Measuring non-healthcare occupational exposure to SARS-CoV-2 across occupational groups in the United States

This protocol explains how to characterize non-healthcare occupational exposure to SARS-CoV-2 across occupational groups in the United States using the SARS-CoV-2 Occupational Exposure Matrix (SOEM).

Data:

1. SARS-CoV-2 Occupational Exposure Matrix (SOEM). Council of State and Territorial Epidemiologists. Version: 2021 May 27.
2. 2010 Occupation Code List. United States Census Bureau.

Method:

The first step involves the creation of a spreadsheet file.

1. Create: New spreadsheet named: “SOEM_X”
2. Create: New tab named “Base"
3. Create: New tab named “S_Groups"
4. Create: New tab named “M_Groups"
5. Go to: “Base” tab
6. Label:
    - Column A: “Census Super-Major Groups Title (2010)”
    - Column B: “Census Major Groups Title (2010)”
    - Column C: “Census Occupation Code (2010)”
    - Column D: “COC Occupational Title (2010)”
    - Column E: “Public Facing Exposure Level”
    - Column F: “Working Indoors Exposure Level”
    - Column G: “Close Proximity Exposure Level (M1)”
    - Column H: “Close Proximity Exposure Level (M2)”
    - Column I: “Combined Exposure Group (M1)”
    - Column J: “Combined Exposure Group (M2)”
    - Column K: “Combined Exposure Group (M1)”
    - Column L: “Combined Exposure Group (M2)”
    - Column M: “U.S. Employment Estimates”

The second step involves the collection of source data on risk factors for workplace exposure to SARS-CoV-2.

1. Open: “SOEM – Appendix 1. SOEM and COC 5-27-21.xlsx”
2. Go to: “Table 3: Exposure Levels COC”
3. Copy:
    - Column: Census Occupation Code (2010)

    - Column: COC Occupational Title (2010)
    - Column: Public Facing Exposure Level
    - Column: Working Indoors Exposure Level
    - Column: Close Proximity Measure 1 – Exposure Level
    - Column: Close Proximity Measure 2 – Exposure Level
4. Go to: "SOEM_X" spreadsheet
5. Go to: "Base" tab
6. Paste: Copied Data
    - Column C: "Census Occupation Code (2010)"
    - Column D: "COC Occupational Title (2010)"
    - Column E: "Public Facing Exposure Level"
    - Column F: "Working Indoors Exposure Level"
    - Column G: "Close Proximity Exposure Level (M1)"
    - Column H: "Close Proximity Exposure Level (M2)"
7. Go to: "SOEM – Appendix 1. SOEM and COC 5-27-21.xlsx"
8. Go to: "Table 5: Missing SOC and COC"
9. Go to: "Table 5b"
10. Copy:
    - Column: Census Occupation Code (2010)
    - Column: COC Occupational Title (2010)
    - Column: Public Facing Exposure Level
    - Column: Working Indoors Exposure Level
    - Column: Close Proximity Measure 1 – Exposure Level
    - Column: Close Proximity Measure 2 – Exposure Level
11. Go to: "SOEM_X" spreadsheet
12. Go to: "Base" tab
13. Paste: Copied Data
    - Column C: "Census Occupation Code (2010)"
    - Column D: "COC Occupational Title (2010)"
    - Column E: "Public Facing Exposure Level"
    - Column F: "Working Indoors Exposure Level"
    - Column G: "Close Proximity Exposure Level (M1)"
    - Column H: "Close Proximity Exposure Level (M2)"

The third step involves the collection of source data on combined estimates for workplace exposure to SARS-CoV-2.

1. Open: "SOEM – Appendix 1. SOEM and COC 5-27-21.xlsx"
2. Go to: "Table 4: Combined Exposure COC"
3. Copy:
    - Column: Proximity 1 Exposure Group
    - Column: Proximity 2 Exposure Group
4. Go to: "SOEM_X" spreadsheet
5. Go to: "Base" tab

6. Paste: Copied Data
    - Column K: “Combined Exposure Group (M1)”
    - Column L: “Combined Exposure Group (M2)”
7. Go to: “SOEM – Appendix 1. SOEM and COC 5-27-21.xlsx”
8. Go to: “Table 5: Missing SOC and COC”
9. Go to: “Table 5b”
10. Copy:
    - Column: Proximity 1 Exposure Group
    - Column: Proximity 2 Exposure Group
11. Go to: “SOEM_X” spreadsheet
12. Go to: “Base” tab
13. Paste: Copied Data
    - Column K: “Combined Exposure Group (M1)”
    - Column L: “Combined Exposure Group (M2)”

The fourth step involves the processing of the data collected in the previous step.

