



Who is a postdoc? A synthesis of research on postdoc definitions

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Summary of Key Findings

PDP explored elements of the definition for ‘postdoc.’ A review of establishment-based postdoc definitions, qualitative studies, and list-assessment surveys revealed the following:

1. Establishments may have two general types of postdoc definitions: **functional definitions** and **policy-based definitions**. The former tend to *describe* the postdoc in terms of formal requirements, appointment purpose, scope, and job expectations. Policy-based definitions are *prescriptive*. They tend to focus on the realization of future outcomes, such as enhancing the quality of postdoc mentoring relationships and increasing postdoc compensation and benefits.
2. A postdoc is in the center of a complex network of relationships intended to facilitate a transition to a full-time, independent research career. These parties may include the principal investigator, the department, a mentor, a funding agency, administration officials, and postdoc associations.
3. Twelve definitional elements emerged from the content analysis of postdoc definitions from 11 highly regarded organizations with interests in postdoc populations (the “Definitions Project”).
4. Of the 12 definitional elements in the Definitions Project, only three elements were included in all definitions from all organizations/establishments: ‘training,’ ‘research focus,’ and ‘temporary.’ Qualitative studies and list-assessment surveys of establishments and individuals corroborate the importance of these elements for defining a postdoc. In fact, “a temporary position aimed at training in research” was the key elements that distinguished a postdoc from other research staff in the list-assessment surveys for establishments *and* for individuals.
5. Other elements from the Definitions Project supported by the qualitative studies and list-assessment surveys of establishments and individuals were: ‘Ph.D. or equivalent degree,’ ‘supervised by senior scholar,’ and ‘intention to be transitional to a full-time career in research.’
6. ‘Publication’ was a common element in the 11 organizational definitions analyzed in the Definitions Project. However, we suggest that ‘publication’ be considered one of the usual aspects of a postdoctoral position rather than a formal definitional component. This conclusion is also supported by the focus groups that Krosnick conducted with NPA member postdocs and Stanford postdocs.
7. Several definitional elements were not supported by Phase 2 content analysis, qualitative research, or list-assessment surveys; but they were suggested by Phase 1. These items include: ‘recent degree,’ ‘defined period of time,’ and ‘full-time position.’
 - a. Although ‘recent degree’ was a common element, it would not be useful to specify recency in terms of a specific number of years. Policies on what constitutes a recent degree vary from institution to institution. Respondents have reported a variety of term lengths, and mid-career postdocs and so-called “late bloomers” may take postdoc appointments 9-10 years after their degree.

- b. Some organizations do not define the appointment length of the postdoc appointment, but instead, review and renew the appointments yearly on a case-by-case basis. For this reason, the element ‘defined period of time’ (or a specified number of years) may exclude some individuals working as postdocs.
 - c. Krosnick’s focus groups revealed that although postdocs felt the descriptor “temporary” was pejorative, they appreciated the aforementioned problems with “defined period of time.” Another term, such as “transitional period” may help reconcile individual and establishment definitions.
 - d. We believe that it is undesirable to make ‘full-time status’ a necessary part of the ‘postdoc’ definition. It is not consistent with many institutional definitions. It may also lead to certain populations being disproportionately excluded from counts; since part-time postdocs may be more likely to have special circumstances surrounding their employment (maternity leave or ill health, for example).
8. Krosnick’s focus groups recommended inclusion of the term “postdoc” in a postdoc definition. For PhD-equivalent degreed postdocs, however, this recommendation may be problematic. Clinical scientists may not *self-identify* as “postdocs” unless they hold a formal postdoctoral appointment. Postdoc counts may be underreported if the terms “residents” or “fellows” are considered mutually exclusive of “postdocs.” In dentistry, for example, “postdoctoral training” refers to coursework towards an advanced degree for which students pay tuition. In the context of pharmacy, the term “fellowship” specifically denotes a period of mentored, postdoctoral training for a research career.

Postdoc Definitions

The Division of Science Resources Statistics (SRS), operating under a mandate from the National Science Foundation, collects data on postdoctoral researchers (“postdocs”) through four surveys: the Survey of Earned Doctorates (SED), the Survey of Doctorate Recipients (SDR), the Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS), and the Survey of College Graduates (NSCG). Of these surveys, only the GSS collects data from establishments on postdocs, however, the sample is limited to academic institutions and does not include data from government, industry, or non-profit organizations. None of the SRS surveys currently provide complete counts or in-depth characteristics of postdocs. To enhance these data collections, SRS is engaged in a multi-year effort, the Postdoc Data Project (PDP), to assess the need and feasibility of gathering more in-depth information on postdocs.

During Phase 1, the PDP identified the need to create an accurate and useful operational definition of a postdoc. During Phase 2, the PDP conducted several exercises to evaluate existing postdoc definitions and to develop suggestions for defining the population in the future. These activities were grounded in a review of postdoc definitions from prestigious organizations, government agencies, and academic institutions (“The Definitions Project”). Next, we utilized qualitative research methods and list-assessment surveys to gather more details for more detail on the elements of the postdoc definition that were frequently mentioned in the Definition Project (See Appendix A for a listing of the projects).

Our overarching question was: *Is it feasible to develop one operational definition for “postdoc” for purposes of building a sample frame and screening potential respondents?* We borrow from Babbie’s (1990)¹ definition of “operationalization” as the process of arriving at observations that specify elements within concepts.

More specifically, we were interested in learning:

- Are there definitional elements that distinguish a postdoc from other research staff?
- In what ways are postdoc definitions similar or different between PhD-degreed and professional degreed fields?
- Do postdocs define themselves differently than institutions define them?

This report summarizes postdoc definition research conducted during Phase 2 of the PDP and makes recommendations for future phases of the project.

¹ Babbie, Earl, *Survey Research Methods*, Second Edition, 1990, Belmont, CA: Wadsworth Publishing Company, pp. 121-123.

