

Precision medicine estimates

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Notes

1. In Tables 1-4, the models estimated in columns 4 and 8 are the same as those estimated in 3 and 7, respectively, the key difference being (4) and (8) are estimated with standard errors clustered at the level of most common ICD-9 chapter.
2. Columns listed as *All* include all Phase I-III trials since 1995 while *Recent* include only trials since 2005.
3. Marginal effects cannot be reported for interaction terms but are reported for models including interactions.
4. Start year fixed effects are estimated in Table 5-6 Columns 1-3, but are not reported because of mechanical relationship with the outcome variable (trial duration). Column 4 reports the linear trend in duration by trial start year, but this is also mechanically linked to duration in that all observed trials have an upper bound on their observed actual end date (the date data was collected). Therefore recent trials with observed durations will be shorter on average than trials that began earlier.

Some trials have estimated dates after the date of data collection, but the meaning of these dates is somewhat unclear. Table 5 includes trials with actual or estimated end dates while Table 6 subsets to only actual end dates.

Removing estimated-date trials does not seem to radically change the pattern of results, but R-squared does increase substantially indicating much of the unexplained variation in duration may be due to measurement error.

Table 1: Logit Coefficients
Dependent variable: Generous PPM

	(1) All b/se	(2) All b/se	(3) All b/se	(4) All (clustered SE) b/se	(5) Recent b/se	(6) Recent b/se	(7) Recent b/se	(8) Recent (clustered SE) b/se
Trial start year	0.068*** (0.003)	0.068*** (0.003)	0.067*** (0.003)	0.069*** (0.004)	0.102*** (0.005)	0.102*** (0.005)	0.102*** (0.005)	0.104*** (0.006)
Phase 2 Clinical (includes Phase 2/Phase 3 trials)	0.279*** (0.033)		0.268*** (0.033)	0.275** (0.089)	0.328*** (0.036)		0.314*** (0.036)	0.322*** (0.090)
Phase 3 Clinical	0.405*** (0.047)	0.403*** (0.047)	0.383*** (0.047)	0.397* (0.182)	0.440*** (0.051)	0.437*** (0.051)	0.417*** (0.051)	0.430* (0.182)
Trial site in US=1	0.139*** (0.031)	0.136*** (0.032)	0.711*** (0.066)	0.727*** (0.114)	0.149*** (0.033)	0.147*** (0.033)	0.761*** (0.069)	0.776*** (0.127)
Drug indication for neoplasm	2.745*** (0.038)	2.739*** (0.039)	3.101*** (0.055)	3.120*** (0.119)	2.794*** (0.040)	2.787*** (0.041)	3.170*** (0.058)	3.188*** (0.124)
Received NIH funding	-0.151* (0.063)	-0.151* (0.063)	-0.104 (0.063)	-0.104*** (0.015)	-0.192** (0.070)	-0.193** (0.070)	-0.136* (0.069)	-0.134*** (0.019)
Biomarker type: genomic	4.713*** (0.068)	4.713*** (0.068)	4.728*** (0.068)	4.727*** (0.279)	4.735*** (0.075)	4.734*** (0.075)	4.754*** (0.075)	4.757*** (0.317)
Phase 2 only		0.285*** (0.034)				0.335*** (0.036)		
Phase 2/3 Clinical		0.143 (0.105)				0.162 (0.111)		
Trial site in US=1 × Drug indication for neoplasm=1			-0.732*** (0.074)	-0.745*** (0.113)			-0.789*** (0.078)	-0.801*** (0.129)
Constant	-143.869*** (7.030)	-143.910*** (7.030)	-143.462*** (7.021)	-145.976*** (7.894)	-212.276*** (10.107)	-212.390*** (10.108)	-213.810*** (10.104)	-217.810*** (12.564)
N	113410	113410	113410	106626	96254	96254	96254	90650
p<0.05, ** p<0.01, *** p<0.001								

