Supplemental Table 1: Excluded studies identified by systematic search

Excluded studies	Reason excluded
Khan[43]	HR for OS and/or PFS not available
Galli[39]	HR for OS and/or PFS not available
Agarwal[44]	Possible error in available HR for OS, and PFS not available
Megtes[45]	HR for OS and/or PFS not available
Spackowicz[46]	HR for OS and/or PFS not available
Wang[47]	HR for OS and/or PFS not available
Kapoor[48]	HR for OS and/or PFS not available
Kaderbhai[9]	These patients are included in Routy et al
Weinstock[11]	Re-analysis of RCT data (not an observational study)
Chalabi[12]	Re-analysis of RCT data (not an observational study)
Derosa 2017 #1 [49]	Conference abstract, data included in Derosa et al[7]
Derosa 2018[50]	Conference abstract, data included in Derosa et al[7]
Derosa 2017 #2[51]	Conference abstract, data included in Derosa et al[7]
Zhao[52]	Conference abstract, data included in Zhao et al[23]
Huemer 2018[14]	Duplicate data from Huemer et al 2019[5]

RCT = Randomised controlled trial

Supplemental Table 2: Results of multivariate analysis by cohort

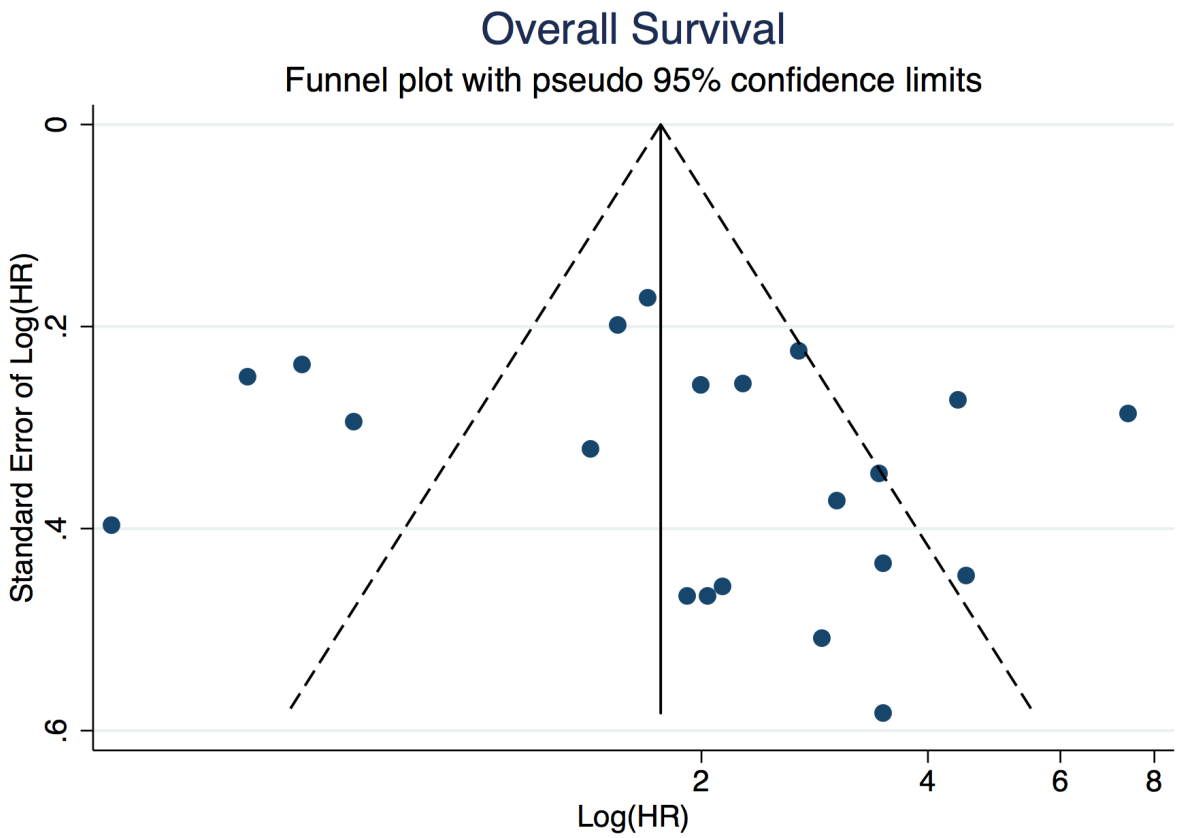
Cohort	Multivariate analysis performed	Adjusted HR for PFS and/or OS where available	Other variables included in adjusted multivariate model
Group 1 Cohorts			
Derosa-RCC[7]	Yes OS not significant PFS remained significant	HR OS 2.1 (0.9 – 5.0, p=0.11) HR PFS 2.2 (1.3-3.3, p<0.01)	IMDC risk group, tumor burden Tumor burden
Derosa-NSCLC[7]	Yes OS remained significant PFS not significant	HR OS 2.5 (1.6-3.7, p<0.01) HR PFS 1.3 (0.0-1.8, p=0.17)	Number of prior regimens, ECOG, clinical trial Smoking status, number of prior regimens, ECOG, clinical trial
Elkrief[8]	Yes OS not significant PFS remained significant	HR OS 2 (0.83 – 4.8, p=0.13) HR PFS 3.1 (1.2 – 7.7, p=0.02)	Age, ECOG, sex, LDH, BRAF status, treatment line, type of ICB
Pinato[16]	Yes OS remained significant PFS not given	HR OS 3.4 (1.9-6.1, p<0.001)	Not specified
Sen[19]	No		
Thompson[22]	Yes OS remained significant PFS remained significant	HR OS 3.5 (95% CI not given, p = 0.004) HR PFS 2.5 (95% CI not given, p=0.02)	Age, sex, race, tobacco history, tumour histology, presence of brain metastases, prior radiotherapy
