

# DNA Compass - Emergency Genomics Infrastructure Overview

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**Goals:** DNA Compass is a California Benefit Corporation, wanting to facilitate the use of ESRI's ArcGIS infrastructure to distribute maps of Covid-19 genomic markers and to help entities stratify populations by genomic risk.

**Background:** The [COVID-19 Host Initiative](#), a major global initiative for studying Covid-19 genomic risk association markers started in April. DNA Compass anticipates that a genomic risk assessment panel will emerge within the next few weeks from this effort to help stratify populations to prioritize vaccine and therapy distribution. The major hurdle facing the COVID-19 Host Initiative is that less than a dozen entities are contributing data due to local government jurisdiction requirements. Bioinformatics software lacks the security and federated data controls that the field of mapping software has successfully developed in response to emergencies. DNA Compass can bridge the gap between the bioinformatics community and population health data professionals by bringing genomic data into an already successful population health data platform - ArcGIS. Meanwhile, the [RIVAS lab at Stanford University has released an initial analysis of Covid-19 genomic risk markers from UK Biobank](#) that have been used in a series of proto-types shown below.

## DNA Compass Micro-Geocoding Service:

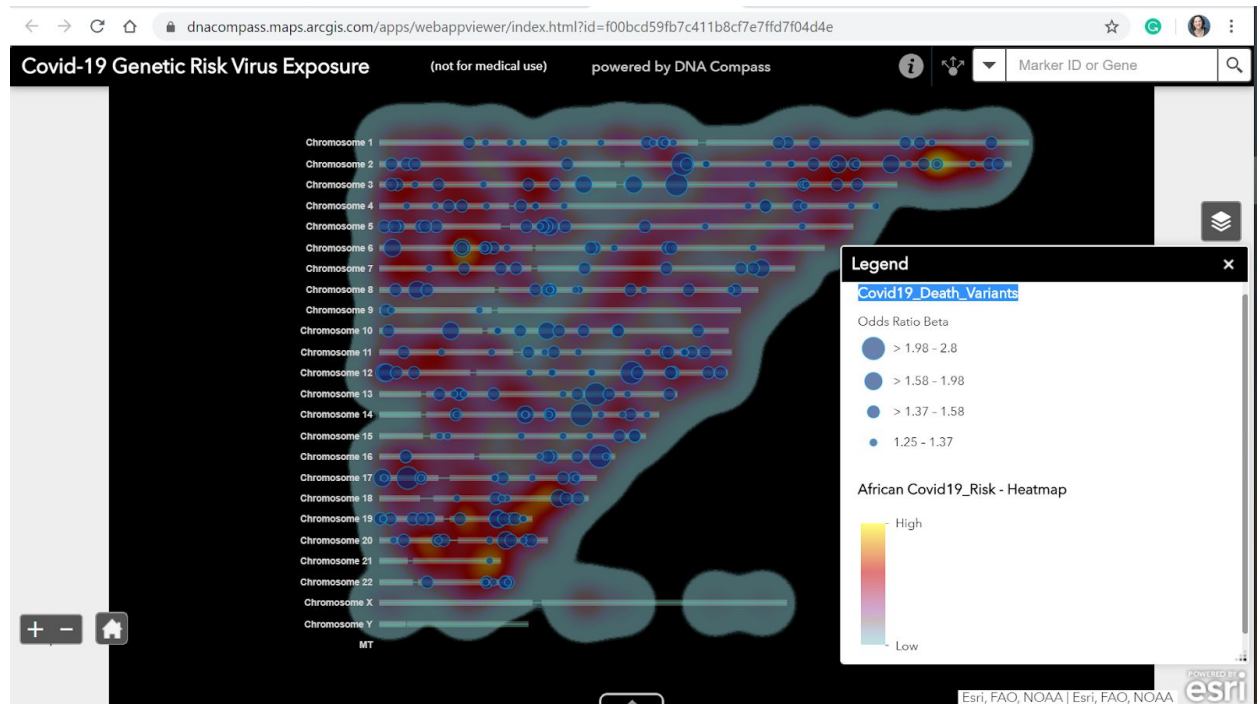
### How DNA Compass Converts Genomic Location Data in Genomic Map Layers:

Researchers worldwide have standardized on organizing genomic information by its location (i.e. Chromosome and Position of the genomic variant). DNA Compass converts genomic coordinates into WGS 1984 Web Mercator (auxiliary sphere) by making 1 DNA base pair = .1 map units. This transformation enables the genome to project inside the coordinate system used to map the earth using the following simple formulas:

- $(\text{Chromosome Number} * -800,000) + 8,000,000 = Y \text{ Coordinate}$
- $(\text{Based Pair Position} - 100000000) / 10 = X \text{ Coordinate}$

Using the formulas above, all of the world's existing algorithms for mapping the earth (i.e. spatial analysis across layers and machine learning) can immediately be reused to map, analyze and manage genomes.

