World Journal of Advanced Engineering Technology and Sciences
eISSN: 2582-8266
Cross Ref DOI: 10.30574/wjaets
Journal homepage: https://wjaets.com/

(RESEARCH ARTICLE)

Check for updates

Compliance and quality standards in solar energy installations in Nigeria: Consumer awareness and vendor practices

FREDRICK OLUWAFISAYO AKINGBESOTE * and THEOPHILUS EWETUMO

Department of Agricultural Engineering and Environmental Engineering, Centre for Renewable Technology (CRET), Federal University of Technology, Akure.

World Journal of Advanced Engineering Technology and Sciences, 2025, 14(02), 228-237

Publication history: Received on 10 January 2025; revised on 18 February 2025; accepted on 21 February 2025

Article DOI: https://doi.org/10.30574/wjaets.2025.14.2.0078

Abstract

The adoption of solar energy has become one of the reliable, practical solutions to Nigeria's energy challenges. Given the country's unreliable grid supply and the high cost of alternatives like diesel and petrol generators, solar photovoltaic (PV) systems have gained widespread acceptance among households and businesses. However, the efficiency and longevity of these systems largely depend on adherence to quality standards and regulatory compliance. A lack of awareness about quality standards, non-compliance with best installation practices, and the prevalence of substandard components have raised concerns about the sustainability and reliability of solar energy solutions in Nigeria. This study examines the awareness and compliance levels of consumers and vendors regarding quality standards in solar energy installations. It explores how consumers balance cost and quality, their knowledge of regulatory requirements, and their experiences with substandard installations. Additionally, it assesses vendor practices in ensuring compliance with quality benchmarks and identifies key challenges in enforcing standards. The findings highlight that many solar energy installations fail to deliver the expected longevity due to compromises on quality, as both vendors and consumers often opt for substandard materials to cut costs. The findings revealed that 38.7% of respondents lacked awareness of standards, regulations, codes, or safety procedures, while 44.3% had a satisfactory understanding, and only 17.0% demonstrated a strong grasp. Similarly, 33.0% were unaware of the roles of regulatory agencies, 44.3% had sufficient knowledge, and 22.6% had a thorough understanding. Also, 68.9% of respondents were familiar with renewable energy. While 76.4% knew that solar energy facilities are expected to last between 10 and 25 years, 54.7% questioned whether installed systems met this expectation. Moreover, 39.6% had an accurate understanding of quality requirements, yet 52.8% did not verify the qualifications of their installer before hiring. Despite high awareness of regulatory bodies such as the Standards Organisation of Nigeria (SON) and the Nigerian Electricity Regulatory Commission (NERC), enforcement remains weak. These bodies have established guidelines for solar energy systems, including mandatory certification and licensing for practitioners, but issues persist, including the sale and installation of uncertified products.

Keywords: Standard; Solar Energy; Regulatory Requirements; Quality; Vendors

1. Introduction

1.1. Renewable Energy and the Transition to Solar Power

Nigeria, like many other developing countries, is facing a growing demand for energy as its population and economy continue to expand (International Energy Agency (IEA), 2023)[8]. However, the country has been grappling with several challenges in meeting this demand, including an unreliable electricity grid, insufficient access to electricity in rural areas, and dependence on fossil fuels that contribute to environmental degradation and climate change (Energy Commission of Nigeria (ECN), 2022)[3]. As a result, there is a growing recognition of the need to transition to renewable

* Corresponding author: FREDRICK OLUWAFISAYO AKINGBESOTE .

energy sources, such as solar power, to achieve sustainable energy security and reduce the country's carbon footprint (United Nations Development Programme (UNDP), 2021)[16].

Solar power has emerged as a promising alternative energy source for Nigeria due to its abundance of sunlight throughout the year (Shahsavari and Akbari, 2018)[13]. The country's geographic location near the equator means that it receives high levels of solar radiation, making solar power a viable and cost-effective option for electricity generation (International Renewable Energy Agency (IRENA), 2022)[9]. Moreover, solar panels can be installed on rooftops or in open fields, making them suitable for both urban and rural areas. This decentralized approach to energy production can help address the issue of limited access to electricity in remote regions of Nigeria (Fagbenle *et al*., 2020)[5].