Zhao[23]	Yes OS remained significant PFS remained significant	HR OS 2.8 (1.3 – 6.2, p=0.009) HR PFS 3.4 (1.8 – 6.7, p=0.003)	Smoking (PFS only), ECOG, histology, treatment line, clinical trial
Group 2 Cohorts			
Ahmed[6]	Yes OS remained significant PFS not given	HR OS not given, p=0.038	age
Hakozaki[41]	Yes OS not significant PFS not given	HR OS 2.02 (0.7 – 5.83, p=0.19)	ECOG, driver mutations, use of proton-pump inhibitors/ histamine blockers
Huemer[14]	Yes OS remained significant PFS remained significant	HR OS 14.81 (95% CI not given, p=0.026) HR PFS 5.4 (95% CI not given, p=0.028)	Age, sex, type of ICB, EGFR mutation, ALK mutation, number of prior lines of therapy, PD-L1 status, immune related adverse events
Huemer - Salzburg[5]	No		
Huemer -Linz [5]	No		
Lalani[26, 42]	Yes OS not significant PFS remained significant	HR OS 1.44 (0.755 – 2.77, p=0.27) HR PFS 1.96 (1.2 – 3.2, p=0.007)	Adjusted for prognostic factors including risk groups, no further details given
Mielgo-Rubio[20]	No		
Routy-NSCLC[13]	Yes OS remained significant PFS not given	HR OS 2.21 (1.3-3.7, p=0.004)	Age, sex, histology, smoking status, number of prior lines of systemic therapy, number of metastatic sites, ECOG

Routy-Urothelial[13]	Yes OS not given PFS not significant	HR PFS 1.96 (0.91 0 4.23, p=0.09)	Haemoglobin, performance status, liver metastases
Schett[24]	Yes OS remained significant PFS not given	HR OS 2.8 (1.7 – 4.5, p<0.001)	ECOG, prior radiotherapy, histology
Tinsley[25]	Yes OS remained significant PFS remained significant	HR OS 1.47 (1.038 – 2.107, p=0.033) HR PFS 1.4 (1.028 – 1.92, p=0.033)	Comorbidities, on clinical trial, number of metastatic sites, ECOG Comorbidities, ECOG
Group 3 Cohorts			
Do[17]	No		
Hemadri[21]	No		
Kulkarni-NSCLC[15]	Yes OS not given PFS remained significant	HR PFS remained significant after adjustment, values not given	Not given
Kulkarni-RCC[15]	Yes OS not given PFS remained significant	HR PFS remained significant after adjustment, values not given	Not given
Masini[18]	No		

