An Economic Analysis of Chimpanzee Housing and Maintenance in U.S. Laboratories and Sanctuaries

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Abstract

Given scientific and legislative concerns surrounding the biomedical use of chimpanzees, the authors conducted an economic investigation into the housing and maintenance of chimpanzees in U.S. labs, the largest federal expenditure for chimpanzees in laboratories. Financial information was analyzed to determine if there is evidence of path dependency, and if that evidence contributes to an understanding of why their housing and maintenance continues despite high economic costs and the decreasing demand for chimpanzees for biomedical research. In 2009, a limited number of chimpanzee researchers and their affiliated facilities that were housing chimpanzees received in total roughly $30 million in federal funding. Of note, the daily per capita cost of caring for chimpanzees in laboratories can be up to 54% higher than sanctuary care. The investigation found that the economic concept of path dependency can account for how the profit associated with chimpanzee housing and maintenance has created an ongoing incentive for laboratories to warehouse chimpanzees.

Introduction

Recent papers investigated the scientific merit and efficacy of chimpanzee research (Bailey 2008, 2009, 2010; Bailey, Balcombe, and Capaldo 2007; Bettauer 2010; Greek, Shanks, and Greek 2005; Knight 2007; Shapiro 2009). They concluded that the use of chimpanzees has made limited contributions to human health, is replaceable by more productive and humane alternatives, and has been counter-productive to scientific advancements. These conclusions have been bolstered by the Institute of Medicine's (IOM) conclusion that there is no current scientific need for invasive chimpanzee research (2011 update). Public opinion (Humane Research Council [HRC] 2005), the opinion of a growing number of scientists (Cohen 2007; Reimers, Schwarzenberger, and Preuschoft 2007), and recent papers on the psychological harm done to chimpanzees in laboratory use and confinement (Bradshaw et al. 2008, 2009) heighten humane and ethical considerations regarding the use of chimpanzees in invasive research. However, the U.S. continues to use, house, and maintain a population of some 1,000 chimpanzees in U.S. labs, making the U.S. the only remaining country continuing this practice. Table 1 summarizes the location and number of chimpanzees in U.S. labs.

Given the ethical costs and mounting evidence against the scientific necessity or worth of chimpanzee research, a critical analysis of possible reasons for their continued laboratory housing and maintenance is necessary. The focus of this paper is to assess if the housing and maintenance of chimpanzees in U.S. laboratories, funded by federal dollars, continues due to what is described in economic literature as path dependency. Path dependency explains how "decisions one faces for any given circumstance [are] limited

by the decisions one has made in the past, even though past circumstances may no longer be relevant"[1] (Praeger 2008). "Social, institutional, and behavioral factors can lead to path dependence" (Frank 2007, 320) and institutions can become "locked-in" to certain "behaviors, beliefs, and perceptions" (Frank 2005, 573) that resist change, even in the face of alternatives and more optimal choices. Path dependency acknowledges "how history matters for institutions and how these institutions in turn determine economic choices" (Frank 2007, 320).

In Economist Joshua Frank's 2005 analysis, he determined that animal research is a good example of an institution affected by path dependency. Frank concluded that animal research "is a candidate for institutional lock-in due to the actions of self-interested stakeholders" (Frank 2005, 561) and that it "demonstrates how one set of historical circumstances and one set of institutions can lead to possible lock-in" (Frank 2005, 573). This current paper analyzes a specific and costly area of animal research – chimpanzees – to determine if there is evidence of path dependency, and if that evidence contributes to an understanding of why their housing and maintenance in U.S. laboratories continues despite high economic costs, particularly to U.S. taxpayers, and serious scientific and ethical concerns. The investigation explores the economic costs of chimpanzee research by examining the history of chimpanzee use in U.S. laboratories, the federal funding

[1] An obvious example of this phenomenon is the QWERTY keyboard layout. In spite of evidence pointing to a better type pad layout, QWERTY persists because it was the *first* to market and has since become entrenched (Shalizi 2001).

involved in their housing and maintenance, and the economic benefits of chimpanzees to the institutions housing them.

Relevant U.S. Legislation and Policy

The National Primate Research Centers (NPRCs) are funded by the National Institutes of Health (NIH) through its National Center for Research Resources (NCRR) division. With NIH's establishment of their breeding program, the number of NIH-owned and supported chimpanzees grew quickly; an initial population of 315 chimpanzees produced nearly 400 offspring by 1997 (Cohen 2007). In 1994, NIH acknowledged a "surplus" of chimpanzees available for research and appointed the National Research Council (NRC) to assess the problem. In conjunction with the Institute for Laboratory Animal Research (ILAR), NRC assembled a committee to analyze long-term costs and needs to house and maintain chimpanzees for research. In 1995, ILAR published a report that projected costs of maintaining chimpanzees in U.S. research (Dyke et al. 1995). That same year, NIH initiated a voluntary breeding moratorium for chimpanzees owned or supported by NCRR. In 1997, the National Academy of Sciences published a report by NRC that, after examining federal costs to maintain chimpanzees in laboratories, recommended extending the breeding moratorium another five years. The report also recommended that NIH establish the Chimpanzee Management Plan Working Group to advise them and NCRR on future issues related to the moratorium (NRC 1997).

Incorporating recommendations from the 1997 NRC report, the U.S. Congress passed the Chimpanzee Health Improvement Maintenance and Protection Act (CHIMP Act) (PL

106-551) in 2000. The Act provides federally supported retirement and lifetime care for chimpanzees no longer needed in research and contains "[a] prohibition that none of the chimpanzees may be subjected to euthanasia, except as in the best interests of the chimpanzee involved…" (42 U.S.C. § 287(a)(3)(A)). Originally, the act allowed for chimpanzees to be returned to research under certain conditions. However in 2007, the Chimp Haven is Home Act (42 U.S.C. § 287(f)(1)) passed and provided retired chimpanzees permanent protection from research. That same year, NCRR announced that it was making the 1995 breeding moratorium permanent, stating: "…after careful review of existing chimpanzee resources, NCRR has determined that it does not have the financial resources to support the breeding of chimpanzees that are owned or supported by NCRR.…" (NCRR 2007).

