

Supplementary Table 1: Cohort and Outcome Definitions

1) Juvenile Idiopathic Arthritis:

Defined by at least 2 International Classification of Diseases (ICD) diagnosis codes (7-365 days apart) followed by at least 1 outpatient pharmacy claim for JIA treatment. Index date is the first pharmacy claim initiation date after second ICD diagnosis.

A) Diagnosis Codes

	ICD-9	ICD-10
Rheumatoid arthritis	714.xx	M05.x, M06.0x, M06.3x, M06.4x, M06.9x, M06.8x
Psoriatic arthritis	696.0	L40.50
Ankylosing spondylitis	720.xx	M08.1x
Inflammatory bowel disease–associated arthritis	713.1x with concurrent code 555.xx or 556.xx	M07.60 with concurrent with code K51.90 or K50.x
Juvenile arthritis		M08.0x, M08.2x, M08.3x, M08.4x, M08.8x, M08.9x

B) JIA-related treatment drugs

Classification	Brand name/Generic name
Non-selective NSAIDs	Ibuprofen Diclofenac Naproxen Flurbiprofen Ketoprofen Ketorolac Sulindac Piroxicam Oxaprozin Nabumetone Mefenamic acid Meclofenamate Fenoprofen Diflunisal Etodolac Meloxicam Tolmetin Indomethacin
Coxibs	Celecoxib Rofecoxib Valdecoxib
Steroid (Oral)	Betamethasone Cortisone Dexamethasone Hydrocortisone Methylprednisolone Paramethasone Prednisolone Prednisone

	Triamcinolone Budesonide
Steroid (Injection)	Betamethasone Cortisone Dexamethasone Hydrocortisone Methylprednisolone Prednisolone Prednisone Triamcinolone
DMARDs	Methotrexate Sulfasalazine Leflunomide
Biologics for JIA (TNF- α inhibitors)	Adalimumab (J0135) Certolizumab (J0717) Etanercept (J1438) Golimumab (J1602) Infliximab (J1745)
Biologics for JIA (non-TNF- α inhibitors)	Abatacept (J0129) Tocilizumab (J3262)

2) Asthma:

Defined by at least 2 ICD diagnosis codes (7-365 days apart) followed by at least 1 outpatient pharmacy claim for asthma treatment. Index date is the first pharmacy claim initiation date after second ICD diagnosis. Exclude ICD diagnosis of asthma during the 365 days prior the index date.

A) Diagnosis Codes

	ICD-9	ICD-10
Asthma	493.xx	J45.2x J45.3x J45.4x J45.5x J45.9x

B) Asthma-related treatment drugs

Classification	Brand name/Generic name
Beta agonist	Short acting <ul style="list-style-type: none"> - Albuterol - Metaproterenol - Levalbuterol - Pirbuterol Long acting <ul style="list-style-type: none"> - Salmeterol - Formoterol - Arfomoterol - Indacaterol - Olodaterol Inhaled beta-agonist combination <ul style="list-style-type: none"> - Albuterol/Ipratropium - Vilanterol/Umeclidinium - Olodaterol/Tiotropium
Inhaled steroid	Beclomethasone HFA

	Budesonide DPI Budesonide nebulizer Budesonide/formoterol HFA Ciclesonide HFA Flunisolide HFA Fluticasone furoate DPI Fluticasone furoate/vilanterol DPI Fluticasone propionate HFA Fluticasone propionate/salmeterol HFA Fluticasone propionate/salmeterol DPI Fluticasone propionate DPI Mometasone DPI Mometasone/formoterol HFA Triamcinolone acetonide Dexamethasone Prednisolone
Oral steroids	Betamethasone Cortisone Dexamethasone Hydrocortisone Methylprednisolone Paramethasone Prednisolone Prednisone Triamcinolone Budesonide
Leukotriene receptor antagonist	Montelukast Zafirlukast
Other alternatives	Cromolyn Nedocromil Theophylline Zileuton Omalizumab
Use of nebulizer	ICD-9P: 93.94 ICD-10P: 3E0F76Z c CPT: 94640, 94644, 94664 (E/M) HCPCS: E0570, A7003, A7004, A7005, A7013, A7014, A7015, A4627
Immunotherapy	CPT: 95115, 95117, 95120, 95125, 95144, 95145, 95146, 95147, 95148, 95149, 95165, 95170

* Combination drugs – i.e. salmeterol/fluticasone – will be captured in 2 groups; once with beta agonist and once with inhaled steroid.