Table 2: Logit Marginal Effects
Dependent variable: Generous PPM

	(1) All b/se	(2) All b/se	(3) All b/se	(4) All (clustered SE) b/se	(5) Recent b/se	(6) Recent b/se	(7) Recent b/se	(8) Recent (clustered SE) b/se
Trial start year	0.0027*** (0.0001)	0.0027*** (0.0001)	0.0027*** (0.0001)	0.0029*** (0.0002)	0.0042*** (0.0002)	0.0042*** (0.0002)	0.0042*** (0.0002)	0.0045*** (0.0003)
Phase 2 Clinical (includes Phase 2/Phase 3 trials)	0.0111*** (0.0013)		0.0107*** (0.0013)	0.0115** (0.0035)	0.0135*** (0.0015)		0.0129*** (0.0015)	0.0138*** (0.0036)
Phase 3 Clinical	0.0162*** (0.0019)	0.0161*** (0.0019)	0.0153*** (0.0019)	0.0166* (0.0073)	0.0181*** (0.0021)	0.0180*** (0.0021)	0.0171*** (0.0021)	0.0185* (0.0074)
Trial site in US=1	0.0056*** (0.0013)	0.0055*** (0.0013)	0.0054*** (0.0013)	0.0056*** (0.0016)	0.0062*** (0.0014)	0.0060*** (0.0014)	0.0061*** (0.0014)	0.0062*** (0.0018)
Drug indication for neoplasm	0.1096*** (0.0011)	0.1093*** (0.0011)	0.1173*** (0.0013)	0.1207*** (0.0030)	0.1149*** (0.0012)	0.1146*** (0.0012)	0.1259*** 0.1259***	0.1294*** 0.1294***
Received NIH funding	-0.0060* (0.0025)	-0.0060* (0.0025)	-0.0042 (0.0025)	-0.0043*** (0.0006)	-0.0079** (0.0029)	-0.0079** (0.0029)	-0.0056* (0.0028)	-0.0058*** (0.0008)
Biomarker type: genomic	0.1881*** (0.0025)	0.1881*** (0.0025)	0.1884*** (0.0025)	0.1976*** (0.0102)	0.1947*** (0.0028)	0.1946*** (0.0028)	0.1951*** (0.0028)	0.2043*** (0.0117)
Phase 2 only		0.0114*** (0.0013)				0.0138*** (0.0015)		
Phase 2/3 Clinical		0.0057 (0.0042)				0.0067 (0.0046)		
N	113410	113410	113410	106626	96254	96254	96254	90650

p<0.05, ** p<0.01, *** p<0.001

Table 3: Logit Coefficients
Dependent variable: Restrictive PPM

	(1) All b/se	(2) All b/se	(3) All b/se	(4) All (clustered SE) b/se	(5) Recent b/se	(6) Recent b/se	(7) Recent b/se	(8) Recent (clustered SE) b/se
Trial start year	0.062*** (0.004)	0.062*** (0.004)	0.062*** (0.004)	0.064*** (0.004)	0.093*** (0.005)	0.093*** (0.005)	0.093*** (0.005)	0.095*** (0.005)
Phase 2 Clinical (includes Phase 2/Phase 3 trials)	0.351*** (0.035)		0.343*** (0.035)	0.355*** (0.058)	0.397*** (0.037)		0.387*** (0.037)	0.401*** (0.058)
Phase 3 Clinical	0.589*** (0.050)	0.586*** (0.050)	0.573*** (0.050)	0.595*** (0.110)	0.621*** (0.054)	0.617*** (0.054)	0.605*** (0.054)	0.626*** (0.114)
Trial site in US=1	0.076* (0.033)	0.073* (0.033)	0.600*** (0.081)	0.610*** (0.114)	0.073* (0.035)	0.070* (0.035)	0.638*** (0.086)	0.642*** (0.130)
Drug indication for neoplasm	3.137*** (0.045)	3.129*** (0.046)	3.429*** (0.064)	3.453*** (0.096)	3.195*** (0.048)	3.185*** (0.048)	3.502*** (0.068)	3.521*** (0.099)
Received NIH funding	-0.168** (0.065)	-0.169** (0.065)	-0.138* (0.065)	-0.132*** (0.018)	-0.181* (0.071)	-0.182* (0.071)	-0.145* (0.071)	-0.141*** (0.017)
Biomarker type: genomic	4.716*** (0.073)	4.715*** (0.073)	4.725*** (0.073)	4.725*** (0.247)	4.750*** (0.081)	4.749*** (0.081)	4.762*** (0.081)	4.766*** (0.271)
Phase 2 only		0.358*** (0.035)				0.405*** (0.037)		
Phase 2/3 Clinical		0.151 (0.117)				0.163 (0.124)		
Trial site in US=1 ×Drug indication for neoplasm=1			-0.621*** (0.088)	-0.628*** (0.111)			-0.672*** (0.093)	-0.673*** (0.130)
Constant	-133.586*** (7.274)	-133.665*** (7.275)	-133.397*** (7.268)	-136.362*** (8.352)	-195.002*** (10.493)	-195.187*** (10.495)	-196.035*** (10.491)	-199.952*** (11.274)
N	113410	113410	113410	106626	96254	96254	96254	90650