In 2008, the Great Ape Protection Act (GAPA) was introduced into Congress. The bill – reintroduced most recently in 2011 as The Great Ape Protection and Cost Savings Act (H.R.1513/S.810) – would prohibit invasive research on great apes and retire all federally owned chimpanzees to sanctuary. Table 2 shows the location and number of sanctuaries from U.S. labs.

Federal Cost Projections

According to the 1995 ILAR report, the 1,447 chimpanzees in NIH owned or funded research facilities cost $15 to $30 per diem per chimpanzee to house and maintain (Dyke et al. 1995). At the average per diem of $25, the report projected that a male chimpanzee

with a life-expectancy of 30 years would cost $403,560 to maintain for life and a female chimpanzee with a life-expectancy of 45 years would cost $739,910 (Dyke et al. 1995).[2]

Assuming no births and expected mortality, the report projected that at $25 per diem it cost $13,026,980 to maintain the U.S. chimpanzee research population. By 2004, this estimate increased to $14,687,180. In contrast if the population remained stable, with births replacing deaths, the annual cost by 2004 was projected to be $18,793,240 (Dyke et al. 1995). By 2009, NIH actually awarded over $30 million in housing and maintenance grants to the five research facilities housing chimpanzees. Appendix 2 shows housing and maintenance grants from 2004 to 2009 awarded by NIH to the five main research facilities with chimpanzees.

In the 1997 NRC report, the cost of maintaining federally funded research chimpanzees was examined further. By then the federal government owned or supported some 900-1,000 laboratory chimpanzees (NRC 1997). Due to the high costs of housing and maintenance and the "surplus" of chimpanzees available to research, the 1997 NRC report recommended extending the breeding moratorium – implemented in 1995 – for at least five more years (NRC 1997). The report predicted the moratorium would reduce the population by 3% annually due to deaths and no births, and demonstrated that a cumulative 15% reduction over five years would reduce government costs by roughly $1 million per year (NRC 1997).

[2] Estimated individual lifetime costs for both sexes based on chimpanzee model life tables and assuming 4% inflation (Dyke et al. 1995).

In addition to continuing the breeding moratorium, the 1997 report advised that chimpanzees not in active protocols be sent to sanctuary; over 60% (by 2010 that rose to approximately 80-90%) of the laboratory chimpanzees were not in active protocols but were instead warehoused at research facilities. The report found that maintaining chimpanzees at sanctuaries cost less, while also providing a higher standard of living. The report states, "This committee enthusiastically supports the principal of retiring chimpanzees not needed for research or breeding to a low-cost, high-quality life [in sanctuary]" (NRC 1997, 77).

In 2007, NCRR's Chimpanzee Management Plan Working Group reassessed the cost and need for chimpanzees in research. Prior to the meeting, NCRR said, "[t]he benefits of chimpanzee resources need to be *weighed against other competing research resources in comparative medicine* [emphasis added]. With lifetime care of the average chimpanzee estimated at about $500,000, breeding is a costly proposition…." (NCRR 2007). Following the working group's report, NCRR stated "that it does not have the financial resources to support the breeding of chimpanzees that are owned or supported by NCRR," and the 1995 breeding moratorium was made permanent (NCRR 2009).

Path Dependency and Chimpanzee Research

The concept of path dependency offers a reasonable explanation for why chimpanzees remain in federally funded laboratories. Regarding path dependency, Nobel Laureate Economist Douglass North said, "individual organizations with bargaining power as a

result of the institutional framework have a crucial stake in perpetuating the system" (North 1993a, 3). Applying his insight to the institutional matrix surrounding chimpanzees in U.S. laboratories, it is evident that there are a limited number of stakeholders with strong bargaining power. These stakeholders – laboratory scientists and their institutions – have an enormous economic incentive to keep chimpanzees in laboratories. In 2009, the limited number of chimpanzee researchers and their affiliated facilities that were housing chimpanzees received in total roughly $30 million in federal funding for housing and maintenance grants – a profitable undertaking. This $30 million was in addition to other sources of revenue from private contracts and other economic opportunities generated by the chimpanzees housed at their institutions.

Frank notes, "Institutions are not just perpetuated by powerful stakeholders advancing their own self interest" (Frank 2005, 559). "Belief systems are the underlying determinant of path dependence…The way the institutions evolve reflects the ongoing belief systems of the players" (North 1994, 5). Laboratory scientists work to convince the public, other researchers, and NIH of the value of chimpanzee research. For example, Yerkes National Primate Research Center (Yerkes) and other chimpanzee labs host or participate in national and international conferences and meetings focused on chimpanzees' potential as a research resource.[3]

[3] For example: NCRR: Navigating the Translational Researcher workshop, "Primate Models and Resources," presentation by Dr. Stuart Zola/Yerkes National Primate Research Center, March 2006; Yerkes National Primate Research Center seminar, "Chimpanzees in Biomedical Research: Status and Strategic Planning," October 2006; NCRR: Comparative Medicine Resource Directors Meeting, "Primate Resource," presentation by Dr. John VandeBerg/Southwest Foundation for Biomedical Research, November 2006.

History, self interested stakeholders, developed infrastructure, and engrained perceptions all play important roles in the existence and continuation of institutional lock-in and path dependence. Examining these factors within the realities of chimpanzee use and housing is prudent.

History

History matters when determining institutional paths. At one time interest in chimpanzee use was growing, reflected in increased government funding, breeding, belief that chimpanzees were a "magic bullet" for certain diseases, and the numbers of institutions acquiring chimpanzees. (Roller 2002). There was tremendous enthusiasm for the chimpanzee model and early chimpanzee experiments ran the gamut – from infecting them with virtually every infectious agent known, to using them in head crash and trauma studies, or as potential donors for organ transplants. No limits, outside of the minimal Animal Welfare Act (AWA) requirements in effect since 1966, were placed on what was done to them (New England Anti-Vivisection Society 2009).

