|  | Human (N=67) | Physical (N=65) | Nature/society (N=22) | Methods (N=61) | Other (N=1) | NA (N=2) | Overall (N=218) |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Fraud (e.g., fabricated or falsified results)** |  |  |  |  |  |  |  |
| Frequently | 5 (7.5%) | 8 (12.3%) | 0 (0%) | 3 (4.9%) | 0 (0%) | 0 (0%) | 16 (7.3%) |
| Occasionally | 10 (14.9%) | 13 (20.0%) | 2 (9.1%) | 21 (34.4%) | 0 (0%) | 0 (0%) | 46 (21.1%) |
| Rarely | 40 (59.7%) | 33 (50.8%) | 17 (77.3%) | 29 (47.5%) | 1 (100%) | 1 (50.0%) | 121 (55.5%) |
| Never | 7 (10.4%) | 9 (13.8%) | 1 (4.5%) | 5 (8.2%) | 0 (0%) | 0 (0%) | 22 (10.1%) |
| Missing | 5 (7.5%) | 2 (3.1%) | 2 (9.1%) | 3 (4.9%) | 0 (0%) | 1 (50.0%) | 13 (6.0%) |
| **Pressure to publish for career advancement** |  |  |  |  |  |  |  |
| Frequently | 17 (25.4%) | 23 (35.4%) | 3 (13.6%) | 21 (34.4%) | 1 (100%) | 0 (0%) | 65 (29.8%) |
| Occasionally | 24 (35.8%) | 31 (47.7%) | 9 (40.9%) | 26 (42.6%) | 0 (0%) | 1 (50.0%) | 91 (41.7%) |
| Rarely | 17 (25.4%) | 7 (10.8%) | 8 (36.4%) | 10 (16.4%) | 0 (0%) | 0 (0%) | 42 (19.3%) |
| Never | 4 (6.0%) | 4 (6.2%) | 0 (0%) | 1 (1.6%) | 0 (0%) | 0 (0%) | 9 (4.1%) |
| Missing | 5 (7.5%) | 0 (0%) | 2 (9.1%) | 3 (4.9%) | 0 (0%) | 1 (50.0%) | 11 (5.0%) |
| **Insufficient oversight or mentoring** |  |  |  |  |  |  |  |
| Frequently | 13 (19.4%) | 23 (35.4%) | 3 (13.6%) | 20 (32.8%) | 0 (0%) | 0 (0%) | 59 (27.1%) |
| Occasionally | 25 (37.3%) | 30 (46.2%) | 11 (50.0%) | 30 (49.2%) | 0 (0%) | 0 (0%) | 96 (44.0%) |
| Rarely | 21 (31.3%) | 10 (15.4%) | 5 (22.7%) | 6 (9.8%) | 1 (100%) | 1 (50.0%) | 44 (20.2%) |
| Never | 2 (3.0%) | 1 (1.5%) | 1 (4.5%) | 2 (3.3%) | 0 (0%) | 0 (0%) | 6 (2.8%) |
| Missing | 6 (9.0%) | 1 (1.5%) | 2 (9.1%) | 3 (4.9%) | 0 (0%) | 1 (50.0%) | 13 (6.0%) |
| **Lack of publishing raw data** |  |  |  |  |  |  |  |
| Frequently | 26 (38.8%) | 28 (43.1%) | 5 (22.7%) | 24 (39.3%) | 0 (0%) | 0 (0%) | 83 (38.1%) |
| Occasionally | 18 (26.9%) | 30 (46.2%) | 8 (36.4%) | 24 (39.3%) | 1 (100%) | 0 (0%) | 81 (37.2%) |
| Rarely | 12 (17.9%) | 5 (7.7%) | 5 (22.7%) | 8 (13.1%) | 0 (0%) | 1 (50.0%) | 31 (14.2%) |
| Never | 4 (6.0%) | 2 (3.1%) | 1 (4.5%) | 3 (4.9%) | 0 (0%) | 0 (0%) | 10 (4.6%) |