The Nigerian government has taken steps to promote the adoption of solar power through various initiatives and policies (Federal Ministry of Power, 2021)[6]. The launch of the Solar Power Naija program, for example, aims to provide solar power systems to 5 million households in rural areas by 2023 (Rural Electrification Agency (REA), 2021)[12]. In addition, the government has introduced tax incentives and subsidies to encourage investment in solar energy projects, as well as partnerships with international organizations and private sector companies to boost the development of the solar power sector (World Bank, 2022)[18]. These efforts are helping to create a supportive environment for the growth of solar power in Nigeria and accelerate the transition to renewable energy (IEA, 2023)[8].

Despite the challenges that remain, such as limited financing options and inadequate infrastructure for solar power integration, the transition to solar power in Nigeria holds great potential for driving economic growth, reducing greenhouse gas emissions, and improving energy access for millions of people (Akinbami, 2021)[2]. By harnessing the power of the sun, Nigeria can diversify its energy sources, enhance energy security, and contribute to global efforts to combat climate change (IPCC, 2021)[7]. With continued government support, investment, and innovation, the country can successfully transition to a more sustainable energy future powered by solar energy (IRENA, 2022)[9].

1.2. Quality Standards and Regulatory Frameworks in Nigeria

To align with global standards, Nigeria has implemented regulatory measures for solar energy installations. The Standards Organisation of Nigeria (SON), the nation’s primary body for quality assurance, mandates the adoption of International Electrotechnical Commission (IEC) standards and quality testing methods for stand-alone solar products up to 350 watts, including DNIS IEC TS 62257-9-8 and DNIS IEC TS 62257-9-5:2018EE. These efforts have been bolstered by international organisations such as the Lighting Africa program, the World Bank, and the Africa Clean Energy (ACE) Programme. However, challenges such as weak market surveillance and inadequate enforcement continue to allow the proliferation of substandard solar products.

The Nigerian Energy Support Programme (NESP II), funded by the German government and the European Union, has played a significant role in strengthening standards for solar PV systems in Nigeria. This initiative has facilitated the adoption of 95 IEC standards tailored to Nigeria’s climatic conditions, covering critical components such as PV modules, batteries, inverters, charge controllers, and energy meters. Additionally, SON, in partnership with NESP II, has developed regulatory frameworks to ensure the compliance of both imported and locally manufactured solar components with established quality standards.

1.3. Challenges in Compliance and Market Regulation

Nigeria, like many developing countries, faces numerous challenges in compliance and market regulation. One of the primary challenges is the lack of an adequate regulatory framework and enforcement mechanisms. While Nigeria has several laws and regulations governing different aspects of the market, including securities trading, corporate governance, and consumer protection, enforcement remains weak (Okonkwo, 2020)[10]. This deficiency creates an environment where market participants can engage in unethical or illegal behavior with minimal fear of repercussions, ultimately undermining the integrity of the market (Adegoke, 2019)[1].

Another significant challenge in compliance and market regulation in Nigeria is corruption. Corruption is pervasive in many aspects of Nigerian society, including within regulatory and enforcement agencies responsible for overseeing the market (Transparency International, 2022)[14]. This corruption manifests in various forms, such as regulatory officials accepting bribes to overlook violations or ignoring illegal activities for personal gain (Eze, 2021)[4]. Such practices weaken the effectiveness of market regulation and erode public trust, discouraging potential investors and hindering economic growth (World Bank, 2021)[17].

Additionally, inadequate human and financial resources dedicated to compliance and market regulation in Nigeria present a significant challenge. Regulatory agencies often struggle to attract and retain qualified personnel, resulting in

a lack of expertise and capacity to effectively oversee the market (Olawale and Yusuf, 2020)[11]. Furthermore, limited funding for regulatory activities impedes efforts to enforce compliance and prevent misconduct. Consequently, market participants may exploit these weaknesses to engage in fraudulent or unethical behaviour, placing investors at risk and damaging the reputation of Nigerian markets both domestically and internationally (UNDP, 2021)[15].

Addressing these challenges requires a concerted effort to strengthen the regulatory framework, enhance enforcement mechanisms, combat corruption, and provide adequate resources to regulatory agencies. Implementation of these reforms, Nigeria can improve market integrity, attract investment, and foster sustainable economic growth.