However, history's path changed. In recent years, the general public, lawmakers, and scientists are expressing increasing discomfort over the use and confinement of chimpanzees for invasive biomedical research.[4] Chimpanzees have become increasingly

[4] In part, this change in attitude can be attributed to the non-invasive field research of Jane Goodall, Ph.D., who introduced to the world the intelligence, emotional sophistication, and social nature of chimpanzees in the wild. Further, the pioneer work in language development of Roger Fouts, Ph.D. and Debbie Fouts,

visible and popular to the American and world's public, which began to embrace a different ethic with regard to what was acceptable or not in our treatment of chimpanzees. Today it would be morally unacceptable to carry out many of the experiments that were done on chimpanzees in the past. Yet, in spite of changing beliefs, knowledge, and values, institutional inertia is strong.

Self Interest

Chimpanzee research is a hugely profitable industry with stakeholders in government, academia, and industry. Key beneficiaries include laboratory scientists, the large universities and medical facilities hosting the laboratories, private pharmaceutical and biotech companies, animal breeders and transporters, equipment suppliers, government agencies, industry lobbying organizations, and for profit companies that utilize and profit from chimpanzees. It is reasonable to assume that these stakeholders want to protect their financial interests, an assumption supported by the existence of numerous bodies whose sole purpose is to protect animal research – including research on chimpanzees. Appendix 1 shows a list of organizations that support chimpanzee research.

Several government agencies, including NIH, are involved in chimpanzee research. As explained by Frank, "In assessing the self-interest of entities such as agencies, it is important to recognize that not only do the institutions themselves exist in large part to fund animal research, but that there is a strong flow of personnel between regulatory/

M.A. with Washoe, the first chimpanzee to acquire a human language (American Sign Language), teach it to her family, and use it to communicate with humans, began to erase the line drawn between us and them.

funding agencies, private corporations doing animal research, and academic institutions involved in such research" (Frank 2005, 562).

In addition to protecting their financial investment in chimpanzees, academic institutions are likely to support chimpanzee research because of the significant funding for institutional indirect expenses built into NIH grant awards.[5] For example, a review of recent housing and maintenance grants involving chimpanzees reveal that institutional grant recipients were allocated anywhere from 39% to 71%, or on average 51%, of their total awards for indirect expenses alone (see Appendix 2). They can allocate this money to expenses extraneous to the research or the care of chimpanzees, to university salaries, administration, and/or other operating costs instead.

Self interest is evident at both the individual and institutional level. As explained by Frank (2005), considering the central role economics has traditionally given to self-interest in motivating human behavior and given that most of the 'experts' on the need for animal research are the beneficiaries of animal research, their opinions should be suspect for bias.

[5] Instead of "Overhead Costs," NIH uses the term "Facilities & Administrative Costs" or "F&A Costs." "F&A Costs" are defined as "[c]osts that are incurred by a grantee for common or joint objectives and cannot be identified specifically with a particular project or program. These costs are also known as 'indirect costs' " (NIH 2009a).

Infrastructure

Institutional lock-in perpetuates chimpanzee research, not just because of history and the existence of self-interested stakeholders, but also because of its massive supporting infrastructure. The federal government has made an enormous financial investment in physical infrastructure, including holding and breeding facilities and equipment, all of which are uniquely designed for the large and powerful chimpanzee. For example, in 2002 the MD Anderson Cancer Center (MD Anderson) received almost $2 million for construction of additional housing for 40 to 60 chimpanzees (National Institutes of Health [NIH] 2002). In 2007, the Southwest National Primate Research Center (Southwest) requested, for inclusion in their annual housing and maintenance award, $1,165,005 for "alterations and renovations" – including $42,000 to replace fence panels, $68,000 to replace 7 heating units, $48,000 for asphalt, $35,000 for a shower/locker facility, $65,000 to install traps on drains, and over $80,000 for A/C modifications (NIH 2007). Recently, Southwest received between $2 - 3 million from NIH for "renovations [that] will include a combination of upgrading and expanding current chimpanzee facilities and converting macaque facilities to accommodate [the transfer of] chimpanzees [from Alamogordo Primate Facility]" (NCRR 2010a). NIH anticipates that it will cost around $3 million per year to maintain Southwest's chimpanzee population (NCRR 2010a).

In addition to building infrastructure, the chimpanzees themselves have been enormously expensive to purchase and maintain. In 1997, NIH projected the cost of maintaining a single chimpanzee over his/her lifetime could be as high as $300,000[6] (NRC 1997).

[6] Projected lifespan used for NIH's 1997 and 2007 lifetime cost estimates could not be ascertained.

Multiplied by the approximate 1,000 chimpanzees currently in laboratories, the cost of this "inventory" could be as much as $300 million. In 2007, NCRR estimated the lifetime care at $500,000 per chimpanzee or a total of $500 million (NCRR 2007). In 2009, the estimated lifetime care cost could be over $900,000 per chimpanzee, equaling an estimated total of almost $1 billion for a population of 1000 chimpanzees.[7]

In addition to infrastructure, journals, graduate programs, conferences, and associations exist in support of and supported by chimpanzee research. Between the years 1995 and 2004, while 749 studies of captive chimpanzees were published, "less than 15% … had been cited by papers… relevant to human medicine" (Bailey, Balcombe, and Capaldo 2007).[8] Yet, worldwide, numerous conferences advocate for biomedical chimpanzee experimentation. "The New Comparative Biology of Human Nature" colloquium in 2006 contained much discussion about *potential* uses for chimpanzees in research, arguably to help "push the chimpanzee research agenda" (Capaldo 2006). In explaining the

[7] Lifetime cost estimate based on a NIH funded per diem of $67 and a projected lifespan of 38 years ($67 x 365 days x 38 years = $929, 290). The life expectancy of a chimpanzee in captivity is 30-years/male and 45-years/female, equaling an average of 38 years.