3) Healthy control:

Defined by at least 1 ICD diagnosis code or Current Procedural Terminology (CPT) code for Well-Care Visit. Index date is the first date of diagnosis code.

No JIA or asthma during the 365 days prior the index date based on ICD diagnosis code.

A) Diagnosis Codes

	ICD-9	ICD-10	CPT
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Healthy control	V20.2, V20.3, V70.0, V70.3, V70.5, V70.6, V70.8, V70.9	Z00.00, Z00.01, Z00.121, Z00.129, Z00.5, Z00.8, Z02.0, Z02.1, Z02.2, Z02.3, Z02.4, Z02.5, Z02.6, Z02.71, Z02.79, Z02.81, Z02.82, Z02.83, Z02.89, Z02.9	99381 - 99385, 99391 - 99395, 99461
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4) Diabetes mellitus:

New diagnosis of Type 1 or Type 2 DM by ICD diagnosis followed by prescription claim for Insulin-containing drugs only in type 1 DM and any anti-diabetic drug or insulin-containing DM drug in Type 2.

A) Diagnosis Codes

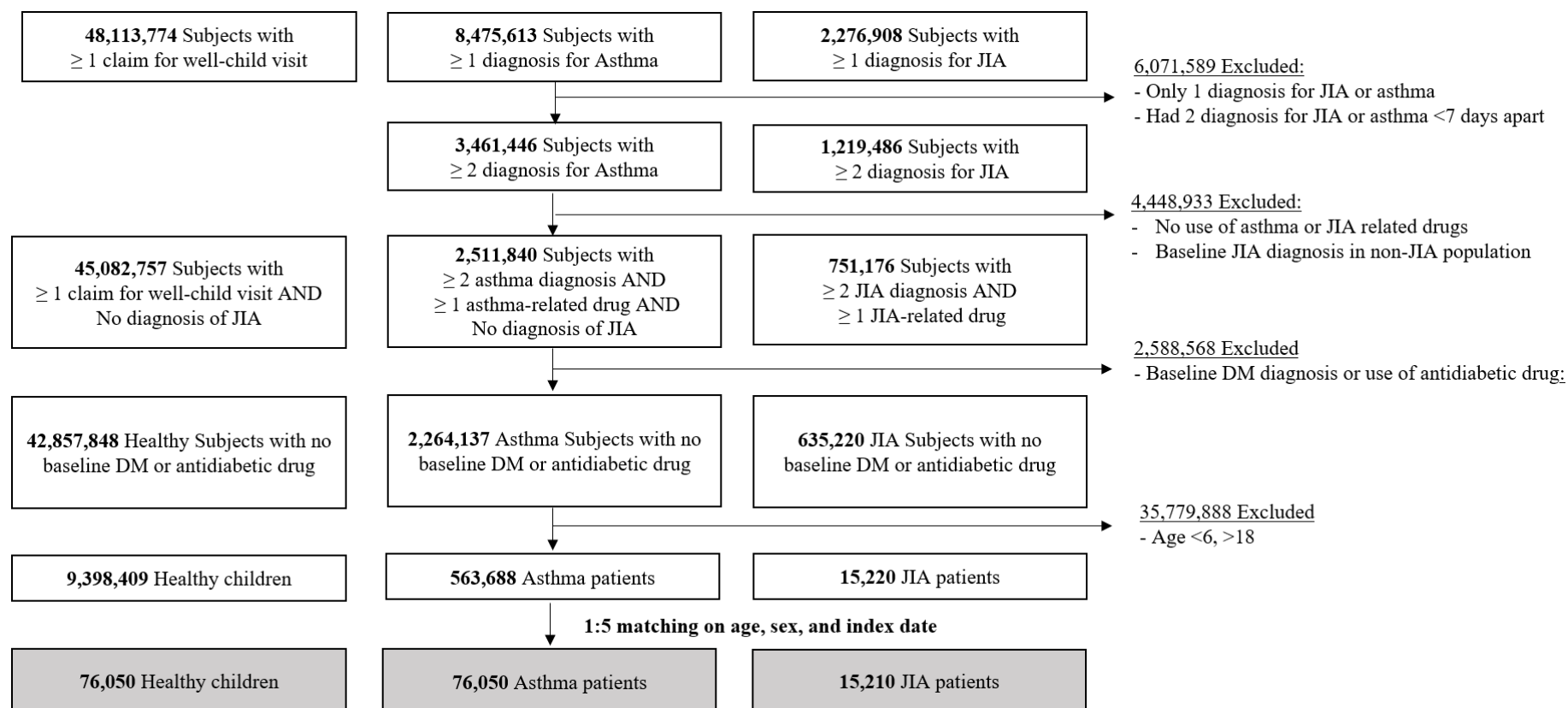
	ICD-9	ICD-10
Type 1	250.x1, 250.x3	E10.x
Type 2	250.x0 or 250.x2	E11.x