## DNA Compass Sample Applications



## Population Genome Risk Map Prototypes -

[DNAcovid-19.com](https://DNAcovid-19.com)

[DNAcovid19.com](https://DNAcovid19.com)

[abcDNA.com](https://abcDNA.com)

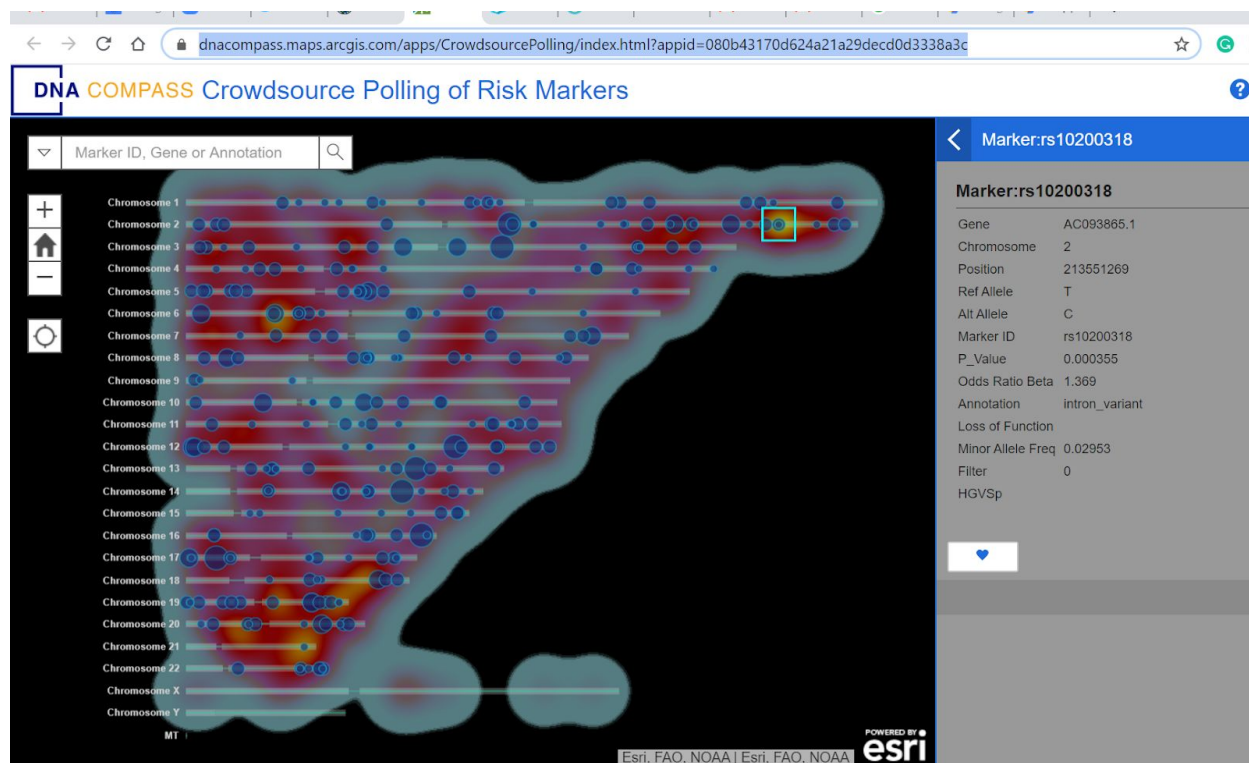
## Patient Genome Map

[Secure Genome Map Layer Feature Services](#)

[REST APIs:](#)

## Collaboration Tools

[Crowd Source Polling](#)



## Critical Emergency Genome Mapping Infrastructure Features

### Organizational Accounts with Role Based Security:

**DNA Compass** Overview Members Licenses Status **Settings**

Save Cancel

**General**

- Home Page
- Gallery
- Map
- Items
- Groups
- Utility Services
- Member Roles
- Marketplace
- Collaborations
- Credits
- Security**
- Open Data

**Security**  
Configure the security settings for your organization.

**Policies**

- ☒ Allow anonymous access to your organization's website, DNACompass.maps.arcgis.com.  
[What does this mean?](#)
- ☒ Allow members to edit biographical information and who can see their profile.