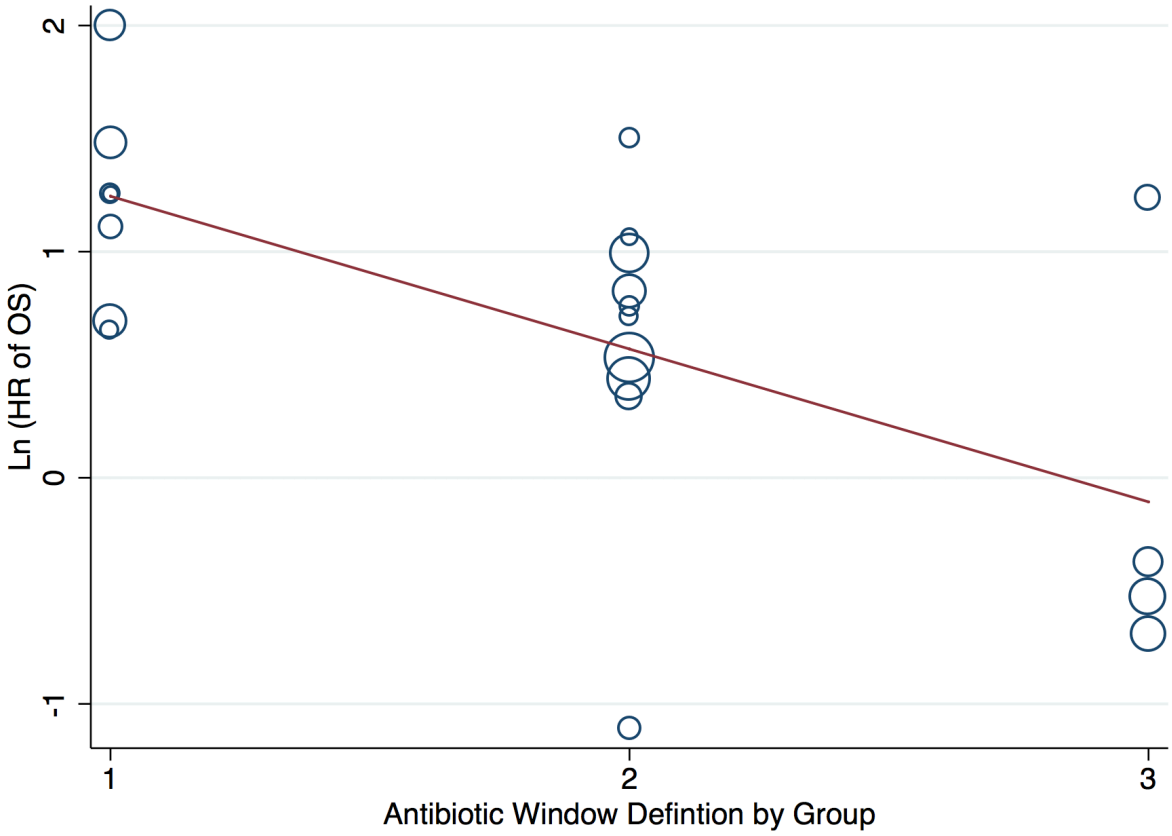
IMDC = International Metastatic RCC Database Consortium
EGFR = Epidermal Growth Factor Receptor
ALK = anaplastic lymphoma kinase
LDH = Lactate Dehydrogenase

