

# Economic And Demographic Trends Signal An Impending Physician Shortage

A new model of workforce projections, based on physician supply and utilization, predicts an impending physician shortage, which the nation cannot afford to ignore.

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**140****IMPENDING  
SHORTAGE**

**PROLOGUE:** Although Medicare invests about \$7 billion a year in the training of medical residents, for the past two decades Congress has never really addressed the question of how many physicians are enough to provide medical care to the U.S. population. However, the Council on Graduate Medical Education (COGME), an advisory body with little staff and limited authority, has for many years maintained that by 2000 the United States would face an overall surplus of physicians, particularly specialists, but a shortage of primary care doctors. With only a few dissenting voices along the way, this pattern of thinking has been the conventional wisdom among health workforce analysts.

Among this small cadre is Richard Cooper, a former medical school dean. Cooper and colleagues at the Medical College of Wisconsin and Temple University have developed a model that measures the adequacy of physician supply based on the growth of the nation's economy and also on a number of factors that are changing the productivity of the average physician. They conclude that the United States is likely to experience a serious shortage of specialists in the future.

The hypothesis put forward by Cooper and colleagues comes under serious challenge in a set of invited perspectives that follow. We thought that it was important to gather a variety of views because the debate over health care workforce issues has been long neglected and deserves closer scrutiny.

**ABSTRACT:** It is widely believed that the United States is producing too many physicians. We have approached this issue by developing a new model for workforce planning based on assessments of the macro trends that underlie the supply and use of physician services. These trends include economic expansion, population growth, physicians' work effort, and the provision of services by nonphysician clinicians. Contrary to earlier predictions, this model projects that the United States soon will have a shortage of physicians and that if the pace of medical education remains unchanged, the shortage will become more severe. A dialogue focused on that eventuality is imperative.

FOR PEOPLE INTERESTED IN THE PHYSICIAN WORKFORCE, 2000 was an important year, since it was the year in which it was generally accepted—indeed feared—that there would be a vast surplus of physicians, particularly of specialists. The increased expenditure associated with this was to have been detrimental to the overall economy. Instead, we are beginning to see shortages of physicians, principally of specialists, and an economic decline that would be much deeper than it is, if not for sustained levels of health care spending.<sup>1</sup>

Why was the current need for physicians so underestimated? How can future requirements be more reliably discerned? And what do shortages and surpluses of physicians mean for the health care system and for the profession of medicine itself? This paper attempts to find answers to these questions in the context of the long-term trends that underlie physician supply and utilization. It leads ultimately to the question of whether it is time for the nation to begin to increase its medical training capacity to meet the demands for physicians that are evolving.

### Past Predictions Of Surpluses

Concerns about potential physician surpluses were prominent during the debate over medical school expansion in the 1960s. In 1981 the report of the Graduate Medical Education National Advisory Committee (GMENAC) gave these concerns a quantitative basis, which was reinforced by a series of studies conducted in the 1990s on behalf of the Council on Graduate Medical Education (COGME).<sup>2</sup> The message from these various studies was consistent: Surplus numbers of specialists equal to 15–30 percent of all physicians would develop by the year 2000, to be accompanied by shortages in the number of primary care physicians.

While differing in detail, these studies shared a common framework, which was based on quantifying the “tasks” (that is, physician visits and procedures) and associated “times” (expressed as full-time-equivalent, or FTE, physicians) that constituted “good” patient care, an approach that was first developed in the 1920s by the

Committee on the Costs of Medical Care (CCMC).<sup>3</sup> This methodology was based on the assumption that more detail would lead to greater accuracy. Therefore, these studies required that physician services be disaggregated into microunits according to such factors as disease prevalence, demographic subgroups, or insurance products, a requirement that exceeded the available data and confounded the results. However, their greatest deficit was not methodological, but conceptual. It was their adoption of a social planning perspective that centered on what ought to occur, rather than an analytic approach that sought to define what most likely would occur. Nonetheless, despite challenges from some, the surpluses predicted by these studies gained wide acceptance, and they formed the theoretical basis for subsequent actions, including the termination of federal support for undergraduate medical education and a progressive decrease in support for graduate medical education.<sup>4</sup>

### **The Trend Model**

We have developed an alternative approach to physician workforce planning, based not on microanalyses of tasks and times but on macroanalyses of the long-term trends that underlie the supply and use of physician services.<sup>5</sup> Four such trends were considered. First is economic expansion, the dominant factor that drives the use of health care.<sup>6</sup> Second is population growth, which directly affects the need for physicians. Third is the work effort of physicians, which has been declining.<sup>7</sup> And fourth are the services provided by non-physician clinicians (NPCs), which have been increasing.<sup>8</sup> These four trends have been combined into a model termed the “Trend Model,” which we have used to assess the adequacy of physician supply over the next twenty years.