Starting Point: Phase 1 Recommendations

PDP Phase 1 saw the need for a postdoc definition that would give establishments, organizations, and agencies guidance on who to consider when responding to a survey, keeping in mind that the definition of for “postdoc” must be broad enough to ensure inclusion of postdocs in less traditional departments or settings, postdocs across sectors of employment, and postdocs in PhD-equivalent fields. Their recommendation was to begin with the GSS definition, and modify it in the following ways²:

- Change: “The appointment is primarily for the purpose of training in research or scholarship” to include ‘career development’ as a concept
- Drop: “The appointee works under the supervision of a senior scholar in a department or research unit affiliated with the university”
- Add: reference to ‘publishing’
- Add: reference to ‘fulltime research or scholarship’

No change to the following bulleted items of the GSS definition:

- The appointee holds a PhD or equivalent doctorate (e.g., ScD, MD, DDS, DO, DVM, or foreign degrees equivalent to U.S. doctorates)
- The doctorate was awarded recently, generally within the last 5 years
- The appointment is for a limited term, the limit generally being 5-7 years
- GSS instruction related to clinical fellows (i.e., exclude clinical fellows “unless research training under supervision of a senior mentor is the primary purpose of the appointment”)

Framework for Phase 2: The Definitions Project

Building upon Phase 1 recommendations, SSG began its exploration into postdoc definitional issues with a content analysis of postdoc definitions used by eleven highly regarded organizations with interests in postdoc populations (see: Appendix B for a compendium of those definitions). Early in the process of searching for postdoc definitions, we observed an important distinction between two general types of definitions: descriptive **functional definitions**, such as the one offered by the National Academy of Sciences, and prescriptive **policy-based definitions** as exemplified by the definition provided by the National Postdoctoral Association. Functional definitions tended to define “postdoc” in terms of formal requirements, appointment purpose, scope, and job expectations. Policy-based definitions tended to focus on the realization of future outcomes, such as enhancing the quality of postdoc mentoring relationships and increasing postdoc compensation and benefits.

² Apprise (March, 2006). *Postdoc Data Project Design Options*. Report prepared for the Division of Science Resources Statistics of the National Science Foundation.

We collected the following data about each organization: verbatim definitions, location, activity, and unique phrases within each definition. We then identified key components that cross linked definitions. We found that the definitions had no more than seven points (or phrases). Most had 5-6 points. We observed significant overlap among definitions, which may suggest some borrowing or sharing of phrases between organizations. However, there were no perfect matches among definitions across organizations. Most definitions contained several (or many) of the following 12 postdoc elements:

1. 'PhD or equivalent'
2. 'Recent PhD or equivalent'
3. 'Foreign equivalent to a PhD'
4. 'Position involving mentorship'
5. 'Position requiring supervision'
6. 'Position that was preparatory for something else'
7. 'Position focused on training in research or scholarship'
8. 'Temporary position/position for a defined period of time (occasionally, an exact number of years was provided)'
9. 'Full-time position'
10. 'Publication expected, or at least credit given for publication'
11. 'Clinical fellows included if focus of their activities is on research'
12. 'Location' (some said "academic or similar research institution")

We then created a profile of the organizations, highlighting each of the elements in their definitions. Table 1 shows the similarities and differences in postdoc definitions. The table helps us see that only three elements were fully shared across all organizations: 'research focus,' 'training focus,' and 'temporary position.' The elements were further probed in qualitative explorations, list-assessment surveys, and questionnaire-development tasks during Phase 2.

Table 1. Profile of 11 Organizational Postdoc Definitions

Definitional Element	NAS	NSF/NIH 2007	GSS	SED 2008	SDR 2006	AAU	NPA	Sigma Xi	AAMC	FASEB	UC
PhD / PhD-Equivalent											
Recent degree?											
Foreign degree equivalent?											
Research focus											
Preparatory for something else											
Training focus											
Temporary / Defined period of time											
Supervised											
Mentorship											
Full-time											
Publications											
Clinical fellows?											

Next, we analyzed postdoc definitions for the meanings, locations and functions of the various elements. After *extracting* discrete elements such as ‘mentorship,’ ‘training,’ and ‘preparatory for something else,’ we felt that we needed to re-think the elements and make our understanding of them more sensitive to context. For example, ‘mentorship’ could be an actual component of the postdoc experience or an ideal held by an administrator.

We identified six preliminary domains that tend to organize the focus and subject matter of the definitional elements. The first domains that we identified were:

- Postdoc as an ‘appointment’
- Postdoc as an ‘individual’
- Postdoc as an ‘experience’
- Postdoc as a ‘transitional period’
- Postdoc job titles
- Postdoc relationship with employers, mentors, and supervisors

We tabulated all occurrences of the elements in the context of these domains and their place and function within the postdoc definitions. This led to a list of 63 “hits” or times when the elements were mentioned, (including duplicate mentions). We organized them via concept mapping, which depicts a hierarchy of information ranked from high inclusiveness or generality to high exclusivity or specificity. We numbered all of the elements on the map from 1-42 (in parentheses after the element listing in Appendix C) and calculated simple congruence coefficients to reflect how similar or dissimilar each organization’s

definition was to an organization that would use all 42 elements in its definition. These coefficients ranged from .07 for the SED and SDR surveys (fewest definitional elements) to a high of 40.5 for FASEB and UC (most definitional elements). We calculated averages for how many times each definitional element was mentioned by each organization. This resulted in a ranking of postdoc elements. Table 2 below shows those elements mentioned 50 percent or more of the time.

Table 2. Ranking of Postdoc Elements among the 11 Institutional Definitions

Attribute	Percent (%)	Concept Map Element #
Appointment is temporary	1.00	1
Individual has a Ph.D.	0.73	24
or a Ph.D. equivalent degree	0.64	25
Preparation for a full-time career	0.64	14
Appointment is supervised	0.64	3
By a scholar or senior scholar	0.55	5
Transitional period of training	0.55	17
Training in research	0.55	18
Postdoc is expected to publish	0.55	31

Next, we assessed the definitional elements that emerged in the context of the concept map. From Table 3 below, we see that the concept domains of “appointment,” “individual”, and “transition period” captured the most commonly used definitional elements.

Table 3. Summary of Postdoc Elements by Project

Attribute	Percent (%)	Concept Map Domain	Concept Map Element Reference #
Appointment is temporary	1.00	Appointment	1
Individual has a Ph.D.	0.73	Individual	24
or a Ph.D. equivalent degree	0.64	Individual	25
Preparation for a full-time career	0.64	Transitional Period	14
Appointment is supervised	0.64	Appointment	3
By a scholar or senior scholar	0.55	Appointment	5
Transitional period of training	0.55	Transitional Period	17
Training in research	0.55	Transitional Period	18
Postdoc is expected to publish	0.55	Individual	31

The concept map, shown in Appendix C, was our first visualization of postdoc definition elements. It demonstrates how the postdoc seems to be in the center of a complex network of relationships—with the PI, the department, a mentor that may or may not be a supervisor, a funding agency, administration

officials, and postdoc associations available for the purpose of facilitating a transition to a full-time, independent research career.

This analysis revealed that the term “preparation for something else” referred specifically to ‘preparation for a full-time career.’ This interpretation was broadly supported across organizations and identified the importance of the postdoc position as a transitional period of training.

We observed that “recency of the PhD” (map attribute 29) and whether a qualifying degree could be a “foreign-equivalent doctorate” (26) were not very commonly included in the establishment definitions. The concept map also demonstrates how diffuse and unhelpful concepts like ‘mentoring’ and ‘apprenticeship’ are as definitional elements, at least at this point. Part of the problem with these concepts is that they are oriented toward future outcomes and are not particularly helpful as clear statements about the here and now.

