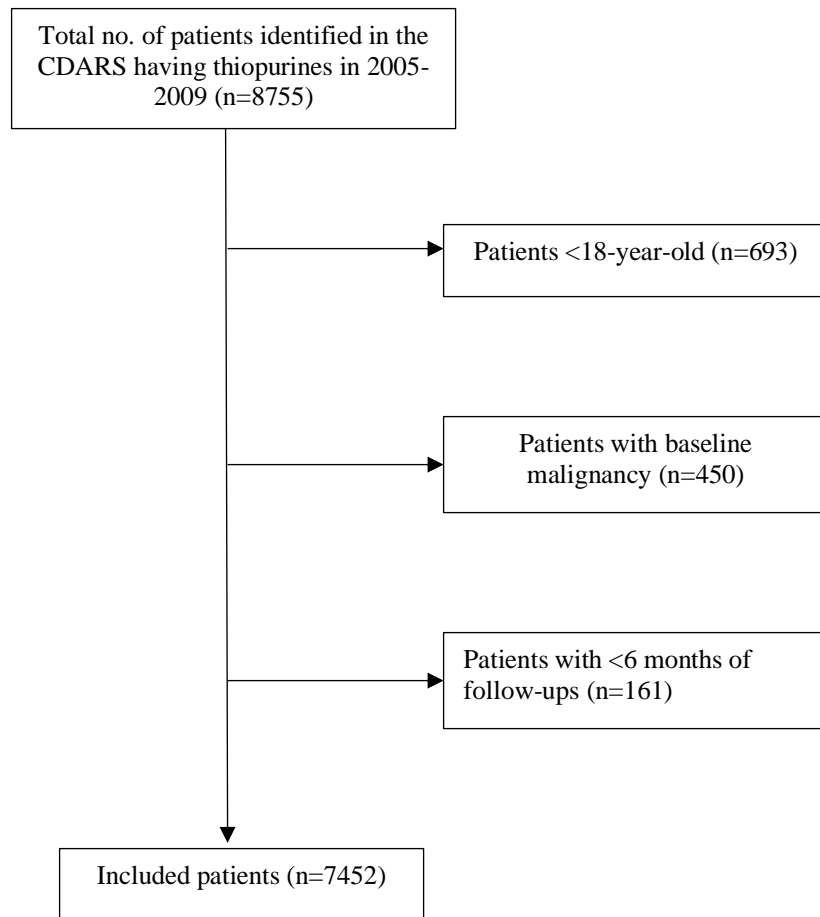


Supplementary Figure 1. Flow chart of included patients



Supplementary Table 1: ICD-9 codes for Malignant Neoplasm (140-208)

ICD-9 Diagnostic code	Malignant Neoplasm of
140	Lip
141	Tongue
142	Major Salivary Gland
143	Gum
144	Floor of mouth
145	Other and unspecified parts of mouth
146	Oropharynx
147	Nasopharynx
148	Hypopharynx
149	Other and ill-defined site within the lip
150	Esophagus
151	Stomach
152	Small intestine, with duodenum
153	Colon
154	Rectum, anus
155	Liver and intrahepatic bile ducts
156	Gallbladder and extrahepatic bile ducts
157	Pancreas
158	Retroperitoneum and peritoneum
159	Other and ill-defined sites within the digestive disease and peritoneum
160	Nasal cavities, middle ear and accessory sinuses
161	Larynx
162	Trachea, bronchus and lung
163	Pleura
164	Thymus, heart and mediastinum
165	Other and ill-defined sites within the respiratory system and intrathoracic organs
171	Bone and articular cartilage
172	Connective and other soft tissue
173	Melanoma of skin
174	Female breast
175	Male breast
176	Kaposi' sarcoma
179	Uterus
180	Cervix uteri
181	Placenta
182	Body of uterus
183	Ovary and other uterine adnexa
184	Other and unspecified parts of female genital organs