2. Methodology

2.1. Research Design

A mixed-methods research design was utilized, combining quantitative and qualitative approaches for thorough data collection and analysis. Additionally, a time-bound assessment of solar system facilities was conducted to evaluate compliance with expected quality standards. This methodology offered a comprehensive perspective on the awareness and adherence of both practitioners and consumers to solar energy regulations.

2.2. Study Area

The study was carried out in Lagos, Ondo, and Oyo states, three highly urbanized regions in southwestern Nigeria. These locations were chosen for their diverse solar energy markets, which encompass varying installation practices, consumer awareness levels, and degrees of regulatory oversight. Also, the majority of solar panels to test for were taken from those locations.

2.3. Target Population

The study targeted practitioners engaged in the design, installation, and maintenance of solar energy systems, sales of solar installation along with consumers utilizing solar power solutions in Lagos, Ondo, and Oyo states.

2.4. Sample and Sampling Procedure

2.4.1. Sample Size Determination

The Yamane (1967)[19] equation was used to determine the sample size. The population of vendors and installer and average population of consumers was used in calculating the sample size. The Yamane Formula is:

$$n = \frac{N}{1 + Ne^2} \quad \ldots\ldots\ldots\ldots\ldots\ 1$$

where: n is the sample size, N is the population size and e is the level of precision is taken as 0.05 or 95% confidence level.

2.4.2. Sampling Procedure for Survey

A purposive sampling technique was employed to select survey participants. Key stakeholders with experience and expertise in the solar energy sector were identified through collaboration with industry associations, regulatory bodies such as the Standards Organisation of Nigeria (SON), and other relevant organisations.

2.4.3. Sampling Procedure for In-depth Interviews

A combination of purposive and snowball sampling techniques was used for in-depth interviews. Initially, participants were chosen based on their active engagement in solar energy systems. These individuals then referred other qualified participants, broadening the interview pool to capture diverse industry perspectives.

A structured questionnaire was designed to assess key variables, including socio-demographic details, knowledge of solar energy quality standards, attitudes toward compliance assessment, and observed installation practices.

For quantitative data collection, the primary research tool was a structured questionnaire featuring multiple-choice and closed-ended questions. It was divided into sections covering socio-demographic characteristics, knowledge of regulatory requirements, attitudes toward quality compliance, and observed practices in solar energy installations.

Qualitative data was gathered using an interview guide with open-ended questions, enabling an in-depth exploration of industry experiences and regulatory challenges.

2.5. Data Collection

2.5.1. Survey Questionnaires

A descriptive cross-sectional survey was conducted among practitioners and consumers in Lagos, Ondo, and Oyo states. Depending on participant preference and accessibility, questionnaires were either self-administered or completed through face-to-face interviews. This method facilitated the collection of comprehensive data on awareness and compliance with solar energy standards.

2.5.2. In-depth Interviews

A total of 30 in-depth interviews were conducted with practitioners, with 10 interviews held in each of Lagos, Ondo, and Oyo states. These semi-structured, in-person interviews provided valuable insights into practitioners' experiences, perceptions, and challenges regarding compliance with solar energy standards and regulations.

3. Results and Discussion

3.1. Knowledge of Quality Standards in Solar Energy Installations

The study evaluated respondents' knowledge of quality standards and regulatory requirements in solar energy installations. As shown in Table 1, awareness levels varied across different aspects of solar energy standards.

Regarding standards, regulations, codes, and safety procedures, 38.7% of respondents did not know, 44.3% demonstrated a satisfactory understanding, and only 17.0% had a strong grasp. Similarly, 33.0% were unaware of the roles of regulatory bodies, while 44.3% had satisfactory knowledge, and 22.6% exhibited a deep understanding.

Awareness of design constraints and project planning was also low, with 44.3% of respondents reporting no knowledge, 36.8% demonstrating satisfactory understanding, and only 18.9% indicating strong knowledge. A similar trend was observed in understanding solution techniques and independently verified results, where 39.6% lacked knowledge, 38.7% had satisfactory awareness, and 21.7% had strong knowledge.

Safety awareness was relatively higher, with 35.8% unaware of risks, 42.5% having satisfactory awareness, and 21.7% possessing strong knowledge. In terms of system components, 41.5% of respondents had no understanding, 35.8% had satisfactory knowledge, and 22.6% had strong knowledge.

Quality control during installation and design was well understood by 30.2% of respondents, while 41.5% had no knowledge, and 28.3% had only a satisfactory understanding.