We assume that the most frequently used definitional elements of institutional definitions are representative of how postdocs are identified (and self-identify) in practice. Therefore, a “postdoc” is “a person with a PhD or equivalent degree in a temporary appointment supervised by a senior scholar (or other staff member) for the purpose of training in research. The postdoc is expected to publish and his/her appointment is intended to be transitional to a full-time career in research.”

Upon further reflection, we felt that “person” was not a particularly descriptive place-holder here, given the very high premium placed on space and time in survey questionnaires. Our background research suggested that ‘postdoc’ hybridizes familiar labels like “student,” “trainee,” and “employee”; so that these discrete categories operate in concert with one another. Thinking about a definition from this perspective, we thought it might be useful to suggest that “a person” might be better replaced by “an employee, trainee, and/or student.”

Definitional Elements that Distinguish Postdocs from Other Research Staff

Turning our attention to other projects in Phase 2, we looked for support or refutation of the emergent elements of a postdoc definition from the Definitions Project, and the Phase 1 recommendation. Based on data collected as part of the establishment list-assessment survey, the site exploration interviews, the employer-based focus groups, and the GSS Respondent Behavior Survey, we see several definitional elements consistently surface in defining “postdoc.” These elements are:

- PhD / PhD-equivalent degree
- Temporary position (but not the use of the phrase “defined period of time”)
- Focus on training
- Focus on research
- A position that is aimed at preparation for full-time career
- A position that is supervised by a senior scholar

Many establishments also reported that publishing is often expected of postdocs (especially in academic establishments) or at least is an opportunity for postdocs (for the non-academic establishments). For establishments that reported that publication was not officially required at an institutional level, several suggested that the PI almost always required this (at least, in some disciplines). We conclude that ‘publication’ may better be considered one of the usual aspects of a postdoctoral position, rather than an essential definitional element.

Phase 1 suggested including “recent degree” and providing a number of years to define ‘recency’—such as in the GSS stipulation that, “the doctorate was awarded recently, generally within the last 5 years.” Phase 2 findings refute this suggestion. The wide spread of years and variability in institutional policies reported in the establishment list-assessments and site exploration interviews suggest that it would not be useful to specify a number of years out of award of a PhD or PhD-equivalent degree. We saw many different term lengths in the Phase 2 projects, not to mention discussion of mid-career postdocs and so-called “late-bloomers” who may take postdoc appointments 9-10 years after their degree.

Phase 1 also supported “defined period of time.” This element does not appear to be widely supported as an attribute of postdoc definitions in the Phase 2 projects, in part because postdoc terms are often driven by funding terms, and frequently in non-academic settings, postdocs are reviewed and renewed annually on a case-by-case basis. Further, when asked about the term-limited nature of postdoc appointments in the site explorations, many institutions reported that postdocs who stay past a certain time are converted to a title code that designates a permanent staff research employee. This is useful in that we want to remove individuals who are fulfilling permanent staff responsibilities from postdoc counts, but it may lead to undercounts if this is more of a formal transformation that is done for bureaucratic purposes without changing either the tasks of the individual and the fact that s/he continues to be mentored and to consider his/her role to be preparatory.

Although Phase 1 suggested inclusion of “full-time position,” we believe that it is undesirable to make this element a necessary part of the postdoc definition. It may lead to certain populations being disproportionately excluded from counts; since part-time postdocs may be more likely to have special circumstances surrounding their employment (maternity leave or ill health, for example).

Finally, the data from the PDP Phase 2 projects show that the characteristics most effective in distinguishing postdocs from non-postdocs were ‘temporary position’ and ‘training in research.’

Summary

Some differences *across* and *within* institutions emerge with respect to defining postdocs; we suspect that they reflect differences in whether individual component are part of the “essence” of being a ‘postdoc,’ or merely a characteristic of many postdocs. While some institutions may consider an attribute central to the definition of ‘postdoc,’ others could consider it coincidental.

Definition content analysis, qualitative studies and list-assessment surveys corroborate the importance of a “temporary position that provides training in research” for distinguishing a postdoc from other research staff in surveys. Other definitional elements important to defining a postdoc included ‘PhD or equivalent degree,’ ‘supervised by senior scholar,’ and intention to be ‘transitional to a full-time career in research.’

Phase 1 research recommended inclusion of ‘recent degree,’ with a ‘defined number of years,’ and ‘full-time’ status. These elements were not supported by Phase 2 content analysis, qualitative research, and list-assessment surveys.

Job Titles

Many institutions reported titles that include the word “postdoc”, such as “Postdoctoral Fellow” or “Postdoctoral Research Associate.” However, some institutions used codes that are less obviously earmarked for postdocs, of which “Research Associate” is the most common. The site explorations, GSS RBS, and establishment list-assessments collectively revealed 70-80 distinct titles for postdocs.

Additionally, some institutions—particularly those with formal policies—made title distinctions among postdocs based on funding source. Postdocs supported by fellowships may be designated as “trainees”; those funded indirectly through grants to their PIs are often considered “employees.” These differences sometimes led to the provision of benefits and other services to employees that are not provided to trainees, which may served as a frustration for postdocs and for institutions who wanted to provide comparable services to all postdocs.

In cases where different record-keeping procedures were used for different postdoc types, more detailed information was generally available for postdocs who are considered employees of the institution (since they are part of the payroll system). These distinctions may contribute to the decentralization of postdoc records; if information about different kinds of postdocs is contained in different systems. Decentralized records, in turn, may mean few individuals are aware of all of the various systems and title codes that designate postdocs.

Similarities and Differences in Postdoc Definitions in PhD-degreed and Professional Degreed Fields

In our review of professionally-degreed postdocs, we noted some differences in training paths and titles for individuals training for research careers. This heterogeneity may affect how postdocs are defined in such settings. Members of this population may be postdocs at some point in their careers, but the multiplicity of career routes undermines efforts to identify them—even when examining a single, delimited research focus. In exploring the paths to diabetes research, for example, we could make a case for identifying any of the following as postdocs:

- An MD/PhD-program graduate who secures a formal postdoctoral appointment in diabetes research
- A traditional MD-program graduate who secures a formal postdoctoral appointment in diabetes research
- An MD/PhD recipient in a conventional (non-research) endocrinology residency who plans on conducting diabetes research in the future
- A traditional MD recipient in a PhD-granting research residency who will conduct diabetes research in the future
- A newly accredited endocrinologist secures an NIH grant to conduct diabetes research through a research-training program [possibly through a Clinical and Translational Science Award (CTSA)]

The heterogeneity in this population not only complicates identifying *when* a clinical researcher is a postdoc—it also complicates identifying what *types* of clinical researchers are postdocs. Postdoc counts may be underreported if the terms “residents” or “fellows” are considered mutually exclusive of “postdocs.” The American Board of Internal Medicine and American Board of Pediatrics both offer PhD-

granting research residencies. Similarly, some veterinary residencies require trainees to take graduate coursework leading to an advanced degree in research. In pharmacy, the equivalent programs are called “fellowships” (in this field, “residency” denotes *clinical* training). Trainees in these programs match many definitional elements of “postdoc” and are a population of interest for PDP.