185	Prostate
186	Testis
187	Penis and other male genital organs
188	Bladder
189	Kidney and other and unspecific3d urinary organs
190	Eye
191	Brain
192	Other and unspecified parts of nervous system
193	Thyroid gland
194	Other endocrine glands and related structures
195	Other and ill-defined sites
196	Secondary and malignant neoplasm of lymph nodes
197	Secondary malignant neoplasm respiratory and digestive systems
198	Secondary malignant neoplasm of other specified sites
199	Malignant neoplasm without specification of site
200	Lymphosarcoma and reticulosarcoma
201	Hodgkin's disease
202	Other malignant neoplasms of lymphoid and histiocytic tissue
203	Multiple myeloma and immunoproliferative neoplasms
204	Lymphoid leukemia
205	Myeloid leukemia
206	Monocytic leukemia
207	Other specified leukemia
208	Leukemia of unspecified cell type

Supplementary Table 2: ICD-9 codes for Disease Subgroup Analysis

ICD 9- Diagnostic Code	
Rheumatological diseases	
Rheumatoid arthritis	714.0
Felty's syndrome	714.1
Other rheumatoid arthritis with visceral or systemic involvement	714.2
Reiter disease	99.3
Ankylosing Spondylitis	720.0
Inflammatory Spondylopathy NOS	720.9
Other Inflammatory Spondylopathy	720.8
Psoriatic arthropathy	696.0
Sacroiliitis NEC	720.2
Inflammatory Bowel Disease	
Regional enteritis	555.0, 555.1, 555.2, 555.9
Ulcerative colitis	556.0-556.9
Transplantations	
Organ or tissue replaced by transplant	V42.0- V42.9
Complications of transplanted organ	996.8
Others	
Giant cell arteritis [†]	446.5
Systemic lupus erythematosus [†]	710.0
Systemic sclerosis	710.1
Sjogren's syndrome/ Sicca Syndrome [†]	710.2
Dermatomyositis [†]	710.3
Polymyositis [†]	710.4
Other specified inflammatory polyarthropathies [†]	714.8
Polymyalgia rheumatica [†]	725.0-725.9
Autoimmune hemolytic anemia [†]	283.0
Sarcoidosis [†]	135.0
Behçet disease [†]	136.1
Idiopathic thrombocytopenia purpura [†]	287.3
Multiple sclerosis [†]	340.0
Myasthenia gravis [†]	358.0
Polyarteritis nodosa [†]	446.0
Goodpasture syndrome [†]	446.2
Wegener granulomatosis/ Granulomatosis with polyangiitis [†]	446.4
Autoimmune hepatitis (Chronic active hepatitis) [†]	571.4
(Discoid) lupus erythematosus [†]	695.4
Relapsing polychondritis [†]	733.9
Uveitis [†]	364.0-364.3
Glomerulonephritis [†]	580.0-583.9
Acquired hemolytic anemia NOS	283.9
Acquired hypothyroid NEC	244.8

Anemia NEC	285.8
Arteritis NOS [†]	447.6
Autoimmune diseases NEC [†]	279.4
Biliary Cirrhosis [†]	571.6
Cholangitis	576.1
Chronic Liver Diseases/ cirrhosis	571.0
Chronic lymphocytic thyroiditis [†]	245.2
Chronic liver disease NEC	571.8
Chronic liver disease NOS	571.9
Circumscribe Scleroderma [†]	701.0
Cirrhosis of liver NOS	571.5
Diff connective tissue disease NEC [†]	710.8
Diff Connective tissue disease NOS [†]	710.9
Disease of Biliary tract NEC	576.8
Disease of biliary tract NOS	576.9
Disorders of thyroid NEC	246.8
Endocrine disorder NEC	259.9
Endocrine/ Nervous Neoplasm NOS	239.7
Hemolytic hemoglobinuria	283.2
Hepatitis NOS	573.3
Hereditary hemolytic anemia	282.9
History of endocrine/ metabolism/ immune disorder	V12.2
Immune mechanism disease NOS [†]	279.9
Impaired Renal Function NOS	588.9
Inflammatory arthropathy NOS [†]	714.9
Juvenile chronic polyarthritis [†]	714.3
Liver Disorder NOS	573.9
Liver Disorder NEC	573.8
Lung Disease NEC	518.8
Myalgia and myositis NOS [†]	729.1
Myopathy in endocrine Disorder	359.5
Myopathy NEC [†]	359.8
Myopathy NOS [†]	359.9
Other Liver Disorders	573.0
Pancreatic Disease NEC	577.8
Polyarthritis NOS [†]	716.5
Raynaud's syndrome [†]	443