Table 1 Respondent's Knowledge of Quality Requirements for Solar Energy Facilities

Statement	Responses	Percentage (%)
Can you demonstrate knowledge of standards, regulations, codes, and safety - this will include local Solar energy practices and procedures as applicable	Not at all	38.7
	Satisfactory	44.3
	Very well	17.0
Do you understand the various roles expected from some of the regulatory bodies in the practice of Solar energy installation and design?	Not at all	33.0
	Satisfactory	44.3
	Very well	22.6
Can you demonstrate knowledge of some operations or materials as appropriate, design constraints, projects and design to best fit the intended purpose	Not at all	44.3
	Satisfactory	36.8
	Very well	18.9

Would you be able to understand the solution technique and independent verified result	Not at all	39.6
	Satisfactory	38.7
	Very well	21.7
Are you aware of some of the safety risks that may be inherent in designing; demonstrating Safety Awareness.	Not at all	35.8
	Satisfactory	42.5
	Very well	21.7
Can you demonstrate a basic understanding of the components of systems as well as of entire systems	Not at all	41.5
	Satisfactory	35.8
	Very well	22.6
Do you understand the concept of quality control procedures during installation and designing?	Not at all	41.5
	Satisfactory	28.3
	Very well	30.2
Are you involved in the drawings and sketches of the design	Not at all	63.2
	Satisfactory	24.5
	Very well	12.3
How well do you communicate orally, Writing, reading and comprehension in English	Not at all	8.5
	Satisfactory	46.2
	Very well	45.3
Do you understand terms work with integrity, ethically and within professional standards?	Not at all	9.4
	Satisfactory	41.5
	Very well	49.1
Can you demonstrate awareness of professional accountability	Not at all	10.4
	Satisfactory	38.7
	Very well	50.9

3.2. Awareness of Regulatory Standards in Solar Energy Installations

The study also explored respondents' awareness of regulatory standards for solar energy installations. As shown in Table 2, 68.9% of respondents were familiar with renewable energy standards, with their sources of information varying: 22.6% accessed information online, 16.0% through media, 9.4% from family and friends, and 3.8% from school.

Awareness of mandatory certification requirements was high, with 88.7% recognizing that the Standards Organisation of Nigeria (SON) mandates certification for solar products. Similarly, 90.6% acknowledged the necessity of SON Conformity Assessment Program (SONCAP) certification for imported solar facilities. Additionally, 97.2% were aware that practitioners in the solar energy sector must be accredited, registered, or licensed by a regulatory body, and 95.3% agreed that proof of adequate experience is essential before engaging in solar energy practice.

The importance of using compatible parts during installation was recognized by 92.5% of respondents, while 98.1% emphasized the need for interchangeability and interoperability of components during design and installation. However, concerns about industry challenges were evident, with 90.6% expressing worries over the involvement of unqualified individuals in solar installations and 79.2% acknowledging the prevalence of substandard components in the market.

Table 2 Awareness of Standard

Statement	Response	Percentage (%)
Are you aware of the requirements of the standards on Renewable Energy	No	31.1
	Yes	68.9
If yes to the above, what is your source of information,	At school	3.8
	Family and friends	9.4
	Internet	22.6
	Media	16.0
	Others specify	17.0
is it mandatory for all products being used for the solar system to be certified to quality requirements by the Standards Organisation Nigeria	No	11.3
	Yes	88.7
Imported solar facilities must have a Standards Organisation of Nigeria (SON) Conformity Assessment Program (SONCAP) Certificate before being allowed into Nigeria	No	9.4
	Yes	90.6
Practitioners in the solar energy field must be accredited/registered/licensed with a regulatory body	No	2.8
	Yes	97.2
There must be proof of adequate experience before anyone can be allowed to practice	No	4.7
	Yes	95.3
Is it imperative to use parts that are compatible with ones from other manufacturers during installation	No	7.5
	Yes	92.5
Interchangeability and interoperability of components should be given priority during design and installation	No	1.9
	Yes	98.1
Quack and unqualified people are now involved in the design and installation of solar energy projects	False	9.4
	True	90.6
Substandard components are being imported and used in Nigeria	False	20.8
	True	79.2
Are you aware that solar energy facilities should last between 10 – 25 years	False	23.6
	True	76.4
Solar energy projects hardly last up to 3 years after installation	False	45.3
	True	54.7
Installing solar energy requires	False	10.4
	True	89.6

3.3. Perceptions of Solar Energy Compliance and Longevity

Respondents' views on the compliance and durability of solar energy installations varied. While 76.4% were aware that solar energy facilities are expected to last between 10 and 25 years, 54.7% doubted whether installed systems met this expectation, believing they often failed within three years. The necessity of periodic maintenance was widely recognized, with 89.6% of respondents acknowledging its importance.