Clinical scientists may not *self*-identify as “postdocs” unless they hold a formal postdoctoral appointment. It is possible that the term might be considered pejorative, since it occludes this population’s clinical expertise and board licensure. Further, ‘postdoc’ has context-specific meanings delimited by professional field. In dentistry, for example, “postdoctoral training” refers to coursework towards an advanced degree for which students pay tuition. Conversely, a population of interest for PDP may hold titles other than “postdoc.” In the context of pharmacy, the term “fellowship” specifically denotes a period of mentored, postdoctoral training for a research career. “Fellowship” is used more loosely in other fields: it may include predoctoral training or feature a clinical focus.

The descriptor “PhD-equivalent” may prove equally problematic—especially for foreign-degreed physicians from countries that use a designation other than “MD.” In India, for example, physicians are awarded an “MBBS.” They may be more likely to identify their degree as equivalent to an MD than PhD. This confusion may be exacerbated by the heterogeneity of non-US degree structures. In India, to reprise the previous example, the MBBS is earned immediately after high-school as opposed to US professional degrees, which require some undergraduate coursework. Further, it is not a terminal degree, since MBBS recipients may receive a higher professional degree. In the US, additional training in medicine (such as a fellowship or specialty training) does not confer another degree.

Earlier phases of PDP research indicated that the term “early-career researcher” may be more useful than “postdoc.” For allopathic physicians, however, the designation “early career” may be problematic. Even after earning their terminal degree, MDs may not practice medicine until they successfully complete a residency and licensure examinations—a process that may take 2-8 years. “Early career” may be interpreted to include recent medical school graduates who have not started a residency, residents, MDs in formal postdoc appointments, and newly accredited physicians many years from earning their degree.

Further, the term “translational research” conflates professional degreed researchers with traditional PhDs. The University of Michigan CTSA, for example, includes a Postdoctoral Translational Scholars Program (PTSP) “which is designed to prepare individuals with a PhD in a biomedical scientific or social science discipline for independent careers in translational research.”³ Since “translational research” fails to distinguish clinical scientists from their PhD counterparts, it is not conducive to closing the empirical gap in professional-degreed postdoc data.

The term “physician-scientist” and the philosophy of bringing “the bench to the bedside” have been widely embraced by professional societies, medical schools, and peer-created resources. Other clinical scientist populations self-consciously compare themselves with MD researchers by describing themselves as veterinarian-scientists, dentist-scientists, or pharmacist-scientists. These terms may be more relevant to clinical researchers than “postdoc.” Therefore, it may be helpful to conduct a targeted, qualitative data collection to evaluate how clinical researchers define themselves—and how they react to the terms “postdoc,” “early-career,” “PhD equivalent,” and “physician-scientist.”

³ Michigan Institute for Clinical and Health Research. *Postdoctoral Translational Scholars Program*. Retrieved October 14, 2008, from <http://www.michr.umich.edu/ptsp/>

Similarities and Differences between Establishment Definitions and Postdoc Self-Definitions

This part of the report will summarize our findings on how postdocs *self-identify*. Studying *organizational* definitions of ‘postdoc’ is important for understanding the possible strategies to identify and count postdocs—including the biases that may emerge from using various definitions. Knowing how *individuals* (postdocs) define themselves helps to connect formal characteristics of the position with an individual career path. The sources available for studying individual postdoc definitions include the list-assessment surveys for individuals (iRLAS), NSF grant database survey, and Jon Krosnick’s focus groups with postdocs from the NPA and one academic institution.

For the purposes of analyzing individual postdoc definitions, we selected a subsample from the iRLAS. The sample comprised individuals from a professional organization who did not indicate that they were students at the time of the survey. Respondents from the two academic institutions were excluded. Individuals in these lists were homogenous both in their field and institution; so their “postdoc” definitions may not be nationally representative. The professional organization’s list and NSF Grant Database included individuals from different institutions and were more balanced in terms of fields and therefore, the results appeared more meaningful. In the NSF Grant Database Survey, the answers about study participants’ positions in 2008 were used (versus 2006 positions, which had more item missing data than the 2008 questions)⁴. The iRLAS instrument included seven definitional elements; the NSF Grant Database Survey instrument had 12 elements.

Possession of a Doctoral Degree and Publication Requirement

⁴ In variables related to the year of 2008 there are 11-13 cases with missing data, while in the same variables related to the year of 2006 there are 25-26 cases with missing data.

Table 4 shows how applicable the definitional elements were for the individuals in postdoc and postdoc-like positions in the iRLAS and NSF grant database survey. 'Possession of a doctoral degree' and 'publications' are important for nearly *all* of these individuals (89-95%). In Krosnick's focus groups, participants referenced 'possession of a doctoral degree' as a necessary element of a postdoc position; it was recommended that publication requirement be dropped due to the different publication needs of postdocs in academia and industry (or desire to pursue academic or non-academic career). The data reveal, however, that a very large number of postdocs and individuals in postdoc-like positions still consider publishing an important aspect of their professional identity.

Table 4. Definitional Elements selected as a Formal Requirement and/or Expectation in iRLAS and NSF Grant Database (valid percent)

The position	AAAS List (%)	NSF Grant Database (%)
Requires a Ph.D. or an equivalent doctorate degree, such as an M.D.	94	95
Requires publication of research in scholarly journals.	89	90
Is primarily for the purpose of providing research training.	79	76
Is for a defined period of time.	73	76
Is temporary.	67	67
Requires that you work under a senior scholar.	69	62
Requires that the doctorate was recently awarded	54	47

Temporary Period of Supervised Training

A majority of respondent (62%-79%) indicated that ‘temporary status,’ ‘training as its intended purpose,’ and ‘supervision/mentoring’ were applicable to their positions. These elements were less popular than ‘possessing a doctorate’ and ‘publications’—although it is possible that these contradictory findings are an artifact; since not all participants in the study were postdocs. Some respondents occupied other kinds of research or teaching positions. They were included in the list either due to inconsistent selection criteria or to the time lag and changing positions during that time.

Focus group participants echoed the importance of ‘training,’ and ‘supervision.’ They described these elements as essential descriptors. ‘Temporary status’ was also described as a necessary element to accommodate the idea of postdoc appointment as a transitional phase in the individual career.

