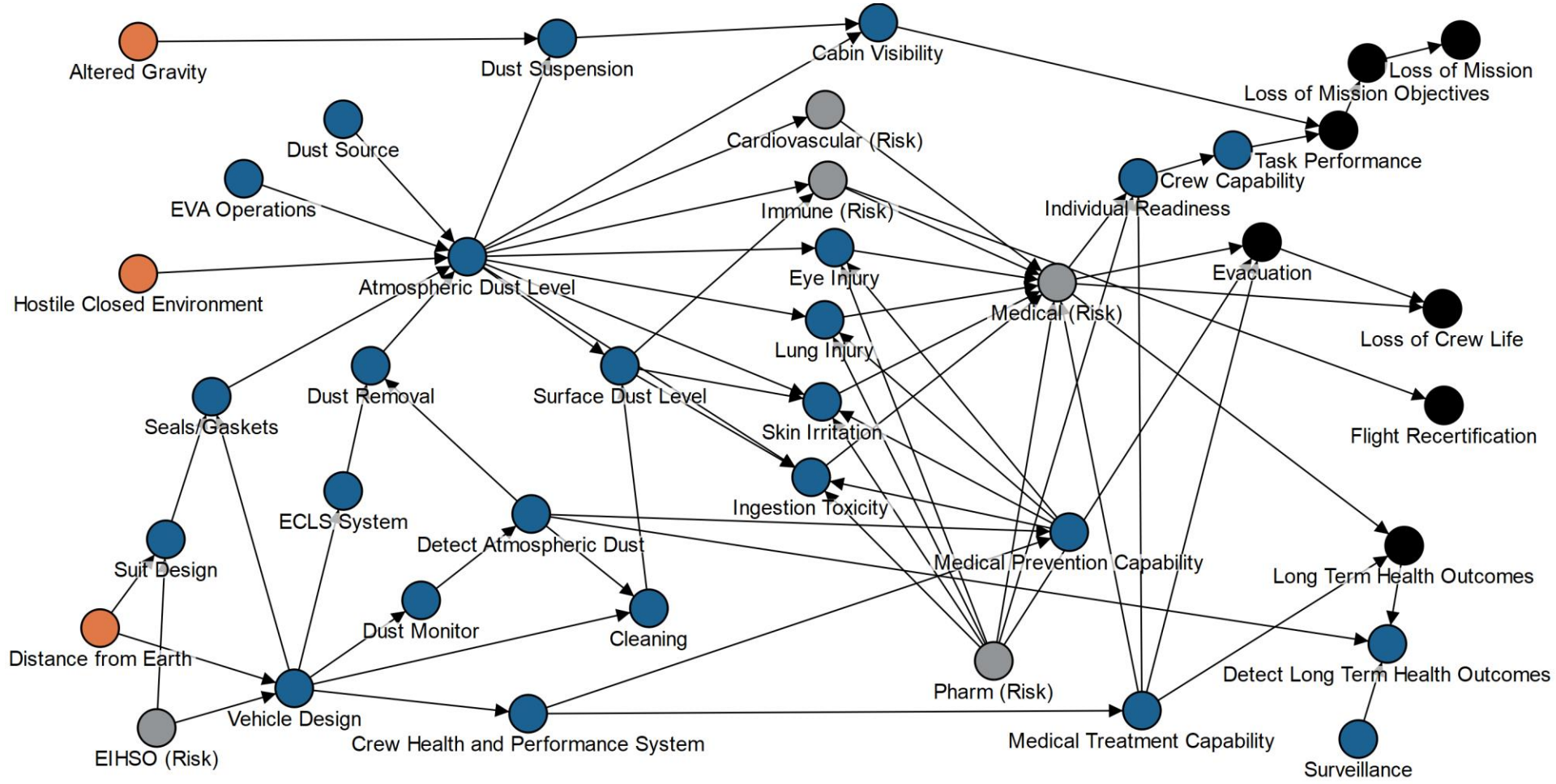
Dust Risk DAG Narrative

- This DAG centers around **Atmospheric Dust Levels** that can occur within vehicles after **EVA Operations** on celestial bodies. During **EVA Operations**, **Dust Sources** from the lunar or Martian surface can result in dust being carried back into a vehicle or habitat, potentially on space suits. The extent to which this will occur depends on **Vehicle Design**, **Suit Design**, and the **Seals/Gasket** designs that are included to prevent dust entry into a vehicle. This is dependent on **EIHSO (Risk)** including crew ability to operate potentially dust contaminated equipment.
- If dust gets into a vehicle or habitat, then the extent of exposure that crews face depends on several factors:
  - The level of **Dust Suspension** that occurs in the vehicle atmosphere.
  - The **Surface Dust Level** that builds up when dust settles from the atmosphere onto vehicle surfaces.
  - The capability for **Dust Monitoring** that enables crews to **Detect Atmospheric Dust** levels must be included in the **ECLS System** to determine the appropriate contamination levels that should prompt **Dust Removal** (filtration) and **Cleaning** of surfaces.
- Inappropriate levels of **Dust Suspension** in the atmosphere can lead to issues with **Cabin Visibility** affecting performance when piloting vehicles, especially on return to microgravity. It will be necessary to design and engineer equipment to be used for surface operations to be maintainable and repairable by crew, in situ.
- Unsuitable **Atmospheric Dust Levels** and **Surface Dust Levels** can also lead to several health challenges that affect **Individual Readiness** and **Crew Capability**.
  - Dust exposure can lead to **Eye Injury**, **Lung Injury** and **Skin Irritation.** Additionally, dust that gets into food or **Pharmaceuticals (Risk)** may lead to **Ingestion Toxicity** - especially in the case of Martian dust with perchlorates. These exposures can all progress to affect the **Medical (Risk)**. Most evidence suggests that the medical issues are likely to be minor in mission.
  - There is some evidence that the **Cardiovascular (Risk)** and the **Immune (Risk)** may be affected by celestial dust exposures, but this remains at the speculative level currently.
- Countermeasures can include:
  - **Medical Prevention Capabilities** such as artificial tears, skin coverings, etc.
  - **Medical Treatment Capabilities** including creams and ointments to treat skin irritation, as well as medical eye drops to address eye irritation or injury. Antibiotics may be required if secondary infection develops.
- **Long Term Health Outcome** may include pneumonoconiosis, hypersensitivity conditions, autoimmune disorders, and cancers, but the level of evidence is currently low that these will occur. **Surveillance** post flight and post-career for these types of conditions can enable us to **Detect Long Term Health Outcomes** and better characterize the magnitude of risk in the long-term health domain.


Altered Gravity
Dust Suspension
Cabin Visibility
Loss of Mission
Loss of Mission Objectives
Dust Source
Cardiovascular (Risk)
Task Performance
Crew Capability
EVA Operations
Immune (Risk)
Individual Readiness
Eye Injury
Evacuation
Hostile Closed Environment
Atmospheric Dust Level
Medical (Risk)
Loss of Crew Life
Lung Injury
Dust Removal
Surface Dust Level
Seals/Gaskets
Skin Irritation
Flight Recertification
ECLS System
Ingestion Toxicity
Detect Atmospheric Dust
Medical Prevention Capability
Suit Design
Long Term Health Outcomes
Dust Monitor
Cleaning
Distance from Earth
Detect Long Term Health Outcomes
Pharm (Risk)
Vehicle Design
Crew Health and Performance System
Medical Treatment Capability
EIHSO (Risk)
Surveillance