| Missing | 7 (10.4%) | 0 (0%) | 3 (13.6%) | 2 (3.3%) | 0 (0%) | 1 (50.0%) | 13 (6.0%) |
| **Lack of publishing research protocols or computer code** |  |  |  |  |  |  |  |
| Frequently | 21 (31.3%) | 25 (38.5%) | 5 (22.7%) | 28 (45.9%) | 0 (0%) | 0 (0%) | 79 (36.2%) |
| Occasionally | 19 (28.4%) | 25 (38.5%) | 6 (27.3%) | 25 (41.0%) | 1 (100%) | 0 (0%) | 76 (34.9%) |
| Rarely | 14 (20.9%) | 12 (18.5%) | 7 (31.8%) | 4 (6.6%) | 0 (0%) | 1 (50.0%) | 38 (17.4%) |
| Never | 5 (7.5%) | 2 (3.1%) | 1 (4.5%) | 2 (3.3%) | 0 (0%) | 0 (0%) | 10 (4.6%) |
| Missing | 8 (11.9%) | 1 (1.5%) | 3 (13.6%) | 2 (3.3%) | 0 (0%) | 1 (50.0%) | 15 (6.9%) |
| **Lack of publishing full results** |  |  |  |  |  |  |  |
| Frequently | 17 (25.4%) | 26 (40.0%) | 4 (18.2%) | 22 (36.1%) | 0 (0%) | 0 (0%) | 69 (31.7%) |
| Occasionally | 21 (31.3%) | 22 (33.8%) | 10 (45.5%) | 26 (42.6%) | 1 (100%) | 0 (0%) | 80 (36.7%) |
| Rarely | 17 (25.4%) | 15 (23.1%) | 4 (18.2%) | 10 (16.4%) | 0 (0%) | 1 (50.0%) | 47 (21.6%) |
| Never | 4 (6.0%) | 2 (3.1%) | 1 (4.5%) | 1 (1.6%) | 0 (0%) | 0 (0%) | 8 (3.7%) |
| Missing | 8 (11.9%) | 0 (0%) | 3 (13.6%) | 2 (3.3%) | 0 (0%) | 1 (50.0%) | 14 (6.4%) |
| **Differences in the software processing environment** |  |  |  |  |  |  |  |
| Frequently | 5 (7.5%) | 13 (20.0%) | 3 (13.6%) | 15 (24.6%) | 1 (100%) | 0 (0%) | 37 (17.0%) |
| Occasionally | 21 (31.3%) | 22 (33.8%) | 4 (18.2%) | 27 (44.3%) | 0 (0%) | 0 (0%) | 74 (33.9%) |
| Rarely | 23 (34.3%) | 24 (36.9%) | 10 (45.5%) | 15 (24.6%) | 0 (0%) | 1 (50.0%) | 73 (33.5%) |
| Never | 8 (11.9%) | 5 (7.7%) | 2 (9.1%) | 1 (1.6%) | 0 (0%) | 0 (0%) | 16 (7.3%) |
| Missing | 10 (14.9%) | 1 (1.5%) | 3 (13.6%) | 3 (4.9%) | 0 (0%) | 1 (50.0%) | 18 (8.3%) |
| **Use of proprietary data or software** |  |  |  |  |  |  |  |
| Frequently | 11 (16.4%) | 18 (27.7%) | 4 (18.2%) | 20 (32.8%) | 0 (0%) | 0 (0%) | 53 (24.3%) |
| Occasionally | 19 (28.4%) | 19 (29.2%) | 5 (22.7%) | 30 (49.2%) | 0 (0%) | 0 (0%) | 73 (33.5%) |
| Rarely | 20 (29.9%) | 24 (36.9%) | 7 (31.8%) | 6 (9.8%) | 1 (100%) | 1 (50.0%) | 59 (27.1%) |
| Never | 6 (9.0%) | 3 (4.6%) | 3 (13.6%) | 2 (3.3%) | 0 (0%) | 0 (0%) | 14 (6.4%) |