The Trend Model differs from earlier models in several ways. First, it is a macroanalysis with relatively few data requirements, based on the notion that simpler and more aggregate models are more effective and readily reproducible. Second, it relies on long-term trends, which tend to dominate short-term fluctuations. Third, by assuming that historical trends in physician supply reflect the historical demand for physician services, it creates a conceptual link between supply and demand. This allows projections of future demand to be based on past trends and compared with separate projections of supply. Finally, while it makes assumptions about what is likely to occur, it does not base its projections on what ought to occur.

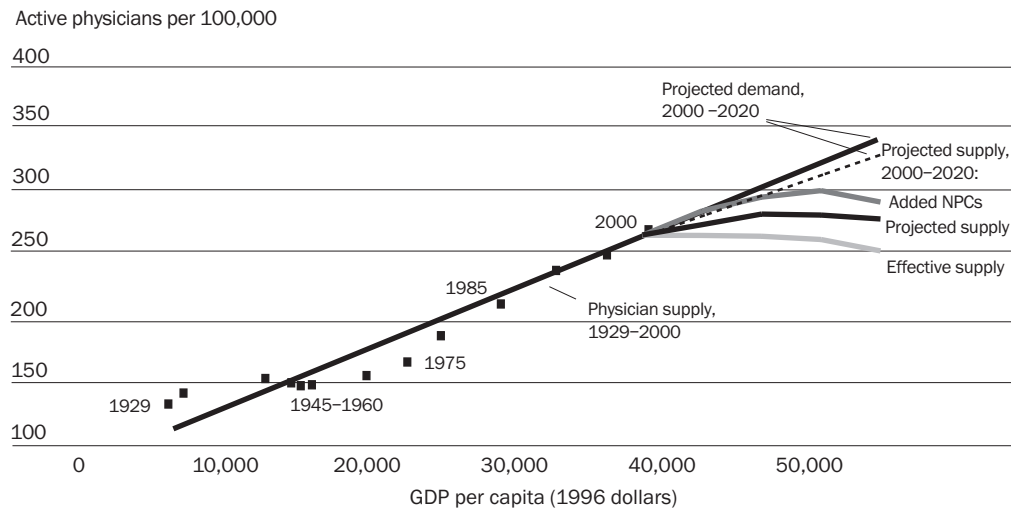
In striking contrast to earlier predictions, the Trend Model indicates that if the pace of medical education remains unchanged, the United States will soon be facing shortages of physicians and that these shortages will become progressively more severe over time.

This echoes the conclusions reached by William Schwartz and colleagues, who, using a conceptually similar approach, predicted more than a decade ago that surpluses of the magnitude predicted by GMENAC and COGME for the year 2000 would not materialize.<sup>9</sup>

## Economic Trends

■ **Longitudinal trends.** The major trend affecting the demand for physician services is the economy. In developed countries throughout the world, health care spending has been closely tied to levels of economic development, as reflected by a country's real (inflation-adjusted) gross domestic product (GDP) or national income.<sup>10</sup> Since labor is the principal health care expense component, it is not surprising that growth of GDP has also correlated with growth of the health care labor force.<sup>11</sup> However, most of this growth in the workforce has involved ancillary personnel, so physicians have become a proportionately smaller component.<sup>12</sup> The composite result of these interrelated trends is depicted in Exhibit 1, which displays the close, long-term relationship that has existed in the United States be-

**EXHIBIT 1**  
**Physician Supply And Gross Domestic Product, 1929–2000 And Projected To 2020**



**SOURCES:** Physician supply: R.I. Lee and L.W. Jones, *The Fundamentals of Good Medical Care* (Chicago: University of Chicago Press, 1933); W.H. Stewart and M. Pennell, "Health Manpower, 1930–75," *Public Health Reports* 75, no. 3 (1960): 274–280; American Osteopathic Association; and Bureau of Health Professions. Population: Bureau of the Census. Gross domestic product: Bureau of Economic Analysis. Supply projections based on authors' model; see Note 4 in text.