[8] This same paper reached the following conclusions: 49.5% of the papers analyzed had not been cited by other scientific papers; 35.8% were cited only by papers that did not describe well-developed prophylactic, diagnostic, or therapeutic methods for combating human diseases; and only 14.7% were cited by 27 subsequent human medical papers. An analysis of the 14 cited papers revealed that the chimpanzee experiments had contributed little, if anything, to the outcome of those papers reporting an advance in human clinical practice, and an examination of the 27 medical papers revealed that *in vitro* research, human clinical and epidemiological investigations, molecular assays and methods, and genomic studies, contributed most to those papers' findings (Bailey, Balcombe, and Capaldo 2007).

implications of institutional inertia in animal research, Frank (2005) stated: "The existence of numerous publication and speaking venues devoted to animal research results begs the question of whether this research is valid and truly useful; the fact that publication is likely makes the research viable from an academician's perspective, and the existence of ongoing research with new findings by 'leaders in the field' makes the continuation of such venues viable" (Frank 2005, 562).

Existing and ongoing grants, contracts, subcontracts, and other agreements supporting chimpanzee research also contribute to institutional inertia. For example, in 2008 NIH funded five housing and maintenance grants and contracts at a total of nearly $28 million. In 2009, NIH spent approximately $30 million to renew those same grants and contracts (see Appendix 2).

Overall, the history of chimpanzee use in laboratories and the self-interests of those associated with chimpanzee research, coupled with hugely expensive institutional infrastructure, makes it more beneficial for those with vested interests to continue to house chimpanzees rather than retire them to sanctuary and replace them with more efficient and effective research models.

Perception

Even if self-interest were absent, perceptions regarding chimpanzee research are an important component of path dependency. North argues that path dependency can be explained, in part, from the way perceptions limit choices (North 1993b). Researchers'

perceptions are formed from years of schooling and job training, "which has implicit in its belief system that 'animal research is ethically justifiable' and 'animal research is useful'" (Frank 2005, 562). These perceptions are reinforced because researchers' work involves conducting animal research and most of their exposure is to other animal researchers. Heiner (1983, 1985) explains how it is the nature of humans to construct rules restricting complicated choices. In constructing these rules, we rely on information sources closest to our experience. In the case of chimpanzee research, this creates a "self-reinforcing belief system" (Frank 2005, 563).

Frank describes this phenomenon as follows: "Both in academic training and later at the professional level there is a tendency to reinforce established beliefs. More specifically, agents with views conforming to discipline norms are more likely to gain prominent and frequent publication, funding for their research, and advancement in their field. Completing the circle, the agents who gain strong reputations are the ones who are most likely to gain positions of power allowing them to determine publication, funding and advancement of future researchers. Thus, the selection processes at both the student and professional [level] help to perpetuate existing norms and belief systems. In animal research disciplines and sub-disciplines, these norms and belief systems are likely to include the efficacy of prevailing methods" (Frank 2005, 564).

Evidence that contradicts chosen belief systems is often rejected when such new data has financial, self-perception, collegial or professional implications. A concrete example includes a recent submission of a rigorous examination of the efficacy of chimpanzee use

in HIV/AIDS vaccine development (Bailey 2008). The Journal of the American Medical Association, in the process of compiling papers for an issue devoted to HIV/AIDS research, showed no interest in the inquiry letter which explained that the paper had taken a critical look at the use of chimpanzees in HIV/AIDS vaccine development. This opposing point of view was rejected without benefit of peer review.

From an analysis of chimpanzee housing, maintenance, and research, the self interested behavior and perceptions of those with a stake in perpetuating them and an examination of the infrastructure built around this institution, chimpanzee use in U.S. laboratories fits the concept of path dependency as one likely explanation for its continuance. In turn, the implications of path dependency, such as economic waste and inefficiency, must be addressed to ascertain the seriousness of the problem and inform current and future policy.

Economic Analysis

While chimpanzees are profitable to facilities housing and maintaining them and provide economic incentive to a limited number of stakeholders', their profit comes at a direct expense to U.S. taxpayers and chimpanzees, and is wasteful considering available alternatives. An objective evaluation of the source and magnitude of this waste is overdue.

Housing and maintenance grants include three types of income. First, a typical grant includes a significant award for indirect costs. Indirect-cost allowances represent

extraneous use of federal funding meant to benefit human health. Instead, these federal dollars benefit only the housing institution. Second, grantees can earn substantial income from leasing their chimpanzees to other scientists/facilities. These outside sources of income need not be reimbursed to the federal granting agency paying to house and maintain the chimpanzees. And third, there is significant opportunity cost in that the money being spent keeping chimpanzees in laboratory confinement could be reallocated for their housing and retirement to better and less expensive life in sanctuary and towards scientific opportunities inherent in more productive forms of research.

Indirect Costs

In each housing and maintenance grant, awards for indirect costs range from 39% to 71% of the total award. As a significant source of revenue for each grantee, these costs need closer examination. As noted, indirect costs are "[c]osts that are incurred by a grantee… and cannot be identified specifically with a particular project or program.…" (NIH 2009a). NIH further defines indirect costs as: "Costs associated with the general operation of an institution and the conduct of its research activities… Health and Human Services supports full reimbursement [for indirect costs] for most grant programs. Allowable [indirect costs] include: Depreciation use allowance; Facilities operation and maintenance; General administration and expenses; Departmental administration; Sponsored project administration; and Libraries" (National Institute of Allergy and Infectious Diseases [NIAID] 2009a).

In comparison, direct costs are defined as "[c]osts in a grant or contract that support a project or program. Allowable direct costs include: Salaries and fringe benefits of principal investigators and supporting staff; Equipment and supplies; Travel expenses; Fees and supporting costs for consultant services; Contract services (also called sub-award); Costs for consortium participants; Inpatient and outpatient costs for human subjects; Alterations and renovations to facilities…; Publications and other miscellaneous expenses" (NIAID 2009b). Tables 3 and 4 show examples of institutional benefit in the form of "indirect" costs allowed in federal grants for 2008 and 2009.