Definitional Elements Distinguishing Postdoc from Other Research Positions from an Individual Perspective

The NSF grant database survey investigated the difference between postdocs and other research positions from the perspective of the individual. We asked all the participants if they considered themselves “postdocs” (in iRLAS, this question was asked of only a small group of people who indicated that they are not working for pay and not engaged in research activities). We consider self-identification as a postdoc to be a useful measure in distinguishing postdoc appointments from other research or teaching positions. In Krosnick’s focus groups, participants recommended that the word “postdoc” is somehow kept in the definition, which suggests a common understanding among postdocs about what constitutes their status.

The NSF grant database questionnaire captures whether each element is a 1) formal requirement, 2) unspoken expectation, 3) both, or 4) neither. The questionnaire included the 12 definitional elements compiled from earlier work on the Postdoc Data Project (PDP). Of the self-identified postdocs in 2008, more than one-half selected *all* of these definitional elements as required and/or expected (see

Table 5). At least 90% selected 8 out of the 12 elements. The most important elements that distinguished postdocs from non-postdocs were ‘temporary position,’ ‘a position for a defined period of time,’ and ‘position intended to provide training in research skills.’

Table 5. Definitional Elements selected as a Formal Requirement and/or Expectation among Postdocs and Non-Postdoc

Definitional Element	Postdocs in 2008 (%)	Non- postdocs in 2008 (%)	Total (%)	Difference b/w postdocs and non-postdocs
Requires a PhD or an equivalent degree	100	87	95	13
Is intended to provide training in research skills	96	45	76	51
Is for a defined period of time	96	47	76	49
Is temporary	94	26	67	69
Requires publication of research in scholarly journals	94	83	90	11
Is intended to prepare you for an independent career	93	55	78	38
Is intended to advance professional skills	93	70	84	23
Requires a full-time commitment to research	90	68	82	22
Requires that you are mentored by a senior scholar	79	32	61	47
Requires that you are supervised by a senior scholar	79	36	62	43
Requires that you contribute to the program through seminars, lectures, or other teaching responsibilities	60	77	66	-17
Requires that the doctorate was recently awarded	56	33	47	23
<i>N</i>	72	47	119	
<i>Missing</i>			12	

Table 6 summarizes the results for postdocs and non-postdocs in formally required elements and shows the difference between the two groups. The difference is important for identifying exclusionary criteria that distinguish postdocs from non-postdocs. For example, “intention to advance professional skills” is a formal requirement for postdocs nearly as often as for other positions (the difference is only 7%). The “formal publication” requirement was stronger for other types of positions (primarily for faculty) than for postdocs. The criterion that best distinguishes postdocs from non-postdocs at the formal level is “temporary status” (60% difference).

Table 6. Difference between postdocs and non-postdocs in formally required⁵ elements

Definitional Element	Postdocs in 2008 (%)	Non-postdocs in 2008 (%)	Total (%)	Difference b/w postdocs and non-postdocs
Is temporary	79	19	55	60
Is for a defined period of time	79	40	64	39
Is intended to prepare you for an independent career	40	13	29	28
Requires a full-time commitment to research	74	49	64	25
Requires a PhD or an equivalent degree	97	77	89	21
Is intended to provide training in research skills	40	21	33	19
Is intended to advance professional skills	35	28	32	7
Requires publication of research in scholarly journals	40	45	42	-4
N	72	47	119	
Missing			12	

Considering “expectations” (rather than formal requirements), “temporary status” was a strong divider between postdocs and other positions (63% difference, see Table 7). This element overlapped to some degree with “defined period of time”— which was a strong exclusionary criterion (49%) in its own right. Both suggest that a postdoctoral appointment is characterized by its temporary, transitional nature.

Another expectation that separates postdoc positions from non-postdoc ones is the “intention to provide training in research skills.” Eighty-six percent of postdocs mention it as expected from their position, while only 43% of non-postdocs do so.

Table 7. Difference between postdocs and non-postdocs in expected⁶ elements

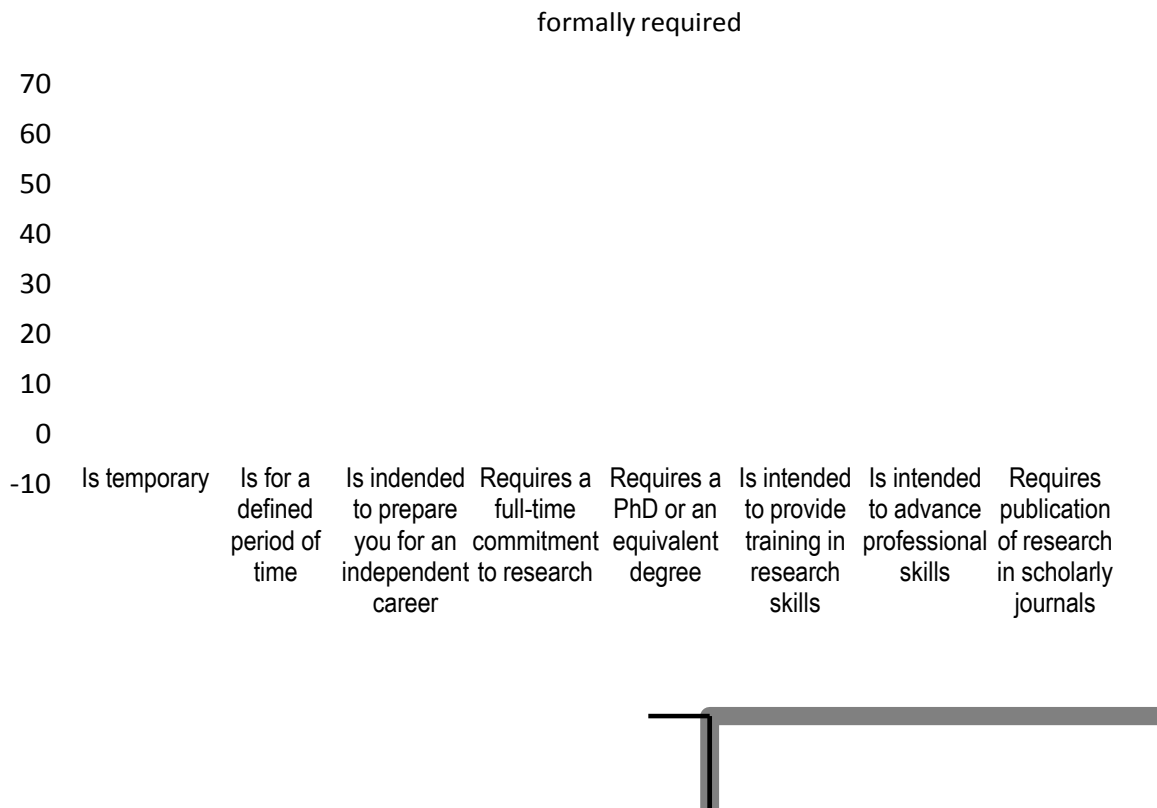
Definitional Element	Postdocs in 2008 (%)	Non-postdocs in 2008 (%)	Total (%)	Difference b/w postdocs and non-postdocs
Is temporary	85	21	60	63
Is for a defined period of time	85	36	66	49
Is intended to provide training in research skills	86	43	69	44
Is intended to prepare you for an independent career	83	53	71	30
Is intended to advance professional skills	82	66	76	16
Requires a full-time commitment to research	83	68	77	15
Requires a PhD or an equivalent degree	97	85	92	12
Requires publication of research in scholarly journals	86	79	83	7
N	72	47	119	
Missing			12	

⁵ This table contains combined results for response options “Both formally stipulated and expected” and “Formally stipulated, but not expected”.

