Summary:

Each year in the United States, 1.8 million new patients are diagnosed with cancers. Beyond this coverage by the NCI SEER registry, 3.3 million additional new patients are diagnosed with non-melanoma skin cancers in US annually. Even a moderate improvement in earlier detection (e.g., 6 months) could have meaningful benefits for survival and costs. The cancer development has been intensively investigated using samples collected after diagnosis. However, cancer development prior to clinical presentation remains mostly unobserved due to scarcity of samples. At Stanford, we have created a prospective longitudinal cohort of individuals followed for up to 10 years. Immune profiling of these individuals is systematically characterized through annual visits. During the period of observation, 48 incidences of malignancies were recorded (67% of them were non-melanoma skin cancers, consistent with the overall US population). Thus, the immune profiling of blood samples collected prior to the cancer diagnosis offers a rare opportunity to understand changes in the immune system during this crucial period.

In these samples, we found that the average concentrations of Cancer-Preceding (CanDx) cytokines were already elevated up to 3 years before the clinical diagnosis. Even at this time point, the impact of cancers on the immune system is large. It is comparable or more significant than the impact associated with over 50 years of aging. We also observed that average concentration of CanDx cytokines decreased immediately in the years following the cancer diagnosis. This is consistent with the fact that most of the incidences of cancers in our cohort, as well as the general US population, were basal cell carcinoma (BCC) and squamous cell carcinoma (SCC). These are nearly always surgically removed soon after diagnosis. Lastly, we also found evidence suggesting that a tilted inflammation balance in aged population may contribute to accelerated cancer development.

Our current dataset is not powered for detailed analyses on cancer subtypes other than non-melanoma skin cancers (BCC/SCC). We are expanding our current study cohort by both active recruitments targeting cancer-prone populations and large-scale electronic health record analyses. Our aim is to examine the role of immunity in early cancer development beyond skin cancers.