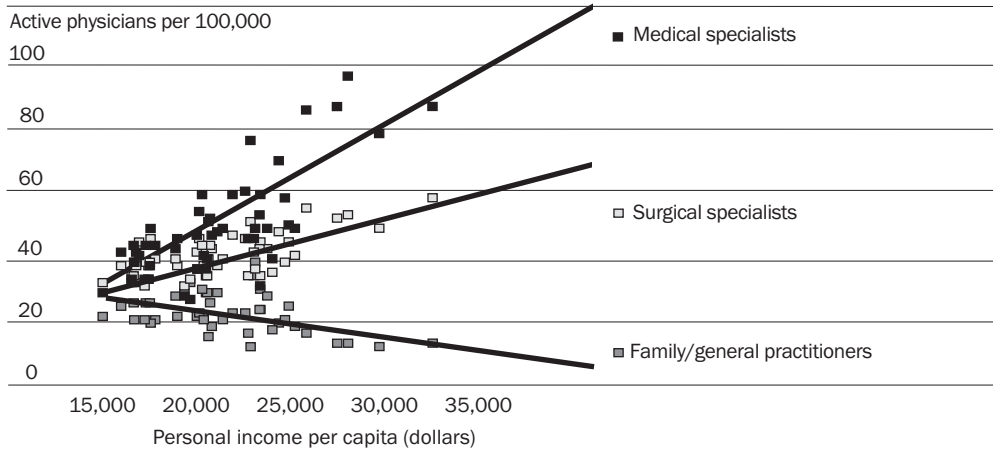
**NOTES:** "Physician supply 1929–2000" includes active physicians only ( $r^2 = 0.94$ ). "Projected supply" includes all active physicians. "Effective supply" represents the number of active physicians reduced by the decrements in work effort associated with increasing numbers of female and older physicians in the workforce. "Added NPCs" represents the sum of "effective supply" plus the incremental contributions of nonphysician providers (NPCs). Per capita GDP is expressed in chained 1996 dollars. "Physician demand" is projected based on average annual GDP growth rates of 1.5 percent (dotted rule) and 2 percent (continued solid rule).

tween growth of GDP and growth of physician supply over a period of more than seventy years. The data diverged in the direction of physician undersupply in the 1960s, when most policymakers agreed that shortages were occurring, but it returned to the trend line in the 1980s following an increase in the number of physicians being trained.

Similar correlations among GDP, health spending, and physician supply were observed in other Western democracies over the shorter time span from 1960 to 1998, as well as in most states over the period 1980–1998.<sup>13</sup> The power of these regressions was greater when the known temporal lags between changes in GDP and changes in health care spending were also considered.<sup>14</sup> Moreover, they remained strong even after GDP was adjusted for the linear effects of time.<sup>15</sup> Taken together, these observations are consistent with the notion that a causal relationship exists between economic expansion and growth of physician supply.

■ **Cross-sectional analyses.** Evidence supporting the role of economic factors in determining physician supply also emerged from cross-sectional analyses of the fifty states (Exhibit 2). Physician supply correlated with state per capita income, as had been noted earlier.<sup>16</sup> The slopes (that is, betas) of these regressions were virtually identical at various time points over a period spanning almost thirty years. However, they were not the same for all specialties of medicine. The medical specialties (including both general and subspecialty internal medicine and pediatrics) were most responsive to income effects, while the surgical specialties were less affected, and family/general practice displayed a slightly negative rela-

**EXHIBIT 2**  
**Physician Supply In States, By Major Specialty Group And State Per Capita Income, 1995**



**SOURCES:** Bureau of Economic Analysis; American Medical Association; and Bureau of the Census.

tionship with per capita income. These observations not only confirm the link between economic growth and the demand for physician services but also suggest that geographic differences in physician supply are likely to persist as long as regional differences in income exist.

■ **The economic chain.** Throughout this series of analyses, physician supply correlated with economic growth. On average, the magnitude of this relationship was equivalent to a difference in physician supply of approximately 0.75 percent for each 1 percent difference in GDP or personal income. However, there are several important points to consider in interpreting this relationship.