⁶ This table contains combined results for response options “Both formally stipulated and expected” and “Expected, but not formally stipulated”.

Figure 1 presents the difference between postdocs and non-postdocs in formally required and expected elements. In most cases, expectations distinguished postdoc positions from non-postdoc positions better than formal requirements. “Intention to provide training in research skills,” for example, was much stronger as an expectation than as a formal requirement. The exceptions are the “full-time commitment to research” and “PhD degree” requirements.

Figure 1. Difference (in %) between postdocs and non-postdocs



Comparison of Individual and Establishment Definitions

Data from the establishments interviewed during Phase 2 suggested that a postdoc is “a person who has a PhD or equivalent degree who has been awarded a temporary appointment supervised by a senior scholar (or other staff member) for the purpose of training in research. The postdoc is expected to publish and his/her appointment is intended to be transitional to a full-time career in research.”

Interestingly, from an individual perspective, we see parallel importance placed on ‘temporary appointment’ (postdocs in Krosnick’s focus groups preferred “defined period of time” over “temporary” as they felt that the latter had negative connotations); ‘supervision by a senior scholar,’ ‘training in research,’ and ‘preparation for an independent career.’ Individual postdocs diverged from establishments by expressing a desire to include ‘mentorship,’ and the term “postdoc” in the definition.

Summary

PDP Phase 1 saw the need for a postdoc definition that would give establishments, organizations, and agencies guidance on who to consider when responding to a survey, keeping in mind that the definition of for “postdoc” must be broad enough to ensure inclusion of postdocs in less traditional departments or settings, postdocs across sectors of employment, and postdocs in PhD-equivalent fields. In Phase 2, the PDP explored elements of the definition for postdoc through a review of establishment-based postdoc definitions, qualitative studies, and list-assessment surveys.

Part of the confusion with postdoc definitions – and partly the reason for variation – is that establishments may have two general types of postdoc definitions: **functional definitions** and **policy-based definitions**. The former tend to *describe* the postdoc in terms of formal requirements, appointment purpose, scope, and job expectations. Policy-based definitions are *prescriptive*. They tend to focus on the realization of future outcomes, such as enhancing the quality of postdoc mentoring relationships and increasing postdoc compensation and benefits.

Relationships that postdocs have with others as part of their career development have an impact on the definition of their roles. A postdoc is in the center of a complex network of relationships intended to facilitate a transition to a full-time, independent research career. These parties may include the principal investigator, the department, a mentor, a funding agency, administration officials, and postdoc associations.

Twelve definitional elements emerged from the content analysis of postdoc definitions from 11 highly regarded organizations with interests in postdoc populations. Of the 12 definitional elements in the Definitions Project, only three elements were included in all definitions from all organizations/establishments: ‘training,’ ‘research focus,’ and ‘temporary.’ Qualitative studies and list-assessment surveys of establishments and individuals corroborate the importance of these elements for defining a postdoc. In fact, “a temporary position aimed at training in research” was the key elements that distinguished a postdoc from other research staff in the list-assessment surveys for establishments and for individuals.

Other elements from the Definitions Project supported by the qualitative studies and list-assessment surveys of establishments and individuals were: ‘Ph.D. or equivalent degree,’ ‘supervised by senior scholar,’ and ‘intention to be transitional to a full-time career in research.’ ‘Publication’ was a common element in the 11 organizational definitions analyzed in the Definitions Project. However, we suggest that ‘publication’ be considered one of the usual aspects of a postdoctoral position rather than a formal definitional component. This conclusion is also supported by the focus groups that Krosnick conducted with NPA member postdocs and Stanford postdocs.

Several definitional elements were not supported by Phase 2 content analysis, qualitative research, or list-assessment surveys; but they were suggested by Phase 1. These items include: ‘recent degree,’ ‘defined period of time,’ and ‘full-time position.’ Although ‘recent degree’ was a common element, it would not be useful to specify recency in terms of a specific number of years. Policies on what constitutes a recent degree vary from institution to institution. Respondents have reported a variety of term lengths, and mid-career postdocs and so-called “late bloomers” may take postdoc appointments 9-10 years after their degree. Some organizations do not define the appointment length of the postdoc appointment, but instead, review and renew the appointments yearly on a case-by-case basis. For this reason, the element ‘defined period of time’ (or a specified number of years) may exclude some individuals working as postdocs. Krosnick’s focus groups revealed that although postdocs felt the descriptor “temporary” was pejorative, they appreciated the aforementioned problems with “defined period of time.” Another term, such as

“transitional period” may help reconcile individual and establishment definitions. We believe that it is undesirable to make ‘full-time status’ a necessary part of the ‘postdoc’ definition. It is not consistent with many institutional definitions. It may also lead to certain populations being disproportionately excluded from counts; since part-time postdocs may be more likely to have special circumstances surrounding their employment (maternity leave or ill health, for example).

Krosnick’s focus groups recommended inclusion of the term “postdoc” in a postdoc definition. For PhD-equivalent degreed postdocs, however, this recommendation may be problematic. Clinical scientists may not *self-identify* as “postdocs” unless they hold a formal postdoctoral appointment. Postdoc counts may be underreported if the terms “residents” or “fellows” are considered mutually exclusive of “postdocs.” In dentistry, for example, “postdoctoral training” refers to coursework towards an advanced degree for which students pay tuition. In the context of pharmacy, the term “fellowship” specifically denotes a period of mentored, postdoctoral training for a research career.

