**Budget Justification (UNC at Chapel Hill)**

The proposed costs on the UNC–Chapel Hill side of this project are all in personnel to support the activities towards the goals of the proposal. Working closely with the prime site (NCCU), the UNC PI will be primarily responsible for codes for community detection, network robustness, and multilayer network analyses, leveraging the UNC team’s expertise. The proposed project start and end dates will be 9/1/2020 to 8/31/2021, with Phase 1 running from 9/1/20 to 12/31/2020 and Phase 2 running from 1/1/2021 to 8/31/2021.

**Personnel**

For phase 1 of the project, 1 month of summer salary is requested for PI Zach Boyd. For phase 2 of the contract, 2 months of salary are requested for PI Zach Boyd. The salary will be $5,417 in phase 1 and $10,833 for phase 2. Within each phase, salary will be paid based on the appended “Milestone-based Budget.”

**Fringe Benefits**

The postdoc fringe benefit rate is 8.99% of salary. Postdoc health insurance costs are currently $4,600 per year, will be charged to the contract based on months effort, and include a 3% inflation rate for all years. The total dollar amount of postdoc benefits (fringe and health insurance) in phase 1 will be $882 and $1,764 for phase 2.

**Indirect Costs**

Indirect costs are calculated at 55.5% of modified total direct cost (MTDC). Equipment, participant costs, graduate tuition and fees, and amounts in excess of $25,000 on sub-awards are excluded from the base.

The total requested from the National Science Foundation is therefore $29,383.

**Milestone-based Budget:**

**50% of Phase A Budget:** Mid second month: Concluding and delivering ten-tier mapping of global supply chain of medical equipment at firm-level, industry-level, regional-level, licensing-level, and finance-level.

**50% of Phase A Budget:** End of month 3: Concluding and delivering newly developed measures of supply chain vulnerabilities and fragmentations, simulations of various scenarios about rupture in the global supply chain, as well as mathematical models to analyze multi-layer networks.

**25% of Phase B Budget:** First of month 5: Concluding the design of the expanded supply chain mapping and analysis based on the need of the intelligence community.

**50% of Phase B Budget:** Mid-month 7: Concluding and delivering multi-tier, multi-layer mapping, and report on the progress of developing novel mathematical tools for the network analysis.

**25% of Phase B Budget:** End of month 9: Concluding and delivering progress on the novel mathematical analysis tools. Deliver simulation and analysis interface prototype.

**Final Report** will be submitted by the end of month 12: Delivering comprehensive report, visualizations, network analysis, raw data, processes data, and operational analysis & simulation portal/interface (this could in the form of a public or private webpage).