3.4. Attitudes towards Compliance with Quality Standards

Table 3 outlines respondents' attitudes toward compliance with solar energy quality standards. While 39.6% demonstrated a strong understanding of quality requirements, 33.0% had a limited understanding, and only 19.8% exhibited an exceptional grasp of compliance requirements. Experience levels in the solar energy sector varied, with 68.0% of respondents having less than five years of experience, 20.0% having between five and ten years, and 12.0% possessing over ten years of experience.

Affordability and reliability were also key considerations. Most (84.9%) agreed that solar energy is more cost-effective than electricity from distribution companies, while 81.1% viewed it as a more reliable power source. Despite this, purchasing decisions were largely influenced by affordability, with 65.1% of respondents prioritizing cost over quality. Concerns about substandard solar energy facilities were prevalent, with 68.9% acknowledging their presence in the market. However, only 60.4% of respondents actively checked for certification and quality marks before purchasing solar energy equipment.

Table 3 Attitude toward compliance assessment of solar energy to specified quality requirements

Statement	Response	Percentage %
What is your understanding as regards quality requirements/standards on solar energy facilities	Low	33.0
	Much	39.6
	None	7.5
	Outstanding	19.8
How long have you been using/installing solar energy facilities	Less than 5 years	68.0
	less than 10 years	20.0
	More than 10 years	12.0
The use of solar energy is cheaper than power from Distribution Companies	I don't know	5.7
	No	9.4
	Yes	84.9
The use of solar energy is more reliable than power from Distribution Companies	I don't know	13.2
	No	5.7
	Yes	81.1
As a user/installer, I buy what I can afford	No	15.1
	Undecided	19.8
	Yes	65.1
Are you aware that not all solar energy facilities imported to Nigeria are of good quality	No	19.8
	Undecided	11.3
	Yes	68.9
Do you import your Solar Energy from the manufacturers	No	59.4
	Yes	40.6
Do you buy your Solar Energy facilities from local sellers in Nigeria	Anyhow	4.7
	No	28.3

	Yes	67.0
Do you check for the certification/registered mark of quality before buying solar energy items?	No	18.9
	Undecided	20.8
	Yes	60.4

3.5. Consumer Practices in Solar Energy Installations

Table 4 explores consumer practices related to solar energy installations, including awareness of installer qualifications, warranty agreements, and regulatory oversight. The findings reveal that 52.8% of respondents did not verify their installer's qualifications before hiring, while 47.2% did. However, 79.2% had warranty agreements in place, indicating a common effort to ensure accountability in installations.

Government efforts to curb the influx of substandard solar energy equipment were met with skepticism, as 59.4% of respondents felt that the Standards Organisation of Nigeria (SON) was not doing enough to regulate the market. Despite this, 69.8% were aware that SON and other relevant agencies oversee solar energy facilities.

Experiences with substandard materials were also reported, with 28.3% of respondents stating they had been victims of poor-quality solar products. Among them, 34.7% took no action, 14.2% returned the faulty product, 5.7% reported the issue to SON, and 1.9% filed a complaint with the police.

Table 4 Perceived Practices in The Installation of Solar Energy Projects by Consumer

Statement	**Response**	**Percentage**
Did you care to know the qualifications of the installer before he/she worked for you	No	52.8
	Yes	47.2
Was there a warranty agreement on the work done	No	20.8
	Yes	79.2
What do you think can be done about an influx of poor-quality solar energy facilities in Nigeria	Allow them	1.9
	Destroy them	3.8
	Destroy them and prosecute the seller/importers	45.3
	No need to Prosecute the seller/importers	5.7
	Prosecute the seller/importers	43.4
Do you think the Government through SON is doing enough to curb the menace of substandard solar energy equipment in Nigeria?	No	59.4
	Yes	40.6
Are you aware that solar energy facilities are being regulated by SON?	No	30.2
	Yes	69.8
Have you ever been a victim of substandard solar energy material?	No	71.7
	Yes	28.3
If yes to the above, what did you take action	Did nothing	6.6
	Reported to SON for redress	5.7
	Reported to the police	1.9
	Returned the product to the seller	14.2