Respiratory System Disease NOS	519.8
Rheumatism NOS	729.0
Takayasu's disease†	446.7
Pemphigus vulgaris†	694.4
Psoriasis†	696.1
Allergic purpura †	287
Benign mucous membrane pemphigoid†	694.6
Bullous dermatoses NOS†	694.9
Dermatitis NOS†	692.9
Drug dermatitis NOS	693.0
Other atopic dermatitis†	691.8
Other dermatitis	692.8
Pemphigoid†	694.5
Panniculitis NOS†	729.3
Idiopathic Urticaria†	708.1
Non-specific skin eruption NEC	782.1
Unspecified allergic alveolitis and pneumonitis†	495.9
Alveolar pneumopathy NOS†	516.9
Post-inflammatory Pulmonary Fibrosis	515.0
Idiopathic pulmonary fibrosis†	516.3
Autonomic neuropathy in other diseases	337.1
Facial nerve disease NEC	351.8
Idiopathic peripheral neuropathy NEC†	356.8
Idiopathic peripheral neuropathy NOS†	356.9
Idiopathic progressive polyneuropathy†	356.4
Inflammatory/ Toxic Neuropathy NEC	357.8
Mononeuritis Leg NOS	355.8
Mononeuritis Multiplex†	354.5
Mononeuritis NOS	355.9
Neuralgia/ Neuritis NOS	729.2
Neuromyelitis Optica†	341.0
Neuropathy in Other disease	357.4
Optic atrophy	377.1
Other optic Nerve Disorder	377.4
Aplastic anemia NOS, NEC	284.8, 284.9
Blood diseases NOS	289.9
Thrombocytopenia NOS	287.5

Abbreviation: NOS, Not otherwise specified, NEC, Not elsewhere classifiable

† other autoimmune diseases

Supplementary Table 3: Concomitant immunosuppressant uses in different disease groups

	IBD	Rheumatological Disease	Transplantation	Others
Biologics				
Anti-TNFs	115	56	0	9
Other immunosuppressants				
Tacrolimus	20	15	445	345
Ciclosporin	22	110	1292	895
Methotrexate	58	229	14	326
Mycophenolate	10	33	647	1148

Abbreviations: IBD, Inflammatory Bowel Disease; TNF, Tumor Necrosis Factor.

Supplementary Table 4. SIR for the all site malignancy in thiopurine users with Crohn's disease or ulcerative colitis

	Crohn's disease (n = 363)			Ulcerative colitis (n=232)		
	Observed No.	Expected No.	SIR (95%CI)	Observed No.	Expected No.	SIR (95%CI)
All Site	19	7.66	2.48 (1.53-3.77)	21	9.24	2.27 (1.43-3.39)
Lip, oral cavity and pharynx	1	0.19	5.24 (0.3-23.0)	1	0.22	4.55 (0.26-20.0)
Digestive organs	9	2.20	4.09 (1.97-7.38)	6	3.08	1.95 (0.77-3.95)
Esophagus	1	0.11	9.39 (1.32-66.7)	0	0.16	N/A
Colorectum	7	1.06	6.58 (2.83-12.7)	4	1.51	2.66 (0.82-6.17)
Liver	1	0.56	1.80 (0.10-7.91)	1	0.72	1.39 (0.08-6.11)
Gallbladder and extrahepatic bile duct	0	0.06	N/A	1	0.11	9.47 (1.33-67.3)
Larynx	1	0.049	20.3 (2.87-144.4)	0	0.074	N/A
Trachea, bronchus and lung	0	1.00	N/A	2	1.50	1.34 (0.33-5.34)
Non-melanoma skin	0	0.20	N/A	1	0.27	3.65 (0.51-25.9)
Breast	0	1.01	N/A	2	0.98	2.04 (0.51-8.16)
Ovary etc.	1	0.18	5.71 (0.33-25.1)	2	0.15	12.9 (2.15-39.9)
Prostate	0	0.31	N/A	2	0.52	3.83 (0.96-15.3)
Kidney and other urinary organs	2	0.25	8.04 (1.34-24.8)	1	0.34	2.95 (0.17-13.0)
Lymphoid and hematopoietic tissue	4	0.53	7.58 (2.35-17.6)	3	0.54	5.54 (1.38-14.4)
Leukemia	2	0.18	11.3 (1.88-34.9)	2	0.16	12.4 (2.07-38.4)
Non-Hodgkin lymphoma	2	0.26	7.61 (1.26-23.5)	1	0.29	3.50 (0.20-15.4)