First, it is not a simple mathematical relationship that always holds true. It is a macrotrend that only applies to physicians in the aggregate over broad periods. While microturbulence, such as changes in payment schemes, governmental regulation, or the structure of health plans, may induce deviations from the trend lasting as long as five to ten years, such factors do not influence the slope of the trend, which is affected by macroeconomic dynamics.

Second, it is not a simple relationship. It results from a complex set of interrelationships that begins with increases in GDP, which (with a lag of several years) induces further demand for health services, thereby causing health care spending to rise. This leads to growth of the health care labor force, of which physicians are an important component. The fact that strong correlations exist across this entire spectrum, from GDP to physician supply, speaks to the systematic nature of the intervening steps.

Finally, the relationship between GDP and the demand for physician services does not exist in isolation. It is the consequence of countervailing societal forces that both promote and constrain utilization. For example, the perceived triumphs of technology contribute to a culture that is willing to devote more resources to health care. Similarly, although population aging does not itself cause health care spending to rise above its established trends, the elderly constitute a political force that can influence the allocation of societal resources.<sup>17</sup> In each instance, efforts to push health care use higher are balanced by public and private “reforms” that work to constrain spending and limit access. The striking observation is that the net of these counterbalancing factors yields such stable results, infrequently allowing physician supply to deviate by more than 10 percent from its long-term relationship with GDP.

## Population Trends

Population growth is a second major factor that affects the demand for physicians. Unfortunately, most previous workforce analyses

used unmodified population forecasts from the Census Bureau, which have proved to be low, and, therefore, the resulting projections of physicians per capita were excessively high. Indeed, this error accounts for approximately 25 percent of the physician surpluses that were previously predicted.<sup>18</sup> To place this into perspective, the total output of ten to twelve medical schools would be required to service the population that was omitted from consideration by these earlier studies.

Using a modification of Census Bureau estimates, we have forecasted that the U.S. population will grow from 285 million in 2000 to 325 million in 2010 and that it will reach 345 million in 2020. These values are similar to those that both we and the Centers for Medicare and Medicaid Services (CMS, formerly HCFA) have used previously.<sup>19</sup> Although 6–8 percent higher than current Census Bureau forecasts, they are within 2 percent of the projections that can be derived using data from the year 2000 census.<sup>20</sup>

### Physician Supply And Sufficiency Trends

■ **Current supply.** The starting point in all workforce supply projections is an estimate of the current physician labor force. Unlike most earlier analyses, the Trend Model avoids the errors that are inherent in deciding what constitutes “one FTE physician” by basing its measures on a “head count” of all active physicians, including residents, irrespective of their level of activity. Applying this definition to data from the period of seventy years that was analyzed, physician supply increased fivefold, from 144,000 in 1929 to 772,000 in 2000.<sup>21</sup> This represents more than a doubling of physicians per capita, from 119 physicians per 100,000 of population in 1929 to 270 in 2000 (Exhibit 1).

■ **Sufficiency.** To use current “head counts” of physicians for projecting future supply, one must first assess both the adequacy of physician supply and the degree to which physicians are utilized. Recent surveys of physicians and the public, combined with information on physician recruitment, yield a picture of marginal sufficiency, with a strong demand for specialists, lengthening of waiting times in many specialties, and sporadic reports of physician shortages.<sup>22</sup>

■ **Future supply.** The method used by the Trend Model to project physician supply into the future follows the general form used by others.<sup>23</sup> For operational purposes, it holds inputs steady by assuming that the number of first-time, first-year residents will remain fixed at 23,000 (126 percent of U.S. medical graduates) and that 20 percent of international medical graduates (IMGs) will return to their countries of origin, as has been true over the past decade. The model also assumes that current patterns of retirement

will continue.<sup>24</sup> Based on these assumptions, and using the population projections discussed above, we project that the “head count” of active physicians will increase from 772,000 (270 per 100,000 of population) in 2000 to a peak level of 887,300 (283 per 100,000 of population) in 2010 (Exhibit 1). Thereafter, the total number will continue to grow, reaching 964,700 in 2020, but the population will grow even faster, and the number of physicians per capita will actually decrease slightly, to 280 per 100,000 of population. Thus, for most of the next twenty years per capita physician supply will be essentially flat.

