**Proposal Draft**

This analysis examines U.S. 15-year-old students who reported career expectations in science in the 2015 Program for International Student Assessment (PISA).

**Study Question 1:** What percentage of U.S. 15-year-olds is interested in pursuing a career in science by demographics (**gender, race/ethnicity, ESCS quarters, and immigrant status**) and a school level variable (**school location**)? How does that change when looking at specific fields in science?

**Study Question 2:** Are the careers of students’ parents associated with the careers students expect to have themselves? For e.g. if a parent has a career in science, is a student more likely to express interest in a science career?

**Study Question 3:** Among those students interested in science careers, to what degree are they **interested in various science content areas?**

**Purpose**

Measuring average academic performance across countries can mask inequities or differences by subgroups, such as by science career expectations.

Students’ career expectations have been found to be highly predictive of students’ actual career choices and outcomes later in life (Tai, Liu, Maltese, & Fan, 2006; Goyette, 2008; Aschbacher, Ing, & Tsai, 2014).

**Methods and data sources**

*Main variable: science careers*

1. In PISA 2015, 15-year-old students answered “what kind of job [they] expect to have when they are about 30 years old” (ST114). Answers to this open-ended question were coded into respective ISCO-08 codes. These codes were used to define science careers (for the purposes of deriving science career expectations) in the following manner, which is the same way that the OECD has defined science careers:

* All science and engineering professionals (except product and garment designers, graphic and multimedia designers)
* All health professionals (except traditional and complementary medicine professionals)
* All information and communications technology professionals
* Science technicians and associate professionals:
  + Physical and engineering science technicians
  + Life science technicians and related associate professionals
  + Air traffic safety electronic technicians
  + Medical and pharmaceutical technicians except medical and dental prosthetic technicians
  + Telecommunications engineering technicians

More broadly, science-related career expectations are defined as those career expectations whose realization requires further engagement with the study of science beyond compulsory education, typically in formal tertiary education settings.

1. The same methodology was used to code responses for mother and father’s occupation. The questions come from the student background questionnaire and read: “The following two questions concern your [mother/father’s] job: (If [she/he] is not working now, please tell us [her/his] last main job.)

*What is your [mother/father’s] main job? (e.g. school teacher, kitchen-hand, sales manager) Please type in the job title*

*What does your [mother/father] do in [her/his] main job? (e.g. teaches high school students, helps the cook prepare meals in a restaurant, manages a sales team) Please use a sentence to describe the kind of work she does or did in that job.”*

A more refined coding of science careers was also implemented, with medical careers disaggregated from science careers in the following manner: all health professionals (except traditional and complementary medicine professionals) were coded as medical careers.

1. This project uses the school location variable of the PISA school questionnaire to define urbanicity. This variable asks principals in what kind of community their school is located and provides the following options: (1) a village, hamlet, or rural area (fewer than 3,000 people), (2) a small town (3,000 to about 15,000 people), (3) a town (15,000 to about 100,000 people), (4) a city (100,000 to about 1,000,000 people), and (5) a large city (with over 1,000,000 people). This analysis considers schools located in the last two options as “urban,” while all other schools are defined as non-urban, consistent with the definition used by the OECD (OECD 2013).

**Initial Findings**

*Student demographic variables*

**Gender**

* U.S. boys outperform girls by 7 points on average, but girls are 10 percentage points more likely to envision a science career: 45% of 15-year-old girls vs. 35% of boys.
  + More than one in three 15-year-old girls sees herself working in medicine (37%), whereas less than one in ten boys (9%) expects to do so.
  + Girls are less likely to express interest in engineering and tech fields: though 26% of boys are interested in these fields, only 8% of girls are. In no PISA-participating country are girls more likely to see themselves in engineering/tech than boys.
  + Girls striving for engineering/tech careers performed at the same level as their male counterparts. Similarly, boys and girls who weren’t interested in science-related careers also showed no significant differences in PISA science scores. However, on average, boys interested in careers in medicine outperformed their female peers by 41 score points.
    - Among girls, there is no statistically significant difference between those interested in medicine and those not interested in any kind of science career.
    - Among boys, those interested in medicine outscore their peers interested in non-science careers by 44 score points.

**Race/ethnicity**

* Even after controlling for ESCS, gaps in student science scores by race/ethnicity persist.
* There are no statistically significant differences between the scores of White and Asian students at the lowest and highest quartiles of the ESCS index; yet, on average, a White student in the *lowest* ESCS quartile received a PISA science score of 482, while a Black student in the *highest* ESCS quartile received a score of 474.
* Fifty percent of Asian students foresee themselves pursuing science careers, whereas 38%, 39%, and 41% of Black, Hispanic, and White students do, respectively.
  + The percentage of students interested in engineering/tech ranges from 12% of all Black students to 23% of all Asian students.

**Immigration status**

* On average, 15-year-old students native to the U.S. tended to outperform their second-generation peers, who in turn tended to outperform first-generation students.
  + Indeed, the largest gap, 50 score points—or one-half of a standard deviation—was between native (506 score points) and first-generation students (456), with second-generation students (482) falling in between.
* Despite the 24-point score gap between native and second-generation students, there is *no* statistically significant difference between two groups of students after accounting for socioeconomic status, and the gap between native and first-generation students falls to 30 score points.
* At the third national quarter of ESCS, there is no statistically significant difference between any of the three immigration categories.
* Career interest differences vary less by student immigrations status. For instance, 16% of students native to the U.S. imagine themselves working in engineering/tech versus 19% of second-generation students and 18% of first-generation students. As for medicine, 23%, 26%, and 25% of native, second-generation, and first-generation students indicate their interest in the field.

**Science interests**

* When looking at the specific science interests of only those students interested in science careers (engineering/tech vs. medical), the difference in interested/highly interested students is between five and seven percentage points for three topics: biosphere, preventing disease, and the Universe.
  + However, students interested in engineering/tech are more likely than those interested in medicine to find energy and motion/forces interesting. The differences for these two topics are 16 and 24 percentage points, respectively.

**References**

OECD (2013), "What Makes Urban Schools Different?", PISA in Focus, No. 28, OECD Publishing, Paris.