Supplemental Figure 1: Search Strategy

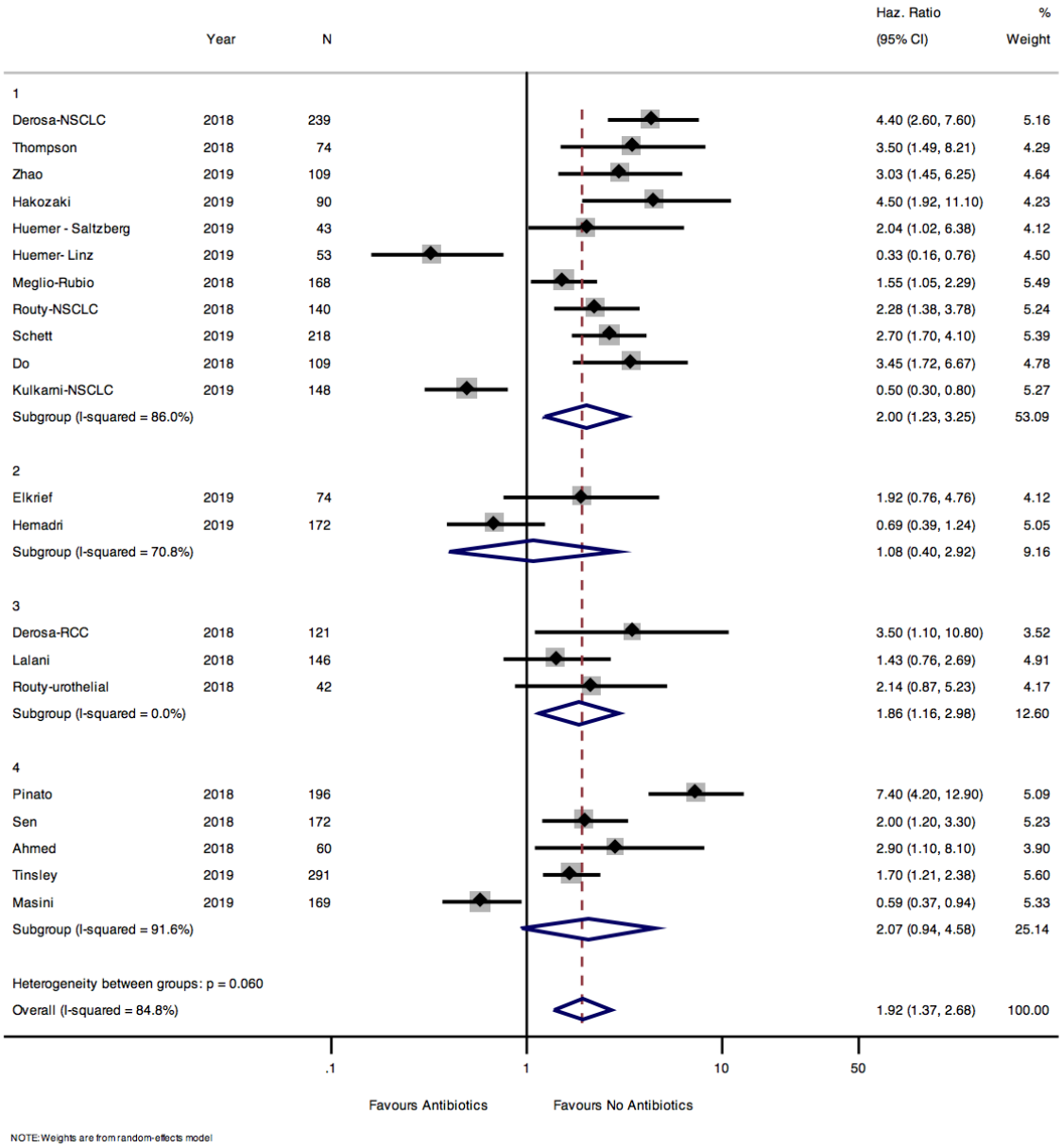
1. exp malignant neoplasm/ or exp neoplasm/
2. cancer.mp
3. 1 or 2
4. Immunotherapy/ or active immunotherapy/ or adaptive immunotherapy/ or cancer immunotherapy/
5. programmed death 1 ligand 1/
6. programmed death 1 receptor/
7. cytotoxic T lymphocyte antigen 4/
8. immune checkpoint blocking agent.mp
9. pembrolizumab/
10. ipilimumab/
11. atezolizumab/
12. durvalumab/
13. nivolumab/
14. avelumab/
15. 4 or 5 or 6 or 7 or 8 or 9 or 10 or 11 or 12 or 13 or 14
16. exp antibiotic agent
17. cohort analysis/
18. observational study/
19. retrospective study/
20. 17 or 18 or 19
21. 3 and 15 and 16 and 17
22. Limit 21 to human