### Physician Work Effort

Because physician work effort is changing, these projections must be modified to reflect the existing trends. All are in the direction of reduced effort. This includes the aging of the physician workforce (with its associated decrease in hours worked), the increasing number of female physicians, the lesser work effort of physicians who are employees, the tendency of younger physicians to place a greater emphasis on personal time, the increasing frequency of early retirement, and the decreasing hours that residents are permitted to work.<sup>25</sup> Although all are important, only the first two were factored into the model, by assuming reductions of 10 percent and 20 percent, respectively, in the efforts of physicians ages 55–65 and over age 65, and a 20 percent reduction in the effort of female physicians. This resulted in a decrease in the “effective supply” of physicians by 5 percent in 2010 and 7 percent in 2020 (Exhibit 1). Because these adjustments do not include consideration of other factors that also reduce work effort, they probably overstate the amount of physician effort that will actually be available in the future.

### Substitution Trends

The final trend that we considered is the substitution of NPCs in the provision of “physician services.” Until recently NPCs’ ability to substitute for physicians was limited by their licensed prerogatives and by their total numbers, but both of these limitations are diminishing.<sup>26</sup> Most NPCs now provide not only adjunctive services but also services that broadly overlap those provided by physicians, and their potential for substitution is substantial.<sup>27</sup> And their numbers are growing. By 2015 there are likely to be as many as 275,000 nurse practitioners, physician assistants, and nurse-midwives; 150,000 chiropractors and acupuncturists; and 100,000 other NPCs engaged in specific specialties, such as psychology, anesthesia, and optometry. Their combined output will be equivalent to the services of approximately 65 physicians per 100,000 of population. More than

one-third of this output is in place already. Therefore, the incremental growth of NPCs over the next fifteen years was taken to be equivalent to 40 physicians per 100,000 of population (Exhibit 1), which is equal to approximately 15 percent of the physician workforce. Paradoxically, most of this growth will be concentrated in primary care, which has shown relatively stable needs, whereas the greatest growth of demand for physician services is in the non-primary care specialties, to which NPCs can be expected to contribute proportionately less.

### Applying The Trend Model

■ **Projections.** Projections based on the Trend Model build from these separate trends. On the demand side, health care spending has tended to outpace GDP by a ratio of approximately 1.5 to 1.0. If this differential continues, as has been projected, and if real per capita economic growth continues at 1.5–2.0 percent annually, as also has been projected, the fraction of GDP devoted to health care will increase from approximately 14 percent in 2000 to 18 percent in 2020.<sup>28</sup> Based on an increase in physician supply of approximately 0.75 percent for each 1 percent increase in GDP, as discussed above, the Trend Model projects a growth in the demand for physician services of approximately 1.1–1.5 percent annually (Exhibit 1), a rate of increase that is similar to the job opportunities for physicians that have been projected by the Bureau of Labor Statistics.<sup>29</sup>

Comparing this growth in the demand for physician services with the number of active physicians that has been projected reveals a shortfall of substantial magnitude (Exhibit 1). This shortfall widens further when work effort is considered and demand is compared, instead, with the “effective supply” of physicians, but the incremental contributions of NPCs more than compensate for changes due to physician work effort, leaving a projected deficit in 2010 of only 50,000 physicians, less than 6 percent of the projected demand. Some of this is within the margin of error of the trends that were analyzed, and much of it could be accommodated by the elasticity of the health care labor force. However, by 2020 the deficit is projected to exceed 200,000 physicians, an amount that represents more than 20 percent of the projected demand. In percentage terms, this is greater than the shortages that existed during the 1960s.

■ **Assumptions.** To properly assess these estimates of shortages, they must be interpreted in the context of the errors and uncertainties that are inherent in the Trend Model. The assumption that the number of physicians being trained would remain constant was simply operational, since the purpose of this exercise is to determine whether that number should change. Other assumptions were in the

*“The greatest uncertainty rests with the demand for physician services and with the economic growth that underlies it.”*

direction of overestimating physician supply. Thus, it was assumed that the current rates of attrition would continue, although anecdotal evidence suggests that attrition is increasing. Similarly, in projecting “effective physician supply,” the model assumed decrements in work effort attributable to aging and sex, but it did not consider other, less well defined factors that also have a negative impact on physician work effort. The major error in the population projections was also in the direction of overestimating per capita physician supply (by underestimating population growth), because it was assumed that the rate of immigration would not change, whereas increases seem likely. Subsequent applications of the Trend Model will have to incorporate alternative projections and assumptions as these various issues are clarified.