Abbreviations: CI, Confidence Interval; SIR, Standardized Incidence Ratio

Supplementary Table 5. Sensitivity analysis to calculating SIRs for autoimmune diseases and other non-specific diseases

	Others (n = 4,915)	Other Autoimmune Diseases (n=4305)
All sites	1.95 (1.76-2.15)	2.01 (1.80-2.23)
Lip, oral cavity and pharynx	3.49 (1.92-5.75)	4.11 (2.38-7.07)
Nasopharynx	2.29 (1.33-3.94)	2.69 (1.56-4.63)
Digestive organs	1.62 (1.31-1.97)	1.66 (1.33-2.05)
Esophagus	2.5 (0.99-5.06)	2.48 (0.89-5.34)
Stomach	0.41 (0.13-1.28)	0.48 (0.16-1.50)
Small intestine	1.58 (0.22-11.19)	1.85 (0.26-13.14)
Colorectum	1.67 (1.26-2.18)	1.85 (1.38-2.43)
Liver	2.19 (1.41-3.22)	1.70 (0.98-2.72)
Gallbladder and extrahepatic bile duct	0.42 (0.06-2.95)	0.49 (0.07-3.48)
Pancreas	1.05 (0.39-2.8)	1.24 (0.46-3.30)
Nasal cavity	N/A	N/A
Larynx	3.10 (1.00-9.63)	3.71 (1.20-11.49)
Trachea, bronchus and lung	1.39 (1.00-1.87)	1.31 (0.91-1.82)
Bone and soft tissue	1.77 (0.57-5.5)	2.05 (0.66-6.34)
Bone and cartilage	8.00 (2.00-32.0)	9.21 (2.30-36.82)
Melanoma of skin	5.86 (1.89-18.2)	6.81 (2.20-21.13)
Non-melanoma skin	1.56 (0.75-2.8)	1.42 (0.61-2.75)
Breast	1.00 (0.7-1.36)	1.04 (0.72-1.43)
Vagina, vulva and other female organs	1.65 (0.23-11.7)	1.91 (0.27-13.53)
Cervix uteri	2.08 (1.12-3.86)	2.34 (1.26-4.36)
Corpus uteri	1.59 (0.94-2.69)	1.55 (0.88-2.73)
Ovary	0.53 (0.13-1.36)	0.40 (0.07-1.22)
Prostate	1.48 (0.77-2.53)	1.28 (0.58-2.38)
Urinary organs	3.56 (2.25-5.31)	4.21 (2.75-6.46)
Kidney and other urinary organs	2.82 (1.52-5.24)	3.33 (1.79-6.18)
Bladder	4.67 (2.58-8.42)	5.53 (3.06-9.99)
Brain and nervous system	1.44 (0.36-5.78)	1.67 (0.42-6.69)
Thyroid gland	2.31 (1.42-3.78)	2.45 (1.47-4.06)
Lymphoid and hematopoietic tissue	5.81 (4.48-7.38)	6.23 (4.75-8.00)
Multiple myeloma	3.38 (1.41-8.12)	3.19 (1.20-8.49)
Leukemia	3.82 (2.04-6.40)	4.06 (2.11-6.96)
Hodgkin lymphoma	2.23 (0.31-15.8)	2.54 (0.36-18.03)
Non-Hodgkin lymphoma	7.88 (5.78-10.5)	8.58 (6.21-11.48)

Abbreviations: CI, Confidence Interval; SIR, Standardized Incidence Ratio