**Sharing and Searching**

- ☒ Members can share content publicly.
- ☒ Members can search for content outside the organization.
- ☒ Show social media links on item and group pages.

**Password Policy**

You can set the password policy for all members with ArcGIS accounts in your organization to establish rules that determine the format of passwords members may provide. In addition, you may set the duration of passwords as well as set how many previously entered passwords to retain to which to compare for redundancy when a new password is supplied.

[Update Password Policy](#)

## Verified Identities:

DNA Compass

OverviewMembersLicensesStatusSettings

SaveCancel

General

Home Page

Gallery

Map

Items

Groups

Utility Services

Member Roles

New Member Defaults

Marketplace

Collaborations

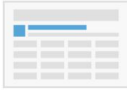
Credits

Security

### General

Represent and describe your organization. You can also set the default language for ArcGIS Online's user interface and the default basemaps and units that users see.

Organization Logo and Name




Click to change thumbnail

Organization Name

DNA Compass

Organization Verification ?



In order to mark the items that you've shared with everyone as Authoritative, you must request that Esri verify your organization's identity. To do this, make sure that your organization allows anonymous access (Settings > Security > Policies), then click the Verify button below. A draft email will appear. Send it to Esri Customer Service. Please do not alter the text or recipients of this email. Once received, Customer Service will verify that your organization name matches your customer name within 24 - 48 business hours and the Verify button will be replaced by a Verified badge.

**Note:** Once your organization has been verified, its organization name and status cannot be changed and all

## Sophisticated End User Sharing Controls:

dnacompass.maps.arcgis.com/home/webmap/viewer.html?webmap=b8df7632f37048c3aaede19f44224bda

Home X-linked Hypophosphatemia Population New Map Create Presentation Ali...

Details

Contents

Participant A

Participant A

Participant A

X-linked Hyp

ACMG Gene

Chromosome

Reference L

Chromosome

Genes

CellSpace

Share

Choose who can view this map.

Your map is currently shared with these people.

☐ Everyone (public)

☐ DNA Compass

☒ Members of these groups:

☐ DNA Compass Open Data (Open Data)

☒ X-linked Hypophosphatemia - FGF23 Clinical Trials (Open Data)

☐ X-linked Hypophosphatemia Awareness

Link to this map

https://arcg.is/0y5XzC

FacebookTwitter

Embed this map

EMBED IN WEBSITE

CREATE A WEB APP

Note: To embed your map, you must share it with Everyone.

Trust Center

Contact Us

Report Abuse

POWERED BY esri

## Open APIs, REST Services

ArcGIS REST Services Directory

[Home](#) > [services](#) > [Clinvar\\_450k\\_II \(FeatureServer\)](#) [API Reference](#)

[JSON](#)

### Clinvar\_450k\_II (FeatureServer)

**View In:** [ArcGIS.com Map](#)

**Service Description:** Clinvar\_Master\_Dataset

**Service ItemId:** d761944b79a147a499bf32f8a69e8ad4

**Has Versioned Data:** false

**Max Record Count:** 2000

**Supported query Formats:** JSON

**Supports applyEdits with GlobalIds:** False

**Source Schema Changes Allowed:** true

**Has Views:** true

[Views](#)

[All Layers and Tables](#)

**Layers:**

- [Clinvar\\_450k\\_II](#) (0)

**Description:**

DNA Compass - Map Layer based on NCBI Clinvar Annotation

PMID: 29165669

Clinvar Data Access: 2019-08-05

## Sample DNA Compass Work Flow for Covid-19 Genomic Risk Assessment:

1. Create initial Covid-19 risk map layers from for risk markers from Rivas Lab initial Covid-19 risk analysis: <https://biobankengine.shinyapps.io/covid19/> Tanigawa, Y.; Rivas, M. Initial Review and Analysis of COVID-19 Host Genetics and Associated Phenotypes. Preprints 2020, 2020030356 (doi: 10.20944/preprints202003.0356.v1).
2. Share instructions for how entities can convert their existing and new patient genome datasets into map layers (using either Chromosome and Position data or the genetic marker ID).
3. Compare patient genome against Covid-19 risk marker map layer.
4. Generate a report/dashboard showing risk assessment for patients
5. Enable entities to work with each other to coordinate response to Covid-19.