The New Iberia Research Center (New Iberia), Southwest, MD Anderson, Yerkes, and Alamogordo Primate Facility (Alamogordo) received nearly $28 million in 2008 and $33 million in 2009 from NIH for housing and maintenance grants.[9] Out of that $28 and $33 million, roughly half was allocated for indirect costs – $14 and $17 million in taxpayer money. In the midst of federal budget cuts, $14-$17 million in "indirect cost" handouts to institutions is a significant waste of tax dollars that could have provided far better care for chimpanzees in sanctuary and been redirected to more valid areas of research (see Tables 3 and 4). Notably, most U.S. 501(c)3 not-for-profit organizations (including U.S. chimpanzee sanctuaries) adhere to a standard of 25% or less on "indirect" or administrative/development costs (Charity Navigator 2010).

[9] Some housing and maintenance grants include support for other nonhuman primates in addition to chimpanzees.

Included in the $28 million NIH awarded in 2008 to New Iberia, Southwest, MD Anderson, and Yerkes was a $4.5 million award for Charles River Laboratories' (CRL)[10] to house and maintain chimpanzees at Alamogordo (NIH 2008). This $4.5 million was a distribution of a 10 year, $42.8 million contract that NIH had with CRL. This contract had a different structure and terms than the typical NIH housing and maintenance grant; for example, in addition to the over $4 million a year, CRL was allowed an undisclosed "annual incentive fee" that could be earned. NIH will not disclose the amount of or criteria for this award, calling it "proprietary information."[11] Further, information as to whether or not CRL negotiated a percentage of their total NIH contract for indirect costs is also unavailable.

In March of 2010, NCRR issued a table of their per diem FY'09 costs (NCRR 2010b). It showed CRL/Alamogordo had received $67 per diem per chimpanzee; MD Anderson had received $53 per day; and that collectively, the five funded labs received on average $40 per diem. Considering it costs approximately $36 a day to care for a comparable number of chimpanzees in superior sanctuary (STC 2009), the difference between laboratory and sanctuary care represents a major waste of taxpayer dollars. Table 5 shows 2008 and 2009 daily costs of care per chimpanzee for those in sanctuaries and at two research facilities housing comparable numbers of government owned chimpanzees.

[10] CRL is a publicly traded, for profit organization. In 2007, CRL generated $1.2 billion in revenue and realized a profit of $158 million (CRL 2007).

[11] Received in response to FOIA request.

If CRL had included indirect costs in their contract and if they were in line with the estimated indirect costs of other labs (average 51%), the $67 per diem would amount to an estimated taxpayer funded gain of $2.6 million to CRL in 2009 alone (see Table 4). This estimated gain would have grown in successive years because the amount of the contract award was not adjusted downward as the chimpanzee population decreased due to deaths.[12]

Program Income

In addition to large sums of NIH dollars for indirect costs, facilities earn money from "use fees" for leasing their chimpanzees to the private sector. The money made from this leasing is included under "program income." NIH defines program income as "gross income — earned by a grantee, a consortium participant, or a contractor under a grant — that was directly generated by the grant-supported activity or earned as a result of the award" (NIH 2003).[13] NIH allows grantees to keep this income, stating: "Program

[12] CRL's contract was not renewed upon its expiration. NCRR plans to move the Alamogordo chimpanzees to Southwest by 2011.

[13] NIH further defines program income: Program income includes, but is not limited to, income from fees for services performed; charges for the use or rental of real property, equipment or supplies acquired under the grant; the sale of commodities or items fabricated under an award; charges for research resources; and license fees and royalties on patents and copyrights. (Note: Program income from license fees and royalties from copyrighted material, patents, and inventions is exempt from reporting requirements.) The requirements for accountability for these various types of income under NIH grants are specified in this subsection. Accountability refers to whether NIH will specify how the income is to be used and whether the income needs to be reported to NIH and for what length of time. Unless otherwise specified in the terms

income earned during the period of grant support (other than income earned as a result of copyrights, patents, or inventions or as a result of the sale of real property, equipment, or supplies) shall be retained by the grantee…" (NIH 2003). Grantees are permitted to use this money however they choose: "Income derived from activities supported by this award will be used to further the respective chimpanzee research project for which the award is made" (NIH 2006a).

Program income can be substantial. Estimated examples include: from 1999 to 2009 Southwest earned $1,519,047 from use fees while Yerkes profited $8,500,836 from the nonhuman primates supported by their federally funded housing and maintenance grant from 1997 to 2011 (NIH 2009b).

Opportunity Cost

Wasting federal tax dollars purporting to be for human health research has high opportunity costs considering the superior and more cost efficient care available in sanctuary, and the cost efficiency and scientific validity of alternatives to chimpanzee use. Opportunity cost is described as: "The true cost of something is what you give up to get it. This includes not only the money spent in buying (or doing) the something, but also the economic benefits …that you did without because you bought (or did) that particular something and thus can no longer buy (or do) something else" (The Economist 2010).

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and conditions of the award, NIH grantees are not accountable for program income accrued after the period of grant support (NIH 2003).

In sanctuary, housing and maintenance is directly related to chimpanzee care, with no padding for indirect costs. This lower overhead results in less money needed for chimpanzee care in sanctuary as opposed to labs (or for the same amount of money awarded to a lab, a sanctuary would provide even greater superior care).

Chimpanzees living in North American sanctuaries are provided with veterinary care; varied fruits and vegetables; enrichment activities; and indoor/outdoor social housing. For example, Save the Chimps (STC) has the capacity to house up to 300 chimpanzees on 150 acres in Florida. The climate is conducive to predominantly outdoor housing with fresh air and spacious, tree shaded islands. Indoor areas provide night housing and areas for chimpanzees who need to be temporarily separated from their group. New chimpanzees are individually evaluated and worked with for optimal group placement with typically approximately 25 chimpanzees who are regularly monitored for possible required changes. Such exemplary care makes for an exceptional quality of captive life.