Exclude other types of DM (ICD-10: E08, E09, E13, Z96.41; ICD-9: 249.xx)

B) DM-related treatment drugs

Antidiabetic drug therapy	Medication
Bolus Insulin	Insulin human regular Insulin Aspart Insulin Glulisine Insulin Lispro Insulin Aspart/Insulin Aspart Protamine Insulin Lispro/Insulin Lispro Protamine insulin,pork purified
Basal Insulin	Insulin human isophane (NPH) Insulin human regular/ Insulin human isophane (NPH) Insulin Detemir Insulin Glargine Insulin Degludec Insulin zinc human rec Insulin zinc extend human rec Insulin nph human recom/insulin regular human rec Insulin zinc human rec Insulin nph human recom/insulin regular human rec
Metformin	Metformin
DDP4 inhibitors	Alogliptin, Linagliptin, Saxagliptin, Sitagliptin
Sulfonylureas	Acetohexamide, Chlorpropamide, tolazamide, tolbutamide, Glipizide, Glyburide, Glimepiride
Meglitinide derivatives	Repaglinide, Nateglinide
Alpha-glucosidase inhibitors	Acarbose, Miglitol
Thiazolidinediones (TZDs)	Rosiglitazone, Pioglitazone
Glucagonlike peptide-1 (GLP-1) agonists	Exenatide, Liraglutide, Lixisenatide, Albiglutide, Dulaglutide, semaglutide
SGLT2 inhibitors	Canagliflozin, Dapagliflozin, Empagliflozin, Ertugliflozin
Pramlintide	Pramlintide

Supplementary Figure 1: Flow Chart Illustrating Selection of Primary Cohorts.



Supplementary Table 2: Hazard ratio of diabetes mellitus in patients with JIA compared to healthy population and asthma patients, stratified by age

	JIA vs Asthma		JIA vs Healthy Children	
	HR in Age 6-12 (95% CI)	HR in Age 13-18 (95% CI)	HR in Age 6-12 (95% CI)	HR in Age 13-18 (95% CI)
Type 1 DM	1.29 (0.51-3.29)	1.63 (0.83-3.22)	1.28 (0.51-3.22)	2.39 (1.17-4.91)
Type 2 DM	0.95 (0.39-2.33)	1.04 (0.64-1.68)	1.11 (0.44-2.81)	1.27 (0.77-2.10)
Composite DM	1.17 (0.53-2.59)	1.19 (0.76-1.84)	1.28 (0.57-2.87)	1.49 (0.94-2.35)

Abbreviations: JIA, Juvenile idiopathic arthritis; DM, Diabetes mellitus; HR, Hazard ratio; CI, Confidence interval