Appendix A: Project List

This report on research conducted by SSG on establishment-based postdoc definitions is drawn from the following sources:

- **Postdoc Definitions Project:** a study of formal definitions of ‘postdoc’ used by government, scientific and professional societies, academic institutions, postdoc associations and advocacy groups. Topics covered include definition domains, elements and meaning arising from a system of relations. Postdoc definitions will be explored by a semiotics/discourse analysis of definition domains and components.
- **Postdoc Records Site Explorations:** semi-structured telephone interviews designed to (1) collect information to inform methodologies to locate and recruit the most knowledgeable/best respondents within institutions and (2) further explore themes in postdoc definitions to develop an operational postdoc definition to use in subsequent surveys. The basic premise of the effort was to approach each institution from a variety of offices and to follow leads to one or more knowledgeable sources of postdoc-related data.

Interviews took place between February and April, 2007. Within academic institutions, we tracked paths to the knowledgeable source of postdoc-related data from an average of five entry points. An entry point was defined as a preselected office within the institution that we thought might have knowledge about postdocs. Within non-academic institutions, we typically approached one or two entry points, depending on what we learned as we explored the organizational structure and the available contact information provided on the institutions’ websites.

The site explorations highlighted the differences across academic and non-academic institutions with regard to contact protocols and varying levels of effort for reaching a knowledgeable contact about postdocs. Further noted, one single department / office / person did not emerge as the knowledgeable contact for postdoc-related data. Institutions varied in their organizational structure, and the “knowledgeable contacts” were located in different offices depending on that structure. Further, the knowledgeable source about postdocs was not readily known across offices in the institution.

Higher-level administrators were often willing and able to provide information about postdoc-related policies and definitional issues. However, a single person cannot always provide all of the postdoc information—there appeared to be a split between individuals with knowledge on the policies and definitions and individuals with the ability to provide actual counts. For this reason, it is likely that there will be a main respondent and another person designated to extract data.

Related to data source and data structure, the funding source influences postdoc position titles and where information about postdocs is stored. Postdocs are paid in a number of different ways, depending on funding source, which, in turn, affects which databases store information about them and the way these postdocs are coded in institutional databases.

- **Employer Focus Group Interviews:** four focus groups in Washington DC, Boston, and San Francisco; explored 1) the definition of a postdoc, 2) postdoc data storage and maintenance, and 3) reporting of postdoc survey data. The participants were selected for their knowledge of postdoc data. They included academic administrators at both the university level and department level; human resource administrators; representatives from national professional organizations; and

postdocs. Every effort was made to contact both representatives from academic and non-academic institutions.

Each session was video- and audio-taped and transcribed by FocusVision, a company that specializes in focus group support services. FocusVision provided live video transmission of the focus groups via the Internet so that SRS staff members could view the sessions from their PCs. Data collection took place March – April, 2007.

The focus groups revealed more variation than consistency within institutions regarding postdoc policies, definition of a postdoc position, and record-keeping. Typically two definitions existed for postdocs within institutions: a functional (working) definition and a policy (official) definition). Postdoc data records don't usually contain needed information such as information about foreign-degrees or funding sources for current positions.

- **Graduate Study Survey Respondent Behavior Survey (GSS RBS):** a multimode survey of GSS departmental contacts designed to assess respondent behavior and perceptions of data quality during the 2005 GSS. The GSS RBS was designed as a short web-based interview with telephone follow-up. Respondents were initially notified by U.S. postal mail letter. Data collection took place during the spring and early summer, 2006. Topics include the impact of postdoc definitions on data quality, respondent reading of postdoc definitions, departmental definitions, ranking of definition components, and open-ended comments from respondents recommending improvements in the clarity of definitional elements.
- **List-Assessment Interview (LAI) for establishments:** list-assessment survey designed to assess the quality of data in the lists. It evaluated the overlaps and gaps among the lists, particularly for nonprofit organizations and establishments that may hire foreign-degreed individuals and those with PhD-equivalent degrees. Ultimately, we wanted to learn if the list had potential for contributing to a comprehensive frame of establishments that employ postdocs. More specifically, we set out to learn: (1) the proportion of establishments on a given list employ postdocs; (2) level of effort required in finding a knowledgeable contact about postdocs at the institution; (3) the definition of a postdoc (taking into consideration the elements that emerged from earlier background research); and (4) if we would be able to obtain a list of individuals who may be in postdoc positions at the establishments on the lists.

The establishment LAI was designed as a short interview, about 10-15 minutes in length. The interview was a mixed-mode survey, involving web-based interview and telephone interview. Respondents were initially notified by U.S. postal mail letter. Data collection took place between September and December, 2007 with five establishment-based lists. No incentives were offered.

- **Rapid List-Assessment Interview (LAI) for individuals:** list-assessment survey designed to assess the quality of data in the lists from a professional organization, academic institution, and from the establishment LAI. It evaluated the overlaps and gaps among the lists, particularly for foreign-degreed individuals and those with PhD-equivalent degrees. The individual LAI was designed as a short interview, about 10-15 minutes in length. It was conducted in two releases: the first, mixed-mode and the other, a web instrument.
- **NSF grant database survey:** a survey designed to assess the utility of using data filed annual by federal grant recipients to create a sampling frame of individual postdocs. The sample contained 207 cases, and data collection took place between July 8, 2008 and August 18, 2008. The study's

mixed-mode approach combined an online survey (1 e-mail invitation and up to 3 e-mail reminders) with phone reminders for non-respondents.

- The response rate was 63% (AAPOR 2 response rate). The results of the survey showed that 60% of the respondents to the study were self-identified postdocs. This survey also illuminated some of the definitional elements that distinguish self-identified postdocs and non-postdocs. ‘Temporary status’ was the criterion that best distinguishes postdocs from non-postdocs *both* as a formal requirement *and* an expectation (60% difference between postdocs and non-postdocs in reporting temporary status as a formal requirement and 63% – as an expectation). ‘Intention to provide training in research’ was another expectation much more relevant for postdocs than for non-postdocs (44% difference).
- **Krosnick’s focus groups:** a total of six focus groups conducted between March 31 and April 1, 2007. One session included postdocs from a single academic institution. The rest were held at the 2007 Annual Meeting of the National Postdoctoral Association (NPA); they included postdocs from institutions across the US. A total of fifty individuals—mostly in science and engineering fields—participated in the five NPA sessions. Three of the NPA sessions were devoted to the discussion of postdoc definitions, whereas two of the sessions focused on compensation and benefits. Each group’s participants were first asked to write down their own ‘postdoc’ definitions privately, which were then used by the whole group when identifying desirable components of a postdoc definition. Participants were then asked to classify the listed components as either necessary or unnecessary and to identify the components that help differentiate postdocs from other research staff. Finally, the participants were asked to describe and explain their evaluations of the five existing definitions.
- **Pathways of Physician-Scientists:** a literature review conducted by SSG to learn more about alternative career paths among postdoctoral researchers in the medical sciences.