Supplemental Figure 2: Funnel plot for overall survival



Supplemental Figure 3: Meta-regression of overall survival and antibiotic window by cohort



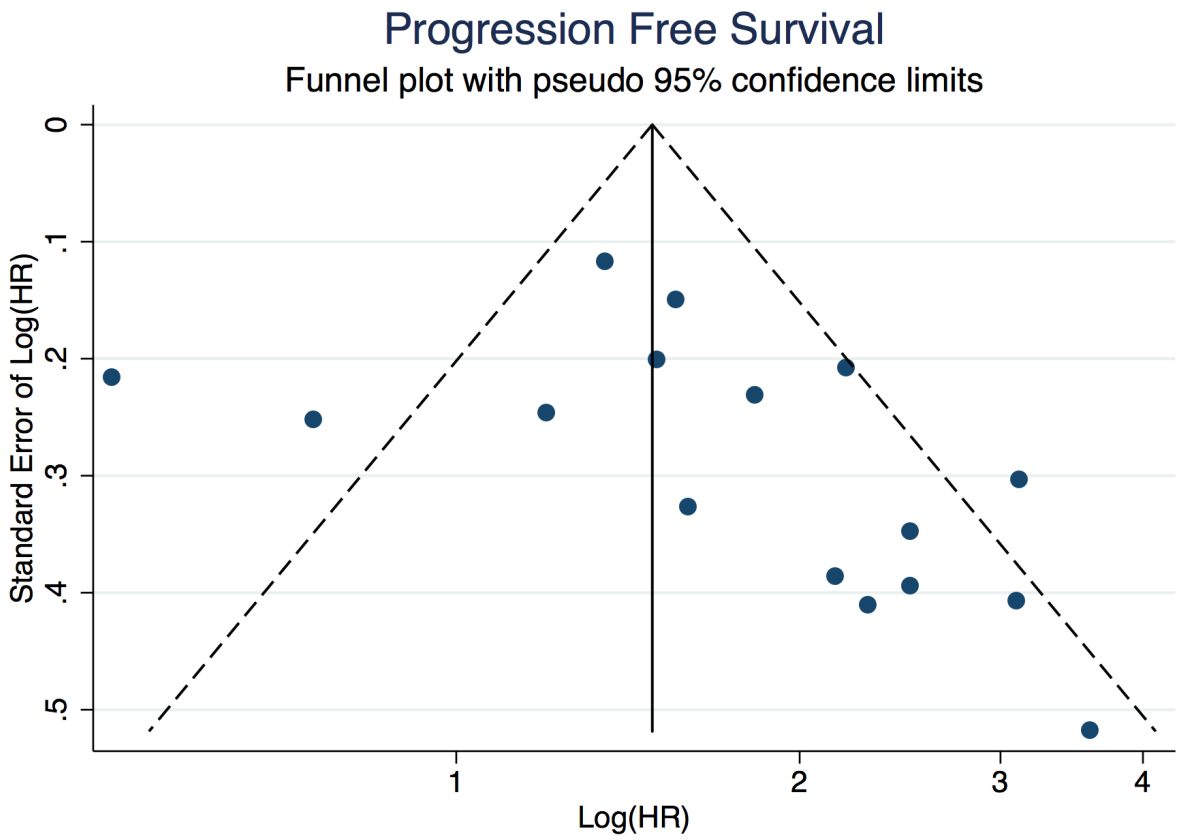
Supplemental Figure 4: Pooled hazards ratio for overall survival among those exposed and unexposed to antibiotics stratified by type of malignancy