| Missing | 11 (16.4%) | 1 (1.5%) | 3 (13.6%) | 3 (4.9%) | 0 (0%) | 1 (50.0%) | 19 (8.7%) |
| **Complexity and variability of geographic systems** |  |  |  |  |  |  |  |
| Frequently | 23 (34.3%) | 31 (47.7%) | 14 (63.6%) | 22 (36.1%) | 1 (100%) | 0 (0%) | 91 (41.7%) |
| Occasionally | 18 (26.9%) | 21 (32.3%) | 4 (18.2%) | 22 (36.1%) | 0 (0%) | 0 (0%) | 65 (29.8%) |
| Rarely | 11 (16.4%) | 9 (13.8%) | 1 (4.5%) | 14 (23.0%) | 0 (0%) | 1 (50.0%) | 36 (16.5%) |
| Never | 5 (7.5%) | 4 (6.2%) | 1 (4.5%) | 0 (0%) | 0 (0%) | 0 (0%) | 10 (4.6%) |
| Missing | 10 (14.9%) | 0 (0%) | 2 (9.1%) | 3 (4.9%) | 0 (0%) | 1 (50.0%) | 16 (7.3%) |
| **Random effects** |  |  |  |  |  |  |  |
| Frequently | 9 (13.4%) | 18 (27.7%) | 5 (22.7%) | 12 (19.7%) | 1 (100%) | 0 (0%) | 45 (20.6%) |
| Occasionally | 28 (41.8%) | 25 (38.5%) | 10 (45.5%) | 28 (45.9%) | 0 (0%) | 0 (0%) | 91 (41.7%) |
| Rarely | 16 (23.9%) | 18 (27.7%) | 3 (13.6%) | 16 (26.2%) | 0 (0%) | 1 (50.0%) | 54 (24.8%) |
| Never | 3 (4.5%) | 4 (6.2%) | 1 (4.5%) | 1 (1.6%) | 0 (0%) | 0 (0%) | 9 (4.1%) |
| Missing | 11 (16.4%) | 0 (0%) | 3 (13.6%) | 4 (6.6%) | 0 (0%) | 1 (50.0%) | 19 (8.7%) |
| **Insufficient documentation about study data (metadata)** |  |  |  |  |  |  |  |
| Frequently | 21 (31.3%) | 24 (36.9%) | 6 (27.3%) | 25 (41.0%) | 0 (0%) | 0 (0%) | 76 (34.9%) |
| Occasionally | 21 (31.3%) | 26 (40.0%) | 7 (31.8%) | 23 (37.7%) | 0 (0%) | 0 (0%) | 77 (35.3%) |
| Rarely | 14 (20.9%) | 14 (21.5%) | 5 (22.7%) | 9 (14.8%) | 1 (100%) | 1 (50.0%) | 44 (20.2%) |
| Never | 3 (4.5%) | 1 (1.5%) | 1 (4.5%) | 1 (1.6%) | 0 (0%) | 0 (0%) | 6 (2.8%) |
| Missing | 8 (11.9%) | 0 (0%) | 3 (13.6%) | 3 (4.9%) | 0 (0%) | 1 (50.0%) | 15 (6.9%) |
| **Researcher positionality** |  |  |  |  |  |  |  |
| Frequently | 26 (38.8%) | 7 (10.8%) | 8 (36.4%) | 12 (19.7%) | 1 (100%) | 0 (0%) | 54 (24.8%) |
| Occasionally | 21 (31.3%) | 26 (40.0%) | 8 (36.4%) | 31 (50.8%) | 0 (0%) | 0 (0%) | 86 (39.4%) |
| Rarely | 12 (17.9%) | 23 (35.4%) | 2 (9.1%) | 12 (19.7%) | 0 (0%) | 1 (50.0%) | 50 (22.9%) |
| Never | 1 (1.5%) | 6 (9.2%) | 1 (4.5%) | 1 (1.6%) | 0 (0%) | 0 (0%) | 9 (4.1%) |
| Missing | 7 (10.4%) | 3 (4.6%) | 3 (13.6%) | 5 (8.2%) | 0 (0%) | 1 (50.0%) | 19 (8.7%) |