More ambiguity is associated with estimates of substitution, particularly since any protracted shortages of physicians are likely to cause an expansion in the autonomy and scope of practice of NPCs in those states in which these prerogatives are still limited, thereby increasing NPCs’ ability to provide “physician services.” However, unless new disciplines emerge or existing disciplines vastly expand their scope of activities, substitution is ultimately limited by the range of tasks that NPCs now can reasonably assume. Thus, under most scenarios the supply of physicians plus NPCs is likely to remain relatively unchanged over the next twenty years (Exhibit 1).

The greatest uncertainty rests with the demand for physician services and with the economic growth that underlies it. While there were no indications in our analyses that the trends defining this relationship were changing, it seems inevitable that, at some point, the relative rates of economic growth and the growth of health care services will have to narrow. However, even if that occurs, or if overall economic growth slows, the inevitable divergence between an essentially flat physician supply and the rising demand that any significant economic expansion will induce predicts progressively increasing physician shortages.

### **The Nation’s Future Physician Supply**

These projections are made against a background of concern that health care spending is excessive and that physicians may exacerbate the problem, either by actually inducing demand or by facilitating utilization in a system in which they exert control over most

expenditures, a conclusion that is not supported by contemporary data.<sup>30</sup> Among those who hold this perspective, constraining the growth of physician supply is seen as a means of limiting spending. Canada followed such a policy throughout the 1990s. Physician supply in the United States has remained lower relative to GDP than in most Organization for Economic Cooperation and Development (OECD) countries, and managed care has been used to further limit access. However, as revealed both by the backlash against managed care in the United States and by the recent recognition in both Canada and California that physician shortages are looming, such constraints inevitably conflict with long-term economic trends and with the perceptions of need that flow from them.<sup>31</sup>

Thus, physicians are at the nexus of a health care system that is shaped in large measure by exogenous trends. Their role is broad. It bridges an expanding universe of medical science and a long tradition of compassion and healing. But are the trends consistent with the continuation of this duality? Faced with the “taut supply” that Eli Ginzberg has advocated, it seems more likely that physicians will be drawn to those complex areas of specialty medicine that demand their attention most and that they will find it increasingly difficult to “lavishly dispense time, sympathy and understanding,” as Francis Peabody urged they should.<sup>32</sup> Patients desire the most advanced treatments, but they also seek a caring physician. Ironically, attempts to impede patients’ access to the former have had the unintended consequence of squeezing out the latter.

The sociologist Andrew Abbott has observed that “a profession whose jurisdiction is excessive must increase its productivity or expand its numbers.” Conversely, “when a powerful profession ignores a potential clientele, paraprofessionals appear to provide the needed services.”<sup>33</sup> These statements characterize the dilemma that physicians now face. Their ability to increase their productivity is limited by their declining work effort. Their ability to grow their numbers is hostage to the belief that surpluses exist. And organized medicine has embarked on a vigorous campaign to thwart expansion of the NPC disciplines.<sup>34</sup> Yet it was shortages in the past that motivated state legislatures to remove the barriers to licensure for NPCs and to enlarge their range of privileges, and it is perceived professional opportunities that stimulated the creation of new disciplines and the expansion of existing ones.

**T**HE LAST DEBATE ABOUT PHYSICIAN SHORTAGES CONTINUED well into the 1960s. Ultimately, the Health Professions Education Assistance Act of 1963 led to a doubling of medical school slots, but it was another fifteen years before appreciably more

physicians were available to the public. It is doubtful that this process could occur any more rapidly today. While the recruitment of additional IMGs could shorten the response time, the wisdom of even our current dependency on IMGs has been questioned.<sup>35</sup> If, instead, the infrastructure of medical education were expanded to alleviate just one-third of the projected shortages, more than twenty-five additional medical schools would be required over the next decade, a formidable undertaking. But to do nothing invites public discontent and forces the profession of medicine to redefine itself in an ever more narrow scientific and technological sphere while other disciplines evolve to fill important gaps. Although the path is uncertain, the choices are clear. We believe that a dialogue regarding these choices is imperative.

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**NOTES**

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