Group 1: NSCLC

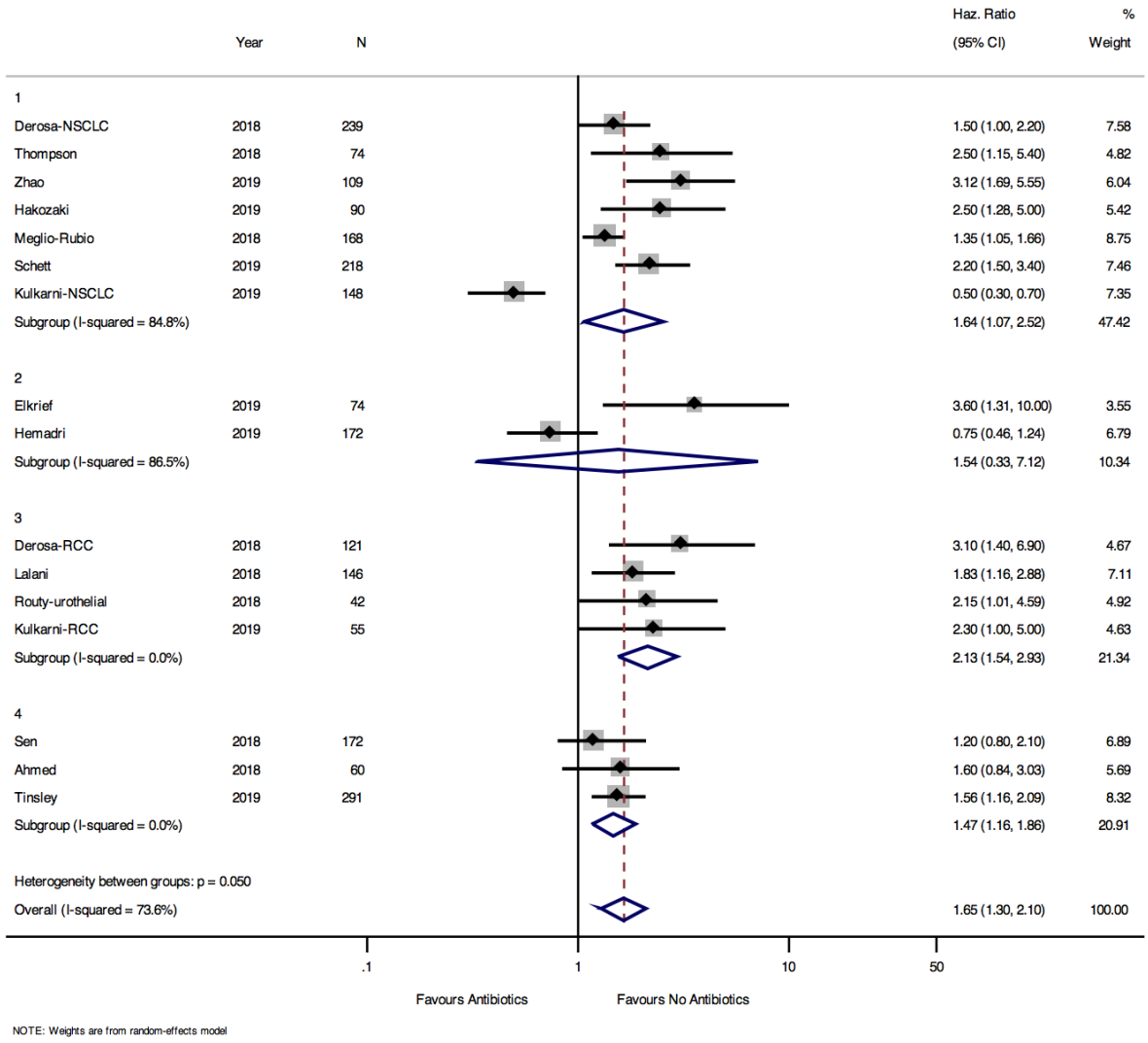
Group 2: Melanoma

Group 3: RCC/Urothelial cancer

Group 4: Studies with mixed tumour types



Supplemental Figure 5: Funnel plot for progression free survival



Supplemental Figure 6: Pooled hazards ratio for progression free survival among those exposed and unexposed to antibiotics stratified by type of malignancy

Group 1: NSCLC

Group 2: Melanoma

Group 3: RCC/Urothelial cancer

Group 4: Studies with mixed tumour types