p<0.05, ** p<0.01, *** p<0.001

Table 4: Logit Marginal Effects
Dependent variable: Generous PPM

	(1) All b/se	(2) All b/se	(3) All b/se	(4) All (clustered SE) b/se	(5) Recent b/se	(6) Recent b/se	(7) Recent b/se	(8) Recent (clustered SE) b/se
Trial start year	0.0023*** (0.0001)	0.0023*** (0.0001)	0.0023*** (0.0001)	0.0025*** (0.0002)	0.0035*** (0.0002)	0.0035*** (0.0002)	0.0035*** (0.0002)	0.0038*** (0.0002)
Phase 2 Clinical (includes Phase 2/Phase 3 trials)	0.0129*** (0.0013)		0.0126*** (0.0013)	0.0137*** (0.0021)	0.0150*** (0.0014)		0.0146*** (0.0014)	0.0159*** (0.0021)
Phase 3 Clinical	0.0216*** (0.0018)	0.0215*** (0.0018)	0.0211*** (0.0018)	0.0230*** (0.0040)	0.0234*** (0.0020)	0.0233*** (0.0020)	0.0228*** (0.0020)	0.0248*** (0.0042)
Trial site in US=1	0.0028* (0.0012)	0.0027* (0.0012)	0.0027* (0.0012)	0.0028** (0.0009)	0.0028* (0.0013)	0.0026* (0.0013)	0.0028* (0.0013)	0.0028* (0.0011)
Drug indication for neoplasm	0.1153*** (0.0013)	0.1150*** (0.0013)	0.1167*** (0.0013)	0.1202*** (0.0016)	0.1207*** (0.0013)	0.1203*** (0.0013)	0.1252*** (0.0014)	0.1288*** (0.0018)
Received NIH funding	-0.0062** (0.0024)	-0.0062** (0.0024)	-0.0051* (0.0024)	-0.0051*** (0.0007)	-0.0068* (0.0027)	-0.0069* (0.0027)	-0.0055* (0.0027)	-0.0056*** (0.0007)
Biomarker type: genomic	0.1734*** (0.0025)	0.1733*** (0.0025)	0.1736*** (0.0025)	0.1825*** (0.0076)	0.1794*** (0.0028)	0.1794*** (0.0028)	0.1797*** (0.0028)	0.1889*** (0.0086)
Phase 2 only		0.0132*** (0.0013)				0.0153*** (0.0014)		
Phase 2/3 Clinical		0.0055 (0.0043)				0.0062 (0.0047)		
N	113410	113410	113410	106626	96254	96254	96254	90650

p<0.05, ** p<0.01, *** p<0.001

Table 5: OLS regression

Dependent variable: Duration in months (winsorized to remove extreme outliers)