1. Open: “SOEM_X” spreadsheet
2. Go to: “Base” tab
3. Run:
    - Cell: I2
    - Command: =IFS(K2="Low",1,K2="Medium",2,K2="High",3)
    - Apply: Entire column
4. Run:
    - Cell: J2
    - Command: =IFS(L2="Low",1,L2="Medium",2,L2="High",3)
    - Apply: Entire column

The fifth step involves correcting the data collected in the second step to fix a known error in the most recent version of the SOEM.

1. Open: “SOEM_X” spreadsheet
2. Go to: “Base” tab
3. Edit:
    - Cell: E222
    - Value: 3 -> 2
4. Edit
    - Cell: E265
    - Value: 3 -> 2
5. Paste Special
    - Copy: All
    - Paste Special: Values
    - Apply: Entire spreadsheet

The sixth step involves the collection of source data on occupational group classifications.

1. Open: “SOEM_X” spreadsheet
2. Go to: “Base” tab
3. Apply:
    - Filter: Column C
    - Direction: Ascending
    - Remove: Filter
4. Insert:
    - Cells: B2 – B30
    - Text: “Management Occupations”
5. Insert:
    - Cells: B31 – B58
    - Text: “Business and Financial Operations Occupations”
6. Insert:
    - Cells: = B59 – B74
    - Text: “Computer and Mathematical Occupations”
7. Insert:
    - Cells: = B75 – B95
    - Text: “Architecture and Engineering Occupations”
8. Insert:
    - Cells: B96 – B118
    - Text: “Life, Physical, and Social Science Occupations”
9. Insert:
    - Cells: B119 – B126
    - Text: “Community and Social Service Occupations”
10. Insert:
    - Cells: B127 – B131
    - Text: “Legal Occupations”
11. Insert:
    - Cells: B132 – B142
    - Text: “Education, Training, and Library Occupations”
12. Insert:
    - Cells: B143 – B161
    - Text: “Arts, Design, Entertainment, Sports, and Media Occupations”
13. Insert:
    - Cells: B162 – B179
    - Text: “Protective Service Occupations”
14. Insert:
    - Cells: B180 – B192
    - Text: “Food Preparation and Serving Related Occupations”
15. Insert:
    - Cells: B193 – B198
    - Text: “Building and Grounds Cleaning and Maintenance Occupations”
16. Insert:
    - Cells: B199 – B218

- Text: “Personal Care and Service Occupations”

17. Insert:
    - Cells: B219 – B236
    - Text: “Sales and Related Occupations”
18. Insert:
    - Cells: B237 – B288
    - Text: “Office and Administrative Support Occupations”
19. Insert:
    - Cells: B289 – B297
    - Text: “Farming, Fishing, and Forestry Occupations”
20. Insert:
    - Cells: B298 – B337
    - Text: “Construction and Extraction Occupations”
21. Insert:
    - Cells: B338 – B374
    - Text: “Installation, Maintenance, and Repair Occupations”
22. Insert:
    - Cells: B375 – B455
    - Text: “Production Occupations”
23. Insert:
    - Cells: B456 – B490
    - Text: “Transportation and Material Moving Occupations”
24. Insert:
    - Cells: A2 – A161
    - Text: “Management, Business, Science, and Arts Occupations”
25. Insert:
    - Cells: A162 – A218
    - Text: “Service Occupations”
26. Insert:
    - Cells: A219 – A288
    - Text: “Sales and Office Occupations”
27. Insert:
    - Cells: A289 – A374
    - Text: “Natural Resources, Construction, and Maintenance Occupations”
28. Insert:
    - Cells: A375 – A490
    - Text: “Production, Transportation, and Material Moving Occupations”

The seventh step involves the creation of a novel set of measures for work exposure to SARS-CoV-2 across super-major occupational groups in the United States