Appendix B: Postdoc Definitions Research: List of Selected Formal Definitions

Definition Source	Full definition
National Academy of Sciences (NAS) (2000 Report)	<p>Defining the Postdoctoral Position: With the rapid growth and importance of the postdoctoral population, some institutions are attempting formal definitions using some or all of these criteria: [1]</p> <ul style="list-style-type: none"> ▪ The appointee has received a PhD or doctorate equivalent. [2] ▪ The appointment is viewed as an apprenticeship—a training or transitional period preparatory to a long-term academic, industrial, governmental, or other fulltime research career. ▪ The appointment involves full-time research or scholarship. [3] ▪ The appointment is temporary. ▪ The appointee is expected to publish (and receive credit for) the results of research or other activities performed during the period of the appointment. <p>[1] Draws on criteria suggested by the American Association of Universities (Committee on Postdoctoral Education, Report and Recommendations, Washington, DC, March 31, 1998) and by Vanderbilt University School of Medicine (Chalkey presentation at COSEPUP's Dec. 1999 workshop).</p> <p>[2] E.g., the MD, DDS, DVM, or other professional degrees in science and engineering.</p> <p>[3] However, in some disciplines, such as mathematics, the postdoctoral experience commonly includes a major teaching element. Also, some postdoctoral experiences, such as the National Academies' and AAAS Fellowships, introduce the postdoc to the field of public policy.</p>
NSF/NIH (Jan 2007)	<p>An individual who has received a doctoral degree (or equivalent) and is engaged in a temporary and defined period of mentored advanced training to enhance the professional skills and research independence needed to pursue his or her chosen career path.</p>

Definition Source	Full definition
National Science Foundation Survey of Graduate Students and Postdoctorates in Science and Engineering (GSS)	<ul style="list-style-type: none"> ▪ The appointee holds a Ph.D. or equivalent doctorate (e.g., ScD, MD, DDS, DO, DVM, or foreign degrees equivalent to U.S. doctorates) ▪ The doctorate was awarded recently, generally within the last 5 years ▪ The appointment is for a limited term, the limit generally being 5–7 years ▪ The appointment is primarily for the purpose of training in research or scholarship ▪ The appointee works under the supervision of a senior scholar in a department or research unit affiliated with the university <p>These Postdoctorates may have different titles—do not include clinical fellows and those with appointments in residency training programs in medical and health professions, unless research training under the supervision of a senior mentor is the primary purpose of the appointment</p>
Survey of Earned Doctorates (SED) (2008 questionnaire)	A “postdoc” is a temporary position primarily for gaining additional education and training in research, usually awarded in academe, industry, or government.
Survey of Doctoral Recipients (SDR) (2006 questionnaire)	A “postdoc” is a temporary position awarded in academe, industry, a non-profit organization or government primarily for gaining additional education and training in research.
American Association of Universities (AAU) (originally crafted 1998)	<p>Definition of a postdoctoral appointment:</p> <ul style="list-style-type: none"> ▪ The appointee was recently awarded a PhD or equivalent doctorate (e.g., ScD, MD) in an appropriate field; and ▪ The appointment is temporary; and ▪ The appointment involves substantially full-time research or scholarship; and ▪ The appointment is viewed as preparatory for a full-time academic and/or research career; and ▪ The appointment is not part of a clinical training program; and ▪ The appointee works under the supervision of a senior scholar or a department in a university or similar research institution (e.g., national laboratory, NIH, etc.); and ▪ The appointee has the freedom, and is expected, to publish the results of his or her research or scholarship during the period of the appointment.

Definition Source	Full definition
National Postdoc Association (NPA) (downloaded from NPA URL 2007)	<p>The NPA believes that the following are essential to a proper postdoctoral experience:</p> <ul style="list-style-type: none"> ▪ Transition to career independence through the development of professional skills that enable the postdoc to actively pursue a career of his/her own choosing. ▪ Supervision by at least one senior scholar who actively promotes the postdoc's professional development. ▪ An individual development plan (IDP) that incorporates equally the postdoc's career and training goals and the mentor's research goals. ▪ Pursuit of basic, clinical, or translational projects so long as effort is focused primarily on research. ▪ Publication of the results of the postdoc's research and scholarship during their appointment. ▪ As the postdoctoral appointment is temporary by nature, the aggregate amount of time spent as a postdoc is recommended to not exceed five years. ▪ As postdocs are important members of the host institution's community, appropriate levels of compensation, health care, and other benefits commensurate with their essential status should be afforded, independent of the postdoc's source of funding.
Sigma Xi (from 2005 survey)	<p>There is general agreement that a postdoctoral appointee has the following characteristics:</p> <ul style="list-style-type: none"> ▪ The appointee has a PhD or equivalent degree, ▪ The degree was received recently, ▪ The appointment is temporary, ▪ The purpose of the appointment is training for a research career, ▪ The appointment involves substantially full-time research or scholarship, ▪ The appointee is expected to publish the results of his or her research, and ▪ The appointee works under the supervision of a senior scholar or a department in a university or research institution.
American Association of Medical Colleges Graduate Research, Education and Training Group (GREAT) (downloaded from AAMC website 2008, originally adapted by AAMC in 1999)	<p>The postdoctoral appointment is temporary and conferred upon an individual who has recently been awarded a PhD or equivalent doctorate in an appropriate field and who will be involved in full-time research or scholarship. The appointment is viewed as preparatory for a full-time academic and/or research career, is supervised by a senior scholar, and the appointee has the freedom, and is expected, to publish the results of her/his research or scholarship during the period of the appointment.</p>

Definition Source	Full definition
Federation of American Societies for Experimental Biology (FASEB)	<p>The appointee was recently awarded a PhD or equivalent doctorate (e.g., ScD, MD) in an appropriate field; and</p> <ul style="list-style-type: none"> ▪ The appointment is temporary; and ▪ The appointment involves substantially full-time research or scholarship; and ▪ The appointment is viewed as preparatory for a full-time academic and/or research career; and ▪ The appointment may be part of a clinical training program, if research training under the supervision of a mentor is a primary purpose of the appointment; and ▪ The appointee works under the supervision of a scholar or a department in a university or similar research institution (e.g., national laboratory, NIH, etc.); and ▪ The appointee is expected to publish the results of his or her research or scholarship during the period of the appointment, in consultation with his or her mentor.
University of California (downloaded from UCSF PDA website 2008)	<p>A Postdoctoral Scholar is a person with a doctoral degree (e.g. PhD, MD, or the foreign equivalent) assigned to a temporary appointment at a university or institution who is receiving full-time advanced academic and research training. A Postdoctoral Scholar trains under the direction and supervision of faculty mentors in preparation for academic or research careers. In addition to research, Postdoctoral Scholars may also engage in other activities to enhance teaching and professional skills</p>
Postdocjobs.com	<p>Anyone who is doing post-doctoral work as an interim employment.</p>

Appendix C: Concept Map of Postdoc Definitional Elements