Trials ending after 2005 with actual or estimated end dates

	(1) All trials b/se	(2) US trials b/se	(3) US cancer trials b/se	(4) Linear b/se
Start year control	Fixed Effects	Fixed Effects	Fixed Effects	Linear
Phase 2 Clinical (includes Phase 2/Phase 3 trials)	7.473*** (0.208)	6.195*** (0.322)	4.870*** (0.533)	4.225*** (0.582)
Phase 3 Clinical	11.283*** (0.245)	7.989*** (0.404)	14.850*** (0.947)	16.634*** (1.025)
Trial site in US	5.398*** (0.184)			
Drug indication for neoplasm	22.541*** (0.209)	20.567*** (0.326)		
Received NIH funding	12.733*** (0.529)	12.745*** (0.595)	8.527*** (0.882)	7.352*** (0.959)
Generous PPM	8.751*** (0.357)	9.805*** (0.516)	9.203*** (0.626)	7.804*** (0.938)
Biomarker role (detailed): diagnosis				2.035 (1.320)
Biomarker role (detailed): differential diagnosis				4.076*** (1.052)
Biomarker role (detailed): predicting drug resistance				-2.948* (1.149)
Biomarker role (detailed): predicting treatment efficacy				-0.452 (1.351)
Biomarker role (detailed): predicting treatment toxicity				0.952 (1.735)
Biomarker role (detailed): screening				1.312 (1.466)
Biomarker role (detailed): selection for therapy				-4.031*** (1.148)
Biomarker role (detailed): disease profiling				2.656* (1.055)
Biomarker role (detailed): monitoring disease progression				-0.286 (1.336)
Biomarker role (detailed): monitoring treatment efficacy				2.237 (1.176)
Biomarker role (detailed): monitoring treatment toxicity				1.193 (2.226)
Biomarker role (detailed): not determined				3.795 (2.091)
Biomarker role (detailed): prognosis				1.198 (1.241)
Biomarker role (detailed): prognosis - risk stratification				2.960* (1.408)
Biomarker role (detailed): risk factor				0.523 (1.084)
Biomarker role (detailed): staging				-4.272*** (1.175)
Biomarker role (detailed): toxicity profiling				-3.957 (11.956)
Constant	114.556*** (3.781)	119.542*** (4.591)	134.880*** (5.587)	6319.361*** (123.376)
N	80334	38668	14663	13208
r ²	0.352	0.327	0.245	0.207
p<0.05, ** p<0.01, *** p<0.001				

Table 6: OLS regression

Dependent variable: Duration in months (winsorized to remove extreme outliers)

Trials ending after 2005 with *actual* end dates

	(1) All trials b/se	(2) US trials b/se	(3) US cancer trials b/se	(4) b/se
Start year control	Fixed Effects	Fixed Effects	Fixed Effects	Linear
Phase 2 Clinical (includes Phase 2/Phase 3 trials)	5.800*** (0.213)	4.469*** (0.315)	2.182*** (0.553)	1.274* (0.603)
Phase 3 Clinical	8.189*** (0.248)	5.663*** (0.386)	8.528*** (1.025)	9.224*** (1.113)
Trial site in US	3.467*** (0.186)			
Drug indication for neoplasm	16.740*** (0.226)	15.473*** (0.327)		
Received NIH funding	11.672*** (0.520)	11.555*** (0.579)	8.388*** (0.885)	7.017*** (0.959)
Generous PPM	7.512*** (0.418)	7.719*** (0.573)	7.890*** (0.716)	5.066*** (1.033)
Biomarker role (detailed): diagnosis				2.654 (1.410)
Biomarker role (detailed): differential diagnosis				3.968*** (1.178)
Biomarker role (detailed): predicting drug resistance				-1.745 (1.281)
Biomarker role (detailed): predicting treatment efficacy				3.832** (1.429)
Biomarker role (detailed): predicting treatment toxicity				0.493 (1.948)
Biomarker role (detailed): screening				1.826 (1.641)
Biomarker role (detailed): selection for therapy				-0.348 (1.299)
Biomarker role (detailed): disease profiling				1.117 (1.146)
Biomarker role (detailed): monitoring disease progression				-1.813 (1.482)
Biomarker role (detailed): monitoring treatment efficacy				1.802 (1.242)
Biomarker role (detailed): monitoring treatment toxicity				-2.811 (2.515)
Biomarker role (detailed): not determined				-1.689 (2.463)
Biomarker role (detailed): prognosis				0.472 (1.329)
Biomarker role (detailed): prognosis - risk stratification				0.808 (1.687)
Biomarker role (detailed): risk factor				-0.551 (1.176)
Biomarker role (detailed): staging				-3.929** (1.320)
Biomarker role (detailed): toxicity profiling				7.927 (10.477)
Constant	122.058*** (3.195)	125.346*** (3.843)	137.731*** (4.846)	11021.899*** (149.589)
N	49591	25898	8867	8020
r ²	0.507	0.502	0.461	0.432
p<0.05, ** p<0.01, *** p<0.001				