

Validation of an indirect linkage algorithm to combine registry data with Medicare claims

Appendix – Supplemental methods

1. Details related to Medicare fee-for-service and Medicare advantage claims

Medicare Fee-for-service (FFS) is administered by CMS while Medicare Advantage (MA) is administered by private insurance companies. Claims for FFS beneficiaries are processed by CMS and claims for MA beneficiaries are processed by these companies. Some of the claims of MA beneficiaries may get submitted to CMS during hospital/provider's administrative billing process. As a result, claims of MA beneficiaries may appear in FFS data, but would not be complete and cannot be used to estimate the matching rate. Therefore, MA beneficiaries were excluded from the denominator for the validation.

Enrollment in MA was 24% in 2010 and 35% in 2018 (1). This was consistent with our gold standard sample, in which 66% of patients (144,045 out of 217,640) were enrolled in FFS.

Reference:

1. Freed M, Damico A, and Neuman T. A Dozen Facts About Medicare Advantage in 2020. Kaiser Family Foundation. 2021.

2. Developmental tests of flexibility to be given to the indirect identifiers

During the developmental stage, we performed tests in EVAR (n=26656) and OAR (n=6188) datasets to determine the flexibility to be given to indirect identifiers. Our final choice was made by balancing the matching rate gained and the potential risk of increasing mismatch (reduced accuracy).

Test 1: 5-digit vs. 3-digit zip code – use 3 digit zip code

		Matching criteria				EVAR (n=26656)				OAR (n=6188)			
Step	Center ID	DOB	sex	Proc date	Zip code	Cum match	% Cum match	Cum Acc	% Cum Acc	Cum match	% Cum match	Cum Acc	% Cum Acc
1	x	x	x	x	5-digit	21512	80.7%	21237	98.7%	4726	76.4%	4644	98.3%
1	x	x	x	x	3-digit	22298	83.7%	22009	98.7%	4914	79.4%	4830	98.3%

Test 2: Procedure date range – use +/- 9 days

		Matching criteria				EVAR (n=26656)				OAR (n=6188)			
Step	Center ID	DOB	sex	Proc date	Zip code	Cum match	% Cum match	Cum Acc	% Cum Acc	Cum match	% Cum match	Cum Acc	% Cum Acc
2	x	x	x	+/-0		23108	86.7%	22807	98.7%	5106	82.5%	5021	98.3%
3	x	x	x	+/-3		23712	89.0%	23405	98.7%	5279	85.3%	5192	98.4%
3	x	x	x	+/-5		23742	89.1%	23435	98.7%	5285	85.4%	5198	98.4%
3	x	x	x	+/-9		23765	89.2%	23458	98.7%	5289	85.5%	5202	98.4%
3	x	x	x	+/-15		23770	89.2%	23461	98.7%	5291	85.5%	5204	98.4%

Test 3: Removing sex vs. no – remove sex in a step

		Matching criteria				EVAR (n=26656)				OAR (n=6188)			
Step	Center ID	DOB	sex	Proc date	Zip code	Cum match	% Cum match	Cum Acc	% Cum Acc	Cum match	% Cum match	Cum Acc	% Cum Acc
3	x	x	x	+/-9		23765	89.2%	23458	98.7%	5289	85.5%	5202	98.4%
4	x	x		x	3 digit	23868	89.5%	23556	98.7%	5305	85.7%	5218	98.4%

Test 4: Birth date range – use +/- 3 days

		Matching criteria				EVAR (n=26656)				OAR (n=6188)			
Step	Center ID	DOB	sex	Proc date	Zip code	Cum match	% Cum match	Cum Acc	% Cum Acc	Cum match	% Cum match	Cum Acc	% Cum Acc
5	x	+/-1	x	x	3 digit	23936	89.8%	23620	98.7%	5318	85.9%	5231	98.4%
5	x	+/-3	x	x	3 digit	23966	89.9%	23649	98.7%	5322	86.0%	5235	98.4%
5	x	+/-5	x	x	3 digit	23976	89.9%	23659	98.7%	5325	86.1%	5237	98.3%