1. Open: “SOEM_X” spreadsheet
2. Go to: “S_Groups” tab
3. Label:

- Column A: “Census Super-Major Groups Title (2010)”
- Column B: “Public Facing Exposure Level”
- Column C: “Working Indoors Exposure Level”
- Column D: “Close Proximity Exposure Level (M1)”
- Column E: “Close Proximity Exposure Level (M2)”
- Column F: “Combined Exposure Group (M1)”
- Column G: “Combined Exposure Group (M2)”
- Column H: “Combined Exposure Group (M1)”
- Column I: “Combined Exposure Group (M2)”
- Column J: “U.S. Employment Estimates”

4. Run:
   - Cell: A2
   - Command: =UNIQUE(Base!A2:A490)
5. Run:
   - Cell: B2
   - Command: =AVERAGEIF(Base!$A$2:$A$490,S_Groups!A2,Base!$E$2:$E$490)
   - Apply: Entire column
6. Run:
   - Cell: C2
   - Command: =AVERAGEIF(Base!$A$2:$A$490,S_Groups!A2,Base!$F$2:$F$490)
   - Apply: Entire column
7. Run:
   - Cell: D2
   - Command: =AVERAGEIF(Base!$A$2:$A$490,S_Groups!A2,Base!$G$2:$G$490)
   - Apply: Entire column
8. Run:
   - Cell: E2
   - Command: =AVERAGEIF(Base!$A$2:$A$490,S_Groups!A2,Base!$H$2:$H$490)
   - Apply: Entire column
9. Run:
   - Cell: F2
   - Command: =AVERAGEIF(Base!$A$2:$A$490,S_Groups!A2,Base!$I$2:$I$490)
   - Apply: Entire column
10. Run:
    - Cell: G2
    - Command: =AVERAGEIF(Base!$A$2:$A$490,S_Groups!A2,Base!$J$2:$J$490)
    - Apply: Entire column
11. Run:
    - Cell: H2
    - Command: =IFS(F2<1.5,"Low",F2<2.5,"Medium",F2>=2.5,"High")
    - Apply: Entire column
12. Run:
    - Cell: I2
    - Command: =IFS(G2<1.5,"Low",G2<2.5,"Medium",G2>=2.5,"High")

- Apply: Entire column

The eighth step involves the creation of a novel set of measures for work exposure to SARS-CoV-2 across major occupational groups in the United States

1. Open: “SOEM_X” spreadsheet
2. Go to: “M_Groups” tab
3. Label:
    - Column A: “Census Major Groups Title (2010)”
    - Column B: “Public Facing Exposure Level”
    - Column C: “Working Indoors Exposure Level”
    - Column D: “Close Proximity Exposure Level (M1)”
    - Column E: “Close Proximity Exposure Level (M2)”
    - Column F: “Combined Exposure Group (M1)”
    - Column G: “Combined Exposure Group (M2)”
    - Column H: “Combined Exposure Group (M1)”
    - Column I: “Combined Exposure Group (M2)”
    - Column J: “U.S. Employment Estimates”
4. Run:
    - Cell: A2
    - Command: =UNIQUE(Base!B2:B490)
5. Run:
    - Cell: B2
    - Command: =AVERAGEIF(Base!$B$2:$B$490,M_Groups!A2,Base!$E$2:$E$490)
    - Apply: Entire column
6. Run:
    - Cell: C2
    - Command: =AVERAGEIF(Base!$B$2:$B$490,M_Groups!A2,Base!$F$2:$F$490)
    - Apply: Entire column
7. Run:
    - Cell: D2
    - Command: =AVERAGEIF(Base!$B$2:$B$490,M_Groups!A2,Base!$G$2:$G$490)
    - Apply: Entire column
8. Run:
    - Cell: E2
    - Command: =AVERAGEIF(Base!$B$2:$B$490,M_Groups!A2,Base!$H$2:$H$490)
    - Apply: Entire column
9. Run:
    - Cell: F2
    - Command: =AVERAGEIF(Base!$B$2:$B$490,M_Groups!A2,Base!$I$2:$I$490)
    - Apply: Entire column
10. Run:
    - Cell: G2
    - Command: =AVERAGEIF(Base!$B$2:$B$490,M_Groups!A2,Base!$J$2:$J$490)

- Apply: Entire column

11. Run:
    - Cell: H2
    - Command: =IFS(F2<1.5,"Low",F2<2.5,"Medium",F2>=2.5,"High")
    - Apply: Entire column
12. Run:
    - Cell: I2
    - Command: =IFS(G2<1.5,"Low",G2<2.5,"Medium",G2>=2.5,"High")
    - Apply: Entire column