Chimp Haven (CH), the federally supported sanctuary in Louisiana, offers 200 acres with indoor and outdoor facilities. New chimpanzees are housed with companions, where possible, until they are evaluated and placed in an appropriate social group with 10-30 others. Chimpanzees can choose to remain indoors or in outside enclosures with trees, natural groundcover, and 20-foot climbing structures. Stimulating feeding apparatuses (for example a man made “termite mound” where food treats are “fished” for with sticks)

and other activities create opportunities for behavioral enrichment and change in routine to stimulate interest and involvement.

Compared to sanctuary life, laboratory care is expensive and typically sterile. In 2009, the daily per capita cost of caring for chimpanzees at Alamogordo was $67, while at MD Anderson it was $53. These contrast significantly with the daily per capita cost of $36 at STC for that same year (see Table 5). Figure 1 depicts the cost comparisons between this sanctuary and the two laboratories for 2005-2009.

In spite of receiving more NIH money per chimpanzee than what sanctuaries are spending to house and maintain them, laboratories spend little on actual care, and conditions can be wholly inadequate. The nature of life in a laboratory that receives federal funding was exposed in the national media following an undercover investigation[14] of New Iberia.[15] As explained by investigators with The Humane Society of the United States (HSUS): "NIRC [New Iberia] cages about 6,000 monkeys and 325 chimpanzees on its 100 acres, but in the span of nine months, the HSUS investigator saw only about 20 of the chimpanzees used in active studies. The majority of chimpanzees at the facility appeared to be warehoused or used for breeding – two activities that cost

[14] While the conditions at one lab may or may not reflect all labs, USDA inspection reports (USDA) and media coverage have documented failures in chimpanzee and other animal welfare at all facilities housing chimpanzees owned or supported by NIH. Appendix 4 shows some USDA AWA violations reported at the five labs.

[15] In 2009, New Iberia received $21 per chimpanzee per diem in NIH funding for 134 federally owned chimpanzees.

American taxpayers millions of dollars, even at a time of fiscal crisis and when no other developed nation uses chimpanzees in experiments" (The Humane Society of the United States [HSUS] 2009a). Jane Goodall, after viewing the New Iberia footage, commented: "The conditions in which the chimpanzees are confined are grim. There are metal cages with no bedding and no enrichment activities for the chimpanzees visible. Particularly shocking, to me, was a clip showing infant chimpanzees in diapers, clinging to each other, in utterly bleak, sterile conditions. This is likely to lead to behavioral abnormalities. The cages of the adults were small and absolutely bare" (HSUS 2009b).

In a lab, food consists predominantly of "lab chow" (similar to dog kibble) with small amounts of fruits and vegetables. In most private sanctuaries, it is the reverse. For example, New Iberia spent $408,000 (more than 40% of their 2006 housing and maintenance dollars) on salaries compared to just $68,550 (a mere 1%) on food for 114 chimpanzees, amounting to $1.65 per day on food for each chimpanzee (NIH 2006b). In 2007, Southwest spent $2.00 a day (NIH 2007). In contrast, sanctuaries report spending nearly twice as much money, anywhere from $3.25 - $3.50 per day, on food for each chimpanzee (STC 2009).[16]

[16] At STC, chimpanzees are individually served three bagged meals a day, which include a balance of fruits, vegetables, nuts, chow and other nutritional foods reflecting seasonal markets, individual preferences and other criteria (STC 2009). At Fauna Foundation, the chimpanzees are served a variety of fruits, vegetables, chow, nuts, and other food items laid out on trolleys, allowing them to make their own meal selections (Fauna Foundation 2009).

In 2008, MD Anderson received almost $60 a day to care for each chimpanzee but spent only $0.75 a day from that grant on food for each chimpanzee (NIH 2008). Such a minimal allocation to feed an animal the size of a chimpanzee suggests that they are fed predominantly lab chow with the occasional fruit or vegetable. In fact, some labs were actually cited for using food (fruit or vegetables) as their enrichment program (see Appendix 4). A varied diet of fresh fruits and vegetables is essential for both the physical and psychological well-being of a species that in the wild spends most of the day foraging over a vast range to access a wide variety of fruits and greens (Jane Goodall Institute 2010).

Discussion

This paper demonstrates the taxpayer burden associated with housing and maintaining federally owned and supported chimpanzees in laboratories versus in sanctuary. Chimpanzees are the most expensive research animal, costing U.S. taxpayers over $30 million dollars a year to house and maintain in a laboratory setting.[17] Assuming 3% inflation, if the current housing and maintenance contracts and costs are extended throughout the expected lifespan of the government owned and supported chimpanzees, it will cost U.S. taxpayers over $312 million[18] (HSUS 2009c). Recent calculations, submitted in response to a Request for Information issued by NCRR to an alliance of private sanctuaries holding the majority of U.S. chimpanzees now in sanctuary, compared

[17] Some of this money also supports other primates in addition to chimpanzees.

[18] This amount is based on only 638 chimpanzees; there are currently 745 that are federally owned and supported.

an average per diem cost of $60 in labs[19] to an average $41 in sanctuaries[20] resulting in a cost savings of $90 million[21] for 500 government owned chimps (Alliance of North American Chimpanzee Sanctuaries 2010). Recalculating their figure to include the 745 government owned and supported chimpanzees would increase the savings to $134 million. If we compare Save the Chimps per diem cost of $36 to the $60 for labs, the cost savings is then $114 million for 500 chimpanzees and $170 million for 745 chimpanzees**.**

Caring for the remaining population of government owned or supported chimpanzees is excessively expensive due to the waste associated with laboratory housing and maintenance awards and contracts. As previously discussed, a significant area of waste comes from federal expenditures unrelated to or unnecessary for direct chimpanzee care, including "indirect costs," "annual incentive fees," no requirement to repay any dollars earned from the use of the chimpanzees, and other economic advantages for chimpanzee housing facilities.

Considering the income of the laboratories housing chimpanzees, it would be reasonable to expect a high standard of care. However, sanctuaries can provide far better care for less compared to the federally supported laboratories (see Table 5; comparing Alamogordo Primate Facility's per diem ($67) with that of Save the Chimps sanctuary

[19] Average cost for labs that house government owned chimpanzees and have agreements with NCRR for total costs of maintenance (MD Anderson $53 per diem; Alamogordo $67 per diem).