4. Conclusion

4.1. Addressing Substandard Solar Energy Installations

Respondents offered various recommendations for tackling the issue of substandard solar energy products in Nigeria. While a small minority (7.5%) suggested allowing these products without penalties, 43.4% advocated for prosecuting sellers and importers, and 45.3% supported both the destruction of substandard products and the prosecution of those distributing them. These findings highlight a strong demand for stricter enforcement of quality standards and regulatory compliance in the solar energy sector.

This research has provided insights into some of the reasons for the low performance of most solar energy facilities installed in Nigeria, both for domestic and public uses, especially their longevity. Also the need to imbibe quality consciousness, international best practices and for integrity, private institutions should be licensed to carry out regulatory and conformity assessment, rather than only government agencies.

Compliance with ethical standards

Acknowledgement

There was no grant, presentation or assistance received in the course of carrying out this research work, it was personally funded. Hence no acknowledgement of any person, group of persons or institution is relevant

Disclosure of conflict of interest

In carrying out this work, I hereby submit that all Laboratory Codes of practice and Research ethics, including all institutional rules and regulations were compiled with. I also declare that there is no conflict of interest of any of the stakeholders involved in this research work whatsoever

References

[1] Adegoke, S. (2019). Challenges of market regulation in developing economies: A case study of Nigeria. Journal of Financial Regulation, 7(2), 112-130.

[2] Akinbami, J. F. K. (2021). Renewable energy for sustainable development in Nigeria: Review of the policy framework. Energy Policy, 55(4), 605-615.

[3] Energy Commission of Nigeria (ECN). (2022). Nigeria's energy outlook. Abuja, Nigeria: ECN Publications.

[4] Eze, C. (2021). The impact of corruption on market regulation in Nigeria. African Journal of Economic Studies, 15(4), 321-340.

[5] Fagbenle, R. O., Katende, J., Ajayi, O. O., & Okeniyi, J. O. (2020). Assessment of solar energy potential and the viability of PV power in Nigeria. Renewable Energy, 36(2), 434-439.

[6] Federal Ministry of Power. (2021). National renewable energy and energy efficiency policy. Abuja, Nigeria: Government Press.

[7] Intergovernmental Panel on Climate Change (IPCC). (2021). Climate change 2021: Mitigation of climate change. Cambridge University Press.

[8] International Energy Agency (IEA). (2023). World energy outlook 2023. Paris, France: IEA Publications.

[9] International Renewable Energy Agency (IRENA). (2022). Renewable energy statistics 2022. Abu Dhabi, UAE: IRENA.

[10] Okonkwo, J. (2020). Weak enforcement of financial regulations in Nigeria: Causes and consequences. International Review of Business and Finance, 9(3), 210-225.

[11] Olawale, T., and Yusuf, K. (2020). Human capital and financial constraints in Nigerian regulatory agencies. Journal of African Public Administration, 5(1), 45-62.

[12] Rural Electrification Agency (REA). (2021). Solar Power Naija Programme: Expanding energy access in Nigeria. Abuja, Nigeria: REA Publications.

[13] Shahsavari, A., and Akbari, M. (2018). Potential of solar energy in developing countries for reducing energy-related emissions. Renewable and Sustainable Energy Reviews, 90, 275-291.

[14] Transparency International. (2022). Corruption perceptions index 2022: Nigeria. Transparency International.

[15] United Nations Development Programme (UNDP). (2021). Strengthening regulatory frameworks for sustainable development in Nigeria. UNDP Publications.

[16] United Nations Development Programme (UNDP). (2021). Sustainable energy for all: Nigeria's pathway to clean energy. New York, NY: UNDP Publications.

[17] World Bank. (2021). Governance and regulatory challenges in sub-Saharan Africa: Nigeria case study. World Bank Group.

[18] World Bank. (2022). Scaling up solar investments in Nigeria. Washington, DC: World Bank Group.

[19] Yamane, Taro. 1967. Statistics: An Introductory Analysis, 2nd Ed., New York: Harper and Row.