancer. The utility values by cancer site and stage are summarized in Table S10.

We assumed that the decrement in quality of life associated with kidney failure was independent of the decrement associated with cancer. Therefore, for patients with both kidney failure and cancer we multiplied the utility values for kidney failure and cancer together. For patients on dialysis with cancer, their utility value was 0.52 (0.73 x 0.71) for *de-novo* cancer and 0.45 (0.73 x 0.62) if the cancer was transmitted. For those with a kidney

transplant and cancer, their utility value was 0.59 (0.83 x 0.71) for *de-novo* cancer and 0.51 (0.83 x 0.62) if the cancer was transmitted.

We did not account for a potential quality of life decrement for recipients of a kidney from a donor with PBM, associated with fear of transmission occurring. Such a decrement would likely be small in comparison to the improvement in quality of life after receiving a kidney transplant, and for patients who agree to accept a kidney with a risk of cancer transmission, this fear may be less likely to influence their quality of life.

A2.4 Costs

All costs were converted to 2021 Australian dollars (AUD) using the consumer price index (CPI) for health, averaged across each calendar year [29]. We included costs associated with dialysis, kidney transplantation, and cancer treatment. All costs were separated into the first 3 months, months 4 to 12, year 2, year 3, year 4, and all subsequent years. Calculations of all costs are available here: https://github.com/james-hedley/PBM_economic_evaluation.

A2.4.1 Dialysis

The cost of dialysis treatment was calculated as an average across home hemodialysis, hospital hemodialysis, and home peritoneal dialysis, weighted by the proportion of patients using each modality reported in the ANZDATA annual report 2020 [2]. The annual cost of home hemodialysis and home peritoneal dialysis were derived from an Independent Hospital Pricing Authority (IHPA) costing study of home delivered dialysis [30], while the cost of hospital hemodialysis was based on Australian-refined Diagnosis Related Group (AR-DRG) L61Z (Hemodialysis) from the National Hospital Cost Data Collection (NHCDC) 2018-2019 [31].

A2.4.2 Transplant

The costs associated with transplant that we included in our model were: organ retrieval, transplant procedure, drug utilization, and nephrologist consultations. These were based on the costs used in the Kidney Health Australia report of the economic impact of end-stage kidney disease in Australia: projections to 2020 [32].

The cost of retrieving a living donor kidney was based on the average of AR-DRGs for Kidney, Ureter and Major Bladder Interventions for Non-Neoplasm with major, intermediate, and minor complications (L04A, L04B, and L04C), weighted by the number of separations from the NHCDC 2018-2019 [31]. For deceased donors, the cost of kidney retrieval was based on an estimate from the Kidney Health Australia report [32].

The cost of transplanting a kidney into a recipient (from a living or deceased donor) was based on the average of AR-DRGs L10A (Kidney Transplant, Age <=16 Years or Major Complexity) and L10B (Kidney Transplant, Age >=17 Years and Minor Complexity), weighted by the number of separations from the NHCDC 2018-2019 [31].

We included costs for the most commonly prescribed induction, immunosuppression, and prophylaxis drugs for transplant recipients based on the ANZDATA annual report 2020 [2]. Induction drugs were basiliximab and thymoglobulin, immunosuppression drugs were tacrolimus, mycophenolate, and prednisolone, and prophylaxis drugs were valganciclovir, trimethoprim + sulfamethoxazole, and nystatin. The proportion of patients prescribed each drug was based on the ANZDATA annual report 2020 [2], while dosages were based on product information available from the Therapeutic Goods Administration (TGA) [33]. Where information was unavailable, we relied on expert opinion from two specialist nephrologist

co-authors (MW and AW). The total costs for induction drugs were derived from a review of the Australian organ donation, retrieval, and transplantation system, while unit costs for immunosuppression and prophylaxis drugs were extracted from the Pharmaceutical Benefits Scheme Schedule [34].

We did not include additional costs for cancer screening or monitoring in recipients of a kidney from a donor with known PBM. It is unpredictable where the transmitted cancer might first appear in the recipient, and in the absence of a global test for cancer we assumed that monitoring would be included in routine post-transplant follow-up.

A2.4.3 Nephrologist visits

The frequency of nephrologist consultations for patients on dialysis or with a kidney transplant was based on national guidelines [35] and the expert opinion of two specialist nephrologist co-authors (MW and AW). The cost associated with each nephrologist visit was based on Medicare Benefits Schedule items 104 (initial visit) and 116 (subsequent visit) [36].

A2.4.4 Cancer

The costs associated with cancer diagnosis and treatment were based on a longitudinal study of health care in 266,000 people from NSW aged 45 and over, and included costs associated with hospital admissions, emergency department presentations, government subsidized prescription medications (PBS), and government subsidized medical services (MBS) [37]. Costs were provided for each of the first 5 years after diagnosis, and we assumed that all subsequent years would incur the same cost as year 5. For *de-novo* cancers we used the overall cost across all cancers. There were no costs reported specifically for brain cancer. We assumed that transmitted cancers would incur a higher cost due to their advanced stage

at diagnosis, hence for transmitted cancers we used the cost associated with kidney cancer because this was higher than the average across all cancers and because transmitted cancers were likely to be diagnosed in the transplanted kidney.

A2.4.5 Nephrectomy

Patients with a donor-transmitted cancer have their transplanted kidney removed after at most nine months. The cost of kidney removal is based on the average of AR-DRGs for Kidney, Ureter and Major Bladder Interventions for Non-Neoplasm with major, intermediate, and minor complications (L04A, L04B, and L04C), weighted by the number of separations from the NHCDC 2018-2019 [31].

A2.5 Uncertainty analyses

For the probabilistic sensitivity analysis, we assumed a uniform distribution for discount rates (0-10%) and the increase in donation and average transmission risk (0-200% of base-case value). Statistical model parameters followed normal distributions based on means and standard errors (SE). Utilities followed beta distributions based on mean (base-case) and reported SE [27] (for cancer utilities we assumed minimum and maximum reported utilities corresponded to the 0.05^{th} and 99.95^{th} percentiles [6]). We considered two alternative methods for combining simultaneous utilities: the minimum (upper estimate), and the sum minus one (lower estimate) [38]. Costs followed uniform distributions (±15%) [39].

We assessed which model inputs had the most influence on results by determining the marginal impact of a percentage change in each input, using linear regression of costs and QALYs adjusted for the randomly selected values of all inputs across 10,000 probabilistic sensitivity analysis simulations. We also performed an extreme worst-case scenario analysis

where cancer transmission would result in immediate death for the recipient, as well as threshold analysis where the average transmission risk of new donors under decision support with increased risk tolerance was varied in increments of 5% from 10% to 50%, to determine how high the transmission risk would need to be before the intervention would no longer be cost-effective.

A2.6 Willingness-to-pay threshold

Our willingness-to-pay (WTP) threshold was $28,000 per QALY as this was used in a recent Australian economic evaluation of kidney donation policy [39] and has been demonstrated to be appropriate in an Australian setting [40]. This is lower than the commonly used $50,000 threshold [41], hence the probability of interventions being cost-effective may be conservative.

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