[20] Average cost includes the federal sanctuary system, which has higher overhead costs than other privately funded sanctuaries.

[21] Amount assumes a projected average lifespan of 26 years.

($36) shows that laboratory costs can range up to nearly 54% higher than sanctuary care). In laboratories, opportunities for enrichment and other stimulating environmental or social interactions are typically limited or meet only the minimal interpretation of the AWA enrichment requirement. For example, even if the quality of a lab's outdoor housing is comparable to that of a fine sanctuary, not all chimpanzees typically have access to those enclosures at the same time. Calculations also show that even food expenditures in most laboratories are minimal.

That laboratories do not meet standards set by the Global Federation of Sanctuaries (GFAS), which are met or exceeded by some of the finest chimpanzee sanctuaries, is a reflection of an attitude that has prevailed for decades in research institutions. Chimpanzees are considered a federal "resource" and, as with all resources, are used by and profitable to those who own or house them. However, in the case of this particular species, their usefulness as a biomedical resource has been challenged and is vastly waning. As such, the "usefulness" of this "resource" – chimpanzees – appears to come from their tremendous financial gain to institutions and their accompanying facilities which house them.

Conclusion and Recommendation

The concept of path dependency can account for how the enormous profit associated with chimpanzee housing and maintenance has created an ongoing incentive for laboratories to warehouse chimpanzees, even in the absence of their need or use in research and the growing ethical concerns of the public. That profit comes at a direct financial cost to

taxpayers – and at an unacceptable humane cost to chimpanzees. Considering the significant economic cost associated with federally supported chimpanzees in laboratories, as well as scientific, ethical, and humane issues surrounding their laboratory confinement and use in research, the conclusions of this paper support the transfer of all federally owned and supported chimpanzees to sanctuary. Compared to the predicted lifetime cost of over $312 million to care for federally supported chimpanzees in laboratories, transferring the current stabilized population of chimpanzees to sanctuary is estimated to cost $139 million for lifetime care – saving taxpayers $173 million while providing a far superior life for the chimpanzees (HSUS 2009c).

NIH/NCRR and the American public need an economically and ethically better solution for the current "surplus" chimpanzees in U.S. laboratories than the continued inefficient housing and maintenance of those chimpanzees in research facilities. Reliance on the taxpayer is even heavier, considering private sanctuaries depend upon donations to provide lifetime care for chimpanzees rescued from research. To meet fiscal responsibility to the U.S. public, curb government waste, and provide superior and more efficient and humane care for chimpanzees, all federal housing and maintenance funding now going to laboratories should be reallocated to sanctuaries, which have shown that they can provide more for less. Eligible sanctuaries would accept chimpanzees currently housed and maintained in research laboratories throughout the U.S., provided that lifetime government funding is reallocated from the laboratories to the hosting sanctuaries. In redirecting funding away from inefficient laboratories and into sanctuaries, NIH dollars would be saved and go further, and chimpanzee lives would be

improved. Certain infrastructures that were previously funded by NIH specifically for chimpanzees already exist and could be converted or transferred to sanctuary use, as existing sanctuaries expand and new sanctuaries are established. Thus, with the ample remaining available space at the federal sanctuary, combined with existing and new private sanctuaries, a network of sanctuaries could provide for all federally owned and supported chimpanzees currently held in laboratories. New facilities would be required to meet or exceed the standards of care set by both the federal sanctuary system and privately run sanctuaries such as Save the Chimps, Fauna Foundation, Center for Great Apes, and others who meet the standards of the GFAS (Global Federation of Animal Sanctuaries 2010).

To move forward, accurate projections based on the existing chimpanzee population's life expectancy and other mortality/morbidity factors must be made. Further, recent and current fiscal decisions and practices by NIH/NCRR regarding chimpanzees in U.S. laboratories must be thoroughly examined by appropriate authorities such as a U.S. Committee on Oversight and Government Reform, the U.S. Government Accountability Office, the Secretary of Health and Human Services, and/or another appropriate administrative authority. Such an investigation, coupled with precise and accurate cost figures and projections, will help determine overall lifetime costs and savings from a new model of care; reinforce the decision to end funding for breeding chimpanzees; support efforts to transfer chimpanzees currently housed and maintained in laboratories to sanctuaries; and establish more economically, ethically, and scientifically responsible mandates for NIH/NCRR's "management" of chimpanzees. The economic benefit to NIH

and the public is obvious in dollars saved that could be reallocated to more productive areas of research. This represents a direct benefit to every American who supports NIH via taxes. And finally, though immeasurable, the benefit of this new model of care for chimpanzees would be in their improved quality of life and well-being after, for most, decades or even their entire lives in laboratory confinement.

(word count 7,781)

References available upon request.
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Tables

Table 1

2010 Census Information for U.S. Laboratories with Chimpanzees

Facility	Location	Number of Chimpanzees	Number of Chimpanzees with NCRR	
			(O)	(S)
New Iberia Research Center	New Iberia, LA	361	134	—
Alamogordo Primate Facility	Alamogordo, NM	208	208	—
Southwest National Primate Research Center	San Antonio, TX	165	—	148
MD Anderson Cancer Center	Bastrop, TX	185	159	—
Yerkes National Primate Research Center	Atlanta, GA	96	—	96
Primate Foundation of Arizona	Mesa, AZ	0		
Bioqual Inc.	Rockville, MD	30		
Center for Disease Control	Atlanta, GA	0		
Food and Drug Administration	Rockville, MD	0		
Language Research Center, Georgia State University	Decatur, GA	4		

Sources. – Freedom of Information Act (FOIA) requests to the National Institutes of Health (NIH) and personal correspondence with NCRR (2010b) and the facilities.

Note. – NCRR = National Center for Research Resources; (O) = owned by NCRR; (S) = supported by NCRR.

Table 2

2010 Census Information for Sanctuaries with Chimpanzees from U.S. Laboratories

Facility	Location	Total Number of Chimpanzees
Fauna Foundation	Canada	12
Save the Chimps	Ft. Pierce, FL and Alamogordo, NM	275
Chimp Haven	Keithville, LA	123
Primarily Primates	San Antonio, TX	61
Wildlife Waystation	Angeles National Forest, CA	47
Animal Sanctuary of the United States/Wild Animal Orphanage	San Antonio, TX	16
Chimpanzee Sanctuary Northwest	Cle Elum, WA	7
Primate Rescue Center	Nicholasville, KY	11
Chimpanzee and Human Communication Institute (CHCI), Central Washington University	Ellensburg, WA	3
Cleveland Amory Black Beauty Ranch	Murchison, TX	3
Center for Great Apes	Wauchula, FL	30

Sources. – Sanctuaries and The Humane Society of the United States (HSUS).

Note. – The total number of chimpanzees listed may also include some rescued from entertainment and the pet trade.

Table 3

2008 Indirect Costs in Millions Allowed in Federal Grants

Facility	Amount Awarded ($)	Indirect Costs Percentage (%)	Indirect Costs Amount ($)
New Iberia Research Center	1	44	0.44
Southwest Foundation for Biomedical Research	7.2	66 (71)	4.8 (5.1)
MD Anderson Cancer Center	3.6	50	1.8
Yerkes National Primate Research Center	11.4	39	4.4
Alamogordo Primate Facility	4.5	51	2.3
Total	27.7	50 (51)	13.7 (14)

Sources. – Facility housing and maintenance grants awarded by NIH for 2008 and grant progress reports.

Table 4

2009 Indirect Costs in Millions Allowed in Federal Grants

Facility	Amount Awarded ($)	Indirect Costs Percentage (%)	Indirect Costs Amount ($)
New Iberia Research Center	1.03	44	0.45
Southwest Foundation for Biomedical Research	10.9	66 (71)	7.2 (7.7)
MD Anderson Cancer Center	3.1	50	1.5
Yerkes National Primate Research Center	12.6	39	4.9
Alamogordo Primate Facility	5.05	51	2.6
Total	32.7	50 (51)	16.4 (16.7)

Sources. – Facility housing and maintenance grants awarded by NIH for 2009, grant progress reports, and NIH 2010b.

Table 5

2008 - 2009 Daily Cost Comparison

Facility	2008 Cost Per Diem Per Chimpanzee ($)	2009 Cost Per Diem Per Chimpanzee ($)
Save the Chimps	39	36
Chimp Haven	37	41
MD Anderson Cancer Center	59.87	53
Alamogordo Primate Facility	57.60	67

Sources. – HSUS (2009c) and NCRR (2010b). STC costs derived from 2008 and 2009 990-PF IRS forms. CH costs from personal correspondence with CH in April 2010.

Note. – STC = Save the Chimps; CH = Chimp Haven. For CH, 2008 "Program" costs at $31.62 plus "Program and Administration" at $42.07 equals an average of $37 per diem; 2009 "Program" costs at $35.84, plus "Program and Administration" at $47.51 equals an average of $41 per diem. This estimated calculation is based on the following CH note: "what constitutes the…categories…is complicated due to [the CH] contract. …[The] increase in cost [compared to STC] comes…from: requirements of the contract…; and smaller colony size." Both CH and STC note that administration is a relatively fixed cost and per diem expenses reflect economy of scale from larger population sizes.

Figures

Figure 1

2005 – 2009 Daily Cost Comparisons

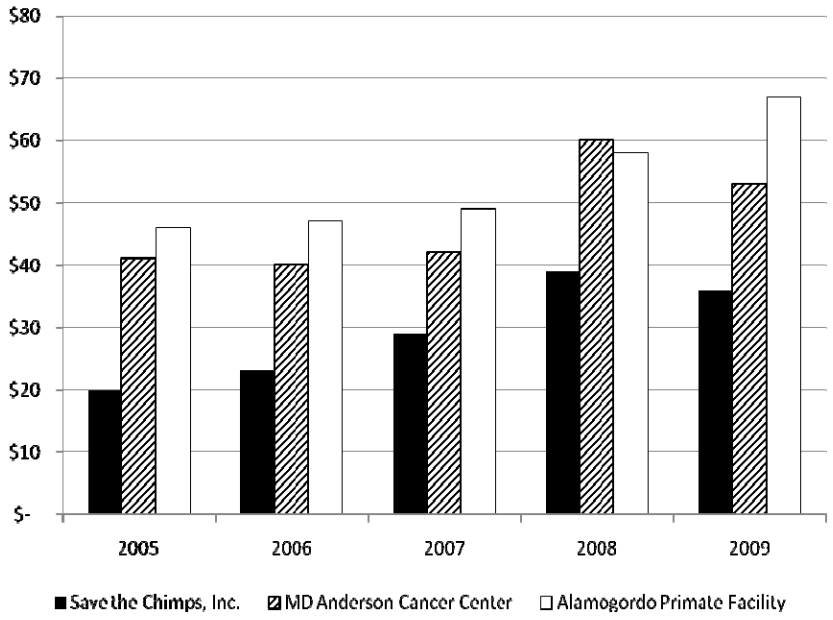

Figure 1: 2005 – 2009 Daily Cost Comparisons

Sources. – Save the Chimps costs derived from 990 and 990-PF forms for 2005 to 2009, Appendix 3. MD Anderson Cancer Center costs derived from grant 2 U42 RR015090, "Chimpanzee Biomedical Research Resource." 2005 total grant award calculated by averaging 2003 and 2008 awards. Facility population numbers from FOIA requests, HSUS (2009c), and NCRR (2010b). Alamogordo Primate Facility costs derived from contract N02-RR-1-2079/ADB#: CJ102079, "Operation and Maintenance of a Chimpanzee Long-Term Holding Facility." 2006 and 2007 facility population numbers from populations reported in 2005 and 2008. 2008 data from HSUS (2009c) and 2